Industrial Internet Innovation Center (Shanghai) Co.,Ltd.

SAR TEST REPORT

PRODUCT	Acoustic Thermal Imager
BRAND	FOTRIC
MODEL	Fotric 860MiX
FCC ID	2AZTCJGACF
APPLICANT	FOTRIC INC.
ISSUE DATE	July 4, 2024
STANDARD(S)	ANSI/IEEE C95.1-1992, IEEE Std 1528-2013

Prepared by: Chen Jintao **Reviewed by: Yan Hang** **Approved by: *Zhang Min***

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1 Summary of Test Report

1.1 Test Standard (s)

No.	Test Standard(s)	Title	Version
1	ANSI/IEEE C95.1	IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.	1992
2	IEEE Std 1528	IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques	2013

1.2 Reference Documents

No.	Reference Document(s)	Title	Version
1	KDB 447498	General RF Exposure Guidance	D01 v06
2	KDB 865664	SAR Measurement 100 MHz to 6 GHz	D01 v01r04
3	KDB 865664	RF Exposure Reporting	D02 v01r02
4	KDB 248227	802.11 Wi-Fi SAR	D01 v02r02

1.3 Summary of Test Results

1.3.1 The maximum results of Specific Absorption Rate (SAR) in standalone mode are as follows.

Band	Reported SAR 1g(W/Kg)	Detailed Results
	Body(0mm)	
Wi-Fi 2.4G	0.01	See section 14.1
Wi-Fi 5G	**1.47**	See section 14.1
BT	0.01	See section 14.1

NOTE1: The Fotric 860MiX manufactured by FOTRIC INC. is a new product for testing.
NOTE2: The test scheme for this project has been executed according to a KDB inquiry.
NOTE3: There are 44 models of this product, and according to the manufacturer's declaration, the following acoustic thermal imager share the same schematic and hardware circuit, including RF parameters, except pixel, lens size differences.
Base Model: Fotric860MiX
Derived model:

Fotric P0MiX	Fotric 360MiX	Fotric 350MiX	/
Fotric P1MiX	Fotric 361MiX	Fotric 351MiX	Fotric 861MiX
Fotric P2MiX	Fotric 362MiX	Fotric 352MiX	Fotric 862MiX
Fotric P3MiX	Fotric 363MiX	Fotric 353MiX	Fotric 863MiX
Fotric P4MiX	Fotric 364MiX	Fotric 354MiX	Fotric 864MiX
Fotric P5MiX	Fotric 365MiX	Fotric 355MiX	Fotric 865MiX
Fotric P6MiX	Fotric 366MiX	Fotric 356MiX	Fotric 866MiX
Fotric P7MiX	Fotric 367MiX	Fotric 357MiX	Fotric 867MiX
Fotric P8MiX	Fotric 368MiX	Fotric 358MiX	Fotric 868MiX
Fotric P9MiX	Fotric 369MiX	Fotric 359MiX	Fotric 869MiX
Fotric P10MiX	Fotric 3610MiX	Fotric 3510MiX	Fotric 8610MiX

NOTE4: Industrial Internet Innovation Center (Shanghai) Co., Ltd. has verified that the compliance of the tested device specified in section 4 of this test report is successfully evaluated according to the procedure and test methods as defined in type certification requirement listed in section 1 of this test report.

2 General Information of The Laboratory

2.1 Testing Laboratory

Lab Name	Industrial Internet Innovation Center (Shanghai) Co.,Ltd.
Address	Building 4， No. 766， Jingang Road， Pudong， Shanghai， China
Telephone	021-68866880
FCC Registration No.	708870
FCC Designation No.	CN1364

2.2 Laboratory Environmental Requirements

Temperature	18℃~25℃
Relative Humidity	25%RH~75%RH

2.3 Project Information

Project Manager	Xu Yuting
Test Date	May 20, 2024 to May 23, 2024

3 General Information of The Customer

3.1 Applicant

Company	FOTRIC INC.
Address	No. 14, Lane 2500, Xiupu Road, Pudong District, Shanghai, PRC
Telephone	N/A

3.2 Manufacturer

Company	FOTRIC INC.
Address	No. 14, Lane 2500, Xiupu Road, Pudong District, Shanghai, PRC
Telephone	N/A

4 General Information of The Product

4.1 Product Description for Equipment under Test (EUT)

Product	Acoustic Thermal Imager
Model	Fotric 860MiX
Date of Receipt	April 10, 2024
EUT ID*	S01
SN/IMEI	863178045168945
Supported Radio Technology and Bands	Wi-Fi 802.11a/b/g/n/ac BT BR/EDR/LE
Tx Frequency	2412 MHz-2462 MHz (Wi-Fi 2.4G) 5180 MHz-5240 MHz (Wi-Fi 5G U-NII-1) 5260 MHz-5320 MHz (Wi-Fi 5G U-NII-2A) 5500 MHz-5720 MHz (Wi-Fi 5G U-NII-2C) 5745 MHz-5825 MHz (Wi-Fi 5G U-NII-3) 2402 MHz-2480 MHz (BT)
Hardware Version	6.0.0
Software Version	6.0.1
Dimension	190mm*181mm*99mm
NOTE1: EUT ID is the internal identification code of the laboratory. NOTE2: Samples in the test report are provided by the customer. The test results are only applicable to the samples received by the laboratory.	

4.2 Description for Auxiliary Equipment (AE)

AE ID*	Description	Model	SN/Remark
BA01	Battery	N/A	N/A
NOTE: AE ID is the internal identification code of the laboratory.			

5 Test Configuration Information

5.1 Test Equipments Utilized

No.	Name	Model	S/N	Software Version	Hardware Version	Manufacturer	Cal. Date	Cal. Interval
1	Network analyzer	N5242A	MY51221755	A.09.33.09	N/A	Agilent	Oct.16, 2023	1 Year
2	Power meter	NRX	103851	02.50.21112602	20.00	R&S	Jul.26, 2023	1 Year
3	Power sensor	NRP18S-10	101841	N/A	N/A	R&S	Jul.26, 2023	1 Year
4	Power sensor	NRP18S-10	101842	N/A	N/A	R&S	Jul.26, 2023	1 Year
5	Signal Generator	E4438C	MY49072044	N/A	C.05.83	Agilent	Jul.26, 2023	1 Year
6	Amplifier	NTWPA-07605	22039018	N/A	N/A	RFLIGHT	Jul.26, 2023	1 Year
7	Test Software	DASY5	N/A	52.10.4.1527	N/A	SPEAG	N/A	N/A
8	DAE	DAE4	1581	N/A	N/A	SPEAG	Feb.22, 2024	1 Year
9	E-field Probe	EX3DV4	7634	N/A	N/A	SPEAG	Mar.20, 2024	1 Year
10	Dipole Validation Kit	D2450V2	858	N/A	N/A	SPEAG	Sep.12, 2023	1 Year
11	Dipole Validation Kit	D5GHzV2	1172	N/A	N/A	SPEAG	Sep.7, 2023	1 Year

5.2 Measurement Uncertainty

Item	Uncertainty
SAR	$U_{SAR(1g)}$=21.70%, $U_{SAR(10g)}$=21.42%
NOTE: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

5.3 EUT Connection Diagram of Test System

5.3.1 SAR

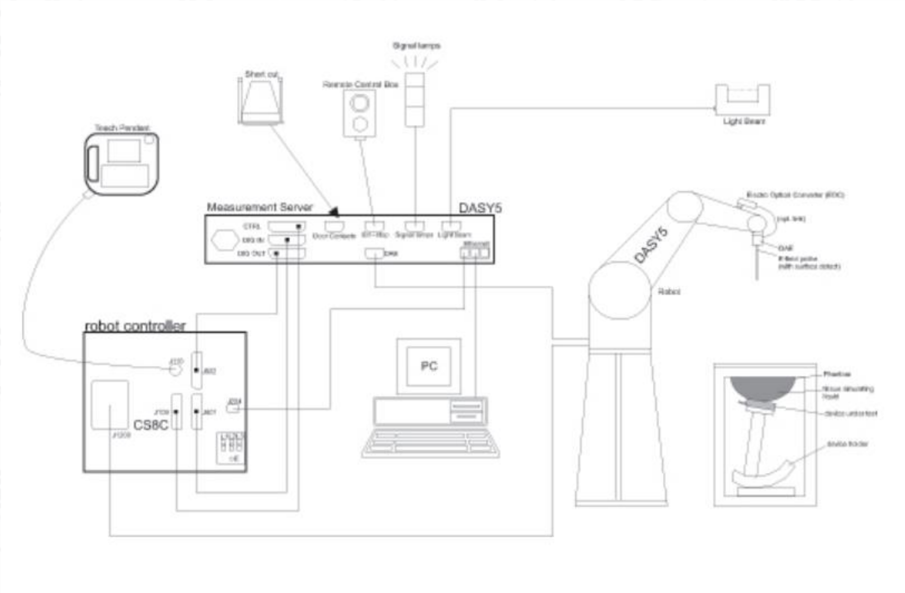


Figure 5.3.1-1 SAR Connection Diagram

6 Specific Absorption Rate(SAR)

6.1 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.

6.2 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 head 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 tissue, which is normally set to 1g/cm^3

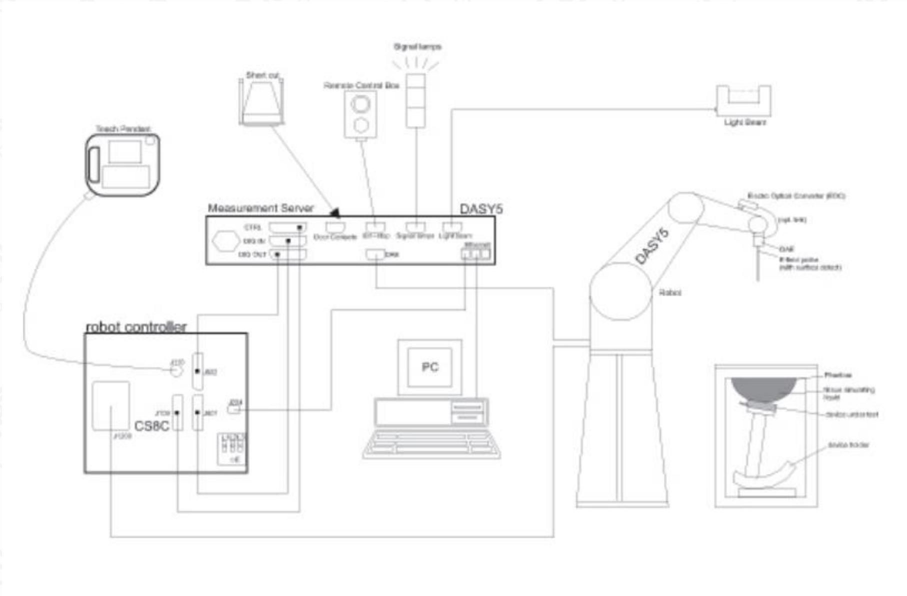
E is the RMS electrical field strength

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

7 SAR Measurement System Introduction

7.1 Measurement Set-up

The DASY5 system for performing compliance tests is illustrated above graphically. This system consists of the following items:



Figures 7.1-1 SAR Measurement Set-up

- A standard high precision 6-axis robot (Stäubli TX=RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP and the DASY software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.

The phantom, the device holder and other accessories according to the targeted measurement.

7.2 E-field Probe System

The SAR measurements were conducted with the dosimetric probe designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe is constructed using the thick film technique; with printed resistive lines on ceramic substrates. The probe is equipped with an optical multi-fiber line ending at the front of the probe tip. It is connected to the EOC box on the robot arm and provides an automatic detection of the phantom surface. Half of the fibers are connected to a pulsed infrared transmitter, the other half to a synchronized receiver. As the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases first during the approach, reaches maximum and then decreases. If the probe is flatly touching the surface, the coupling is zero. The distance of the coupling maximum to the surface is independent of the surface reflectivity and largely independent of the surface to probe angle. The DASY software reads the reflection during a software approach and looks for the maximum using 2nd order curve fitting. The approach is stopped at reaching the maximum.

Probe Specifications	
Model	EX3DV4
Frequency Range	4 MHz – 10 GHz
Calibration	In head simulating tissue at frequency from 650MHz to 5900MHz
Linearity	±0.2 dB (30 MHz – 10 GHz)
Dynamic Range	10 µW/g – >100 mW/g
Probe Length	337 mm
Probe Tip Length	20 mm
Body Diameter	12 mm
Tip Diameter	2.5 mm
Tip-Center	1 mm
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields); the only probe that enables compliance testing for frequencies up to 6 GHz with precision of better than 30%.


Figure 7.2-1 Detail of Probe


Figure 7.2-2 E-field Probe

7.3 E-field Probe Calibration

Each E-Probe/Probe Amplifier combination has unique calibration parameters. A TEM cell calibration procedure is conducted to determine the proper amplifier settings to enter in the probe parameters. The amplifier settings are determined for a given frequency by subjecting the probe to a known E-field density (1 mW/cm2) using an RF Signal generator, TEM cell, and RF Power Meter.

The free space E-field from amplified probe outputs is determined in a test chamber. This calibration can be performed in a TEM cell if the frequency is below 1 GHz and inn a waveguide or other methodologies above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees until the three channels show the maximum reading. The power density readings equates to 1 mW/cm2..

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The E-field in the medium correlates with the temperature rise in the dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

$$SAR = C\frac{\Delta T}{\Delta t}$$

Where:

Δt = Exposure time (30 seconds),

C = Heat capacity of tissue (brain or muscle),

ΔT = Temperature increase due to RF exposure.

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

Where:

σ = Simulated tissue conductivity,

ρ = Tissue density (kg/m^3).

7.4 Other Test Equipment

7.4.1 Data Acquisition Electronics (DAE)

The data acquisition electronics consist 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 with a 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 mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection. The input impedance of the DAE is 200M Ohm; the inputs are symmetrical and floating. Common mode rejection is above 80dB.

Figure 7.4.1-1: DAE

7.4.2 Robot

The SPEAG DASY system uses the high precision robots (DASY5: TX90) type from Stäubli SA (France).
For the 6-axis controller system, the robot controller version from Stäubli is used. The Stäubli robot series have many features that are important for our application

- ➢ High precision (repeatability 0.02mm)
- ➢ High reliability (industrial design)
- ➢ Low maintenance costs (virtually maintenance free due to direct drive gears; no belt drives)
- ➢ Jerk-free straight movements (brushless synchronal motors; no stepper motors)
- ➢ Low ELF interference (motor control fields shielded via the closed metallic construction shields)

Figure 7.4.2-1: DASY5

7.4.3 Measurement Server

The DASY5 measurement server is based on a PC/104 CPU board with a 400 MHz intel ULV Celeron, 128 MB chipdisk and 128 MB RAM. The necessary circuits for communication with either the DAE4 (or DAE3) electronics box as well as the 16 bit AD converter system for optical detection and digital I/O interface are contained on the DASY5 I/O board, which is directly connected to the PC/104 bus of the CPU board.

Figure 7.4.3-1 Server for DASY5

The measurement server performs all real-time data evaluation of field measurements and surface detection, controls robot movements and handles safety operation. The PC operating system cannot interfere with these time critical processes. All connections are supervised by a watchdog, and disconnection of any of the cables to the measurement server will automatically disarm the robot and disable all program-controlled robot movements. Furthermore, the measurement server is equipped with an expansion port which is reserved for future applications. Please note that this expansion port does not have a standardized pinout, and therefore only devices provided by SPEAG can be connected. Devices from any other supplier could seriously damage the measurement server.

7.4.4 Device Holder for Phantom

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 5mm distance, a positioning uncertainty of ±0.5mm would produce a SAR uncertainty of ±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 the different positions given in the standard. It has two scales for device rotation (with respect to the body axis) and device inclination (with respect to the line between the ear reference points). The rotation centers for both scales is the ear reference point (ERP). Thus the device needs no repositioning when changing the angles.

Figure 7.4.4-1: Device Holder

The DASY device holder is constructed of low-loss POM material having the following dielectric parameters: relative permittivity ε =3 and loss tangent δ =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.

The extension is lightweight and made of POM, acrylic glass and foam. It fits easily on the upper part of the Mounting Device in place of the phone positioner. The extension is fully compatible with the Twin-SAM and ELI phantoms.

The DASY device holder is constructed of low-loss POM material having the following dielectric parameters: relative permittivity ε =3 and loss tangent δ =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.

Figure 7.4.4-2: Laptop Extension Kit

7.4.5 Phantom

The SAM Twin Phantom V4.0 is constructed of a fiberglass shell integrated in a table. The shape of the shell is based on data from an anatomical study designed to represent the 90th percentile of the population. The phantom enables the dissymmetric evaluation of SAR for both left and right handed handset usage, as well as body-worn usage using the flat phantom region. Reference markings on the Phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot. The shell phantom has a 2mm shell thickness (except the ear region where shell thickness increases to 6 mm).

Shell Thickness	2 ± 0.2 mm
Available	Special
Filling Volume	Approx. 25 liters
Dimensions	810 mm x l000 mm x 500 mm (H x L x W)

Figure 7.4.5-1: SAM Twin Phantom

8 Test Position in Relation to the Phantom

8.1 General considerations

This standard specifies two handset test positions against the head phantom – the “cheek” position and the “tilt” position.

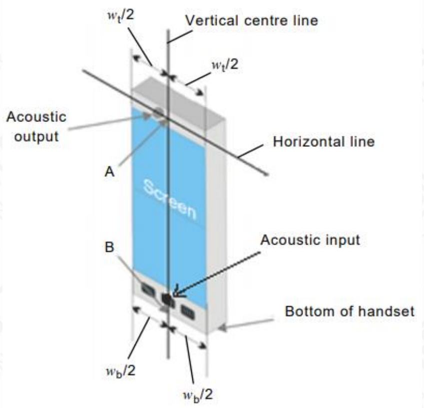


Figure 8.1-1 full touch screen smart phone (top)

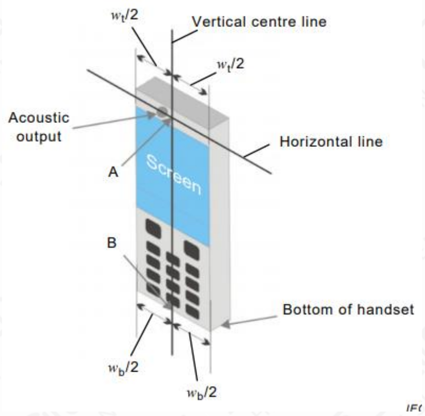


Figure 8.1-2 keyboard handset (bottom)

W_t	Width of the handset at the level of the acoustic output
W_b	Width of the bottom of the handset
A	Midpoint of the width W_t of the DUT at the level of the acoustic output
B	Midpoint of the width W_b of the bottom of the handset

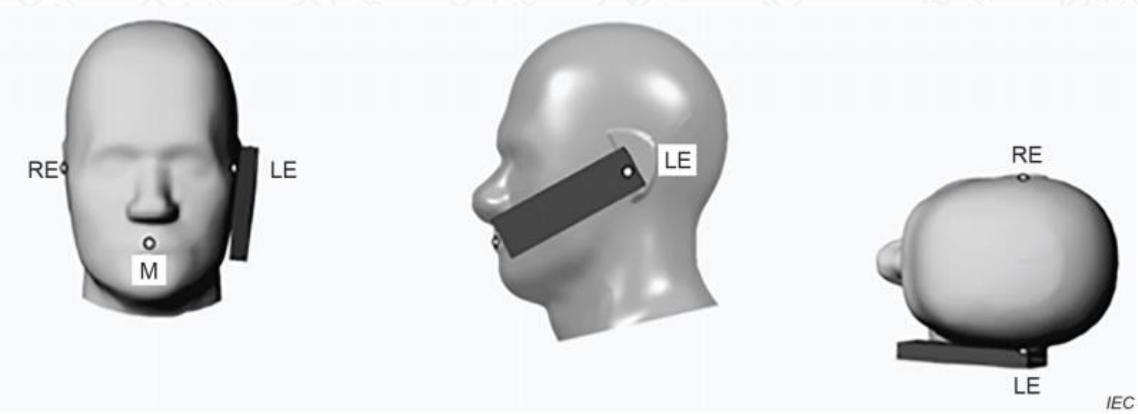


Figure 8.1-3 Cheek position of the wireless device on the left side of SAM

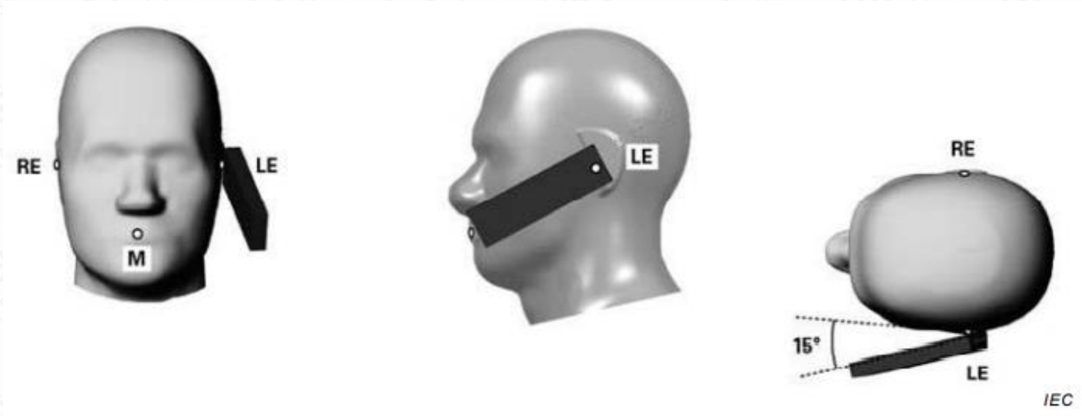


Figure 8.1-4 Tilt position of the wireless device on the left side of SAM

8.2 Body-worn device

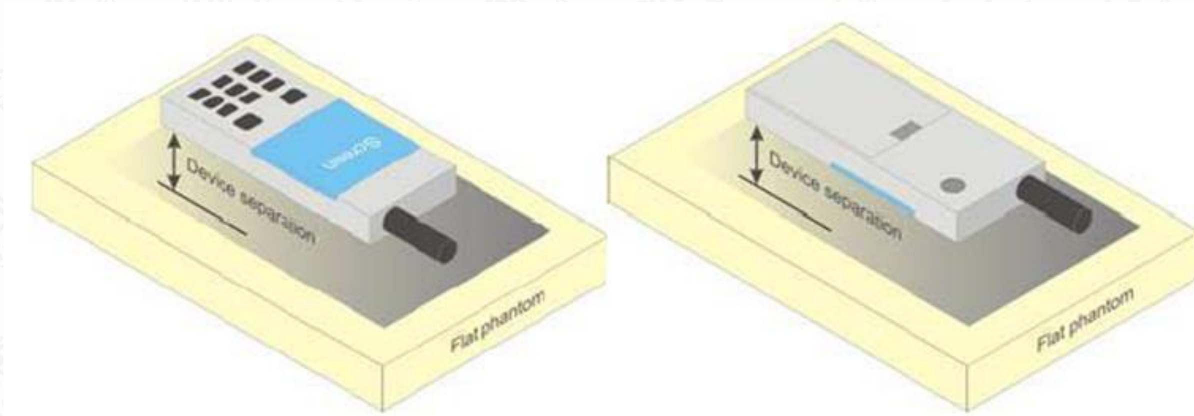


Figure 8.2-1 Test positions for body-worn devices

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

8.3 Desktop device

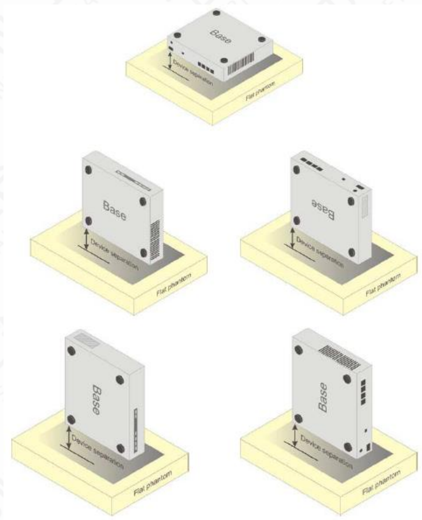
<table>
<tr><td>A typical example of a desktop device is a wireless enabled desktop computer placed on a table or desk when used.</td><td rowspan="4">

Figure 8.3-1 Test positions for desktop devices</td></tr>
<tr><td>The DUT shall be positioned at the distance and in the orientation to the phantom that corresponds to the intended use as specified by the manufacturer in the user instructions. For devices that employ an external antenna with variable positions.</td></tr>
<tr><td>Tests shall be performed for all antenna positions specified.</td></tr>
<tr><td>Picture 8-6 shows positions for desktop device SAR tests. If the intended use is not specified, the device shall be tested directly against the flat</td></tr>
</table>

9 Tissue Simulating Liquids

9.1 Equivalent Tissues Composition

The liquid used for the frequency range of 650-6000 MHz consisted of water, sugar, salt, preventol, glycol monobutyl and Cellulose. The liquid has been previously proven to be suited for worst-case. The Table 9.1 shows the detail solution. It's satisfying the latest tissue dielectric parameters requirements proposed by the IEEE Std 1528.

Table 9.1-1: Composition of the Head Tissue Equivalent Matter

Frequency (MHz)	**835**	**900**	**1800**	**1950**	**2300**	**2450**	**2600**	**5800**
Ingredients (% by weight)								
Water	41.45	40.92	55.242	54.89	56.34	58.79	58.79	65.53
Sugar	56.0	56.5	/	/	/	/	/	/
Salt	1.45	1.48	0.306	0.18	0.14	0.06	0.06	/
Preventol	0.1	0.1	/	/	/	/	/	/
Cellulose	1.0	1.0	/	/	/	/	/	/
GlycolMonobutyl	/	/	44.452	44.93	43.52	41.15	41.15	/
Diethylenglycol momohexylether	/	/	/	/	/	/	/	17.24
Triton X-100	/	/	/	/	/	/	/	17.23
Dielectric Parameters Target Value	ε=41.5 σ=0.90	ε=41.5 σ=0.97	ε=40.0 σ=1.40	ε=40.0 σ=1.40	ε=39.5 σ=1.67	ε=39.2 σ=1.80	ε=39.0 σ=1.96	ε=35.3 σ=5.27

Table 9.1-2: Targets for tissue simulating liquid

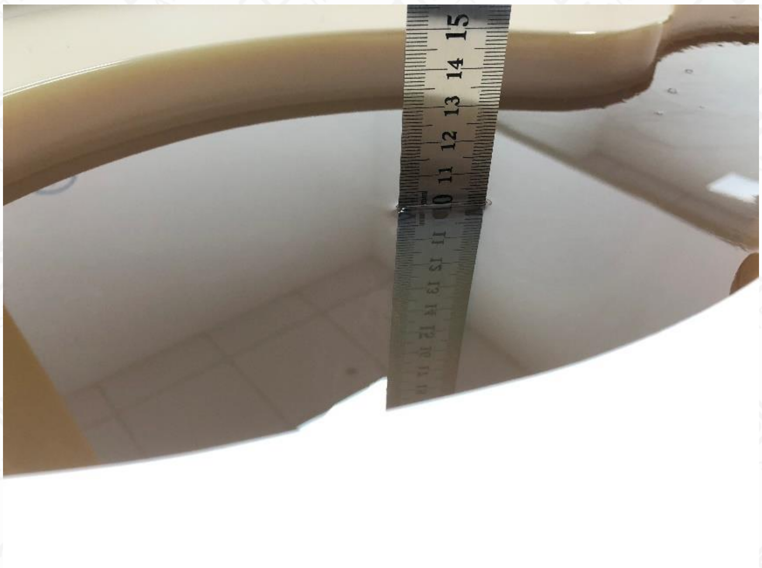
Frequency (MHz)	Liquid Type	Conductivity (σ)	±5% Range	Permittivity (ε)	±5% Range
750	Head	0.89	0.846~0.934	41.9	39.805~43.995
835	Head	0.90	0.855~0.945	41.5	39.425~43.575
900	Head	0.97	0.922~1.018	41.5	39.425~43.575
1450	Head	1.20	1.140~1.260	40.5	38.475~42.525
1750	Head	1.37	1.302~1.438	40.1	38.095~42.105
1800	Head	1.40	1.330~1.470	40.0	38.000~42.000
1900	Head	1.40	1.330~1.470	40.0	38.000~42.000
2000	Head	1.40	1.330~1.470	40.0	38.000~42.000
2100	Head	1.49	1.416~1.564	39.8	37.810~41.790
2300	Head	1.67	1.587~1.753	39.5	37.525~41.475
2450	Head	1.80	1.710~1.890	39.2	37.240~41.160
2600	Head	1.96	1.862~2.058	39.0	37.050~40.950
3000	Head	2.40	2.280~2.520	38.5	36.575~40.425
3500	Head	2.91	2.765~3.055	37.9	36.005~39.795
4000	Head	3.43	3.259~3.601	37.4	35.530~39.270
4500	Head	3.94	3.743~4.137	36.8	34.960~38.640
5000	Head	4.45	4.228~4.672	36.2	34.390~38.010
5200	Head	4.66	4.427~4.893	36.0	34.200~37.800
5400	Head	4.86	4.617~5.103	35.8	34.010~37.590
5600	Head	5.07	4.817~5.323	35.5	33.725~37.275
5800	Head	5.27	5.007~5.533	35.3	33.535~37.065
6000	Head	5.48	5.206~5.754	35.1	33.345~36.855
NOTE: For dielectric properties of head tissue-equivalent liquid at other frequencies within the frequency range, a linear interpolation method shall be used.					

9.2 Liquid depth

The Measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness: 2.0±0.2mm (bottom Plate) filled with Body or Head simulating Liquid.

The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm with ≤ ±0.5 cm variation for SAR measurements ≤ 3 GHz and ≥ 10.0 cm with ≤± 0.5 cm variation for measurements > 3 GHz.

Picture 9.2-1 Liquid depth in the Flat Phantom for SAR measurements ≤ 3 GHz



Picture 9.2-2 Liquid depth in the Flat Phantom for SAR measurements > 3 GHz

9.3 Dielectric Performance of TSL

Table 9.3-1: Dielectric Performance of Head Tissue Simulating Liquid

Tissue Simulating Liquid								
Frequency (MHz)	Head(Standard)		Temperature	Date	Test Result		Deviation	
	Permittivity ε	Conductivity σ			Permittivity ε	Conductivity σ	Permittivity ε	Conductivity σ
2450	39.20	1.80	20.4℃	May 20, 2024	38.216	1.836	-2.51%	2.00%
5200	36.00	4.66	20.2℃	May 21, 2024	35.484	4.68	-1.43%	0.43%
5300	35.90	4.76	20.2℃	May 21, 2024	35.274	4.788	-1.74%	0.59%
5600	35.50	5.07	20.6℃	May 23, 2024	34.653	5.132	-2.39%	1.22%
5800	35.30	5.27	20.6℃	May 23, 2024	34.247	5.369	-2.98%	1.88%

10 System Check

10.1 System Check

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.

10.2 System Setup

In the simplified setup for system evaluation, the DUT 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:

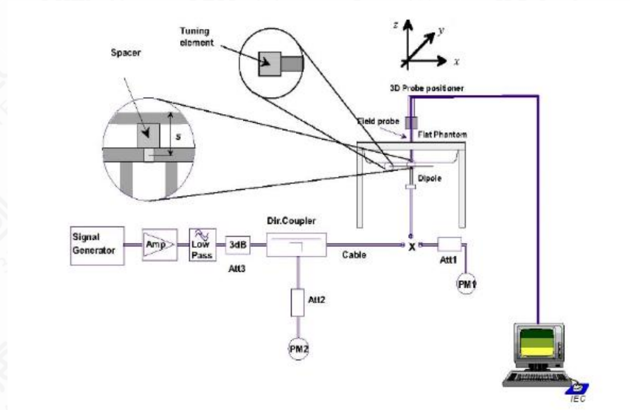


Figure 10.2-1 Set-up for the system check

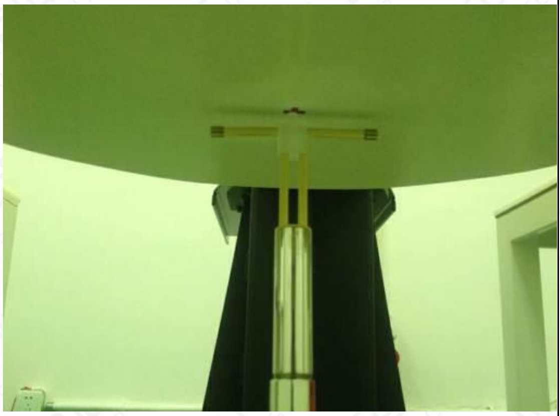


Figure 10.2-2. Setup for Dipole

10.3 System Check Result

Table 10.3-1: System Check Result of SAR

SAR System Check								
Frequency (MHz)	Target Value (w/kg)		Temperature	Date	Test Result (w/kg)		Deviation	
	10g	1g			10g	1g	10g	1g
2450	24.40	52.60	21.5℃	May 20, 2024	24.40	52.80	0.00%	0.38%
5200	21.80	77.40	21.3℃	May 21, 2024	22.40	78.50	2.75%	1.42%
5300	22.50	79.40	21.3℃	May 21, 2024	22.40	78.40	-0.44%	-1.26%
5600	23.20	82.40	21.7℃	May 23, 2024	23.00	81.70	-0.86%	-0.85%
5800	22.00	78.60	21.7℃	May 23, 2024	22.00	78.00	0.00%	-0.76%
NOTE: The system verifies that the measured input power level is equivalent to 250mW for 0.6GHz to 3GHz and above 3GHz is equivalent to 100mW, and the measured results are compared with the target value by converting to 1W.								

11 Measurement Procedures

11.1 Test Steps

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

(a) Power reference measurement

The reference and drift jobs are useful for monitoring the power drift of the device under test in the batch process. Both jobs measure the electric field strength at a specified reference position, at a selectable distance from the phantom surface. The reference position can be either the selected section’s grid reference point or a user point in this section. The reference job projects the selected point onto the phantom surface, orients the probe perpendicularly to the surface, and approaches the surface using the selected detection method.

(b) Area scan

The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a finer measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum locations even in relatively coarse grids. The scan area is defined by an editable grid. This grid is anchored at the grid reference point of the selected section in the phantom. When the area scan’s property sheet is brought up, grid was at to 15mm * 15mm and can be edited by users.

(c) Zoom scan

Zoom scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1g and 10g of simulated tissue. The default zoom scan measures 5 * 5 * 7 points within a cube whose base faces are centered around the maximum found in a preceding area scan job within the same procedure. If the preceding Area Scan job indicates more than one maximum, the number of Zoom Scans has to be enlarged accordingly.

(d) Power drift measurement

The drift job measures the field at the same location as the most recent reference job within the same procedure, and with the same setting. The drift measurement gives the field difference in dB from the reading conducted within the last reference measurement. Several drift measurements are possible for one reference measurement. This allows a user to monitor the power drift of the device under within a batch process. In the properties of the drift job, the user can specify a limit for the drift and have DASY software stop the measurements if this limit is exceeded. This ensures that the power drift during one measurement is within 5%.

The SAR measurement procedures for each of test conditions are as follows:

(a) Make EUT to transmit it maximum output power

(b) Measure conducted output power through RF cable

(c) Place the EUT in the specific position of phantom

(d) Measure SAR results for Middle channel or the highest power channel on each testing position

(e) Measure SAR results for other channels in worst SAR testing position if the reported SAR of highest power channel is larger than 0.8 W/kg

(f) Record the SAR value

11.2 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the IEEE Std 1528 standard. It can be conducted for 1g and 10g.

The DASY system allows evaluations that combine measured data and robot positions, such as:

(a) Maximum Search

During a maximum search, global and local maximum searches are automatically performed in 2D after each Area Scan measurement with at least 6 measurement points. It is based on the evaluation of the local SAR gradient calculated by the Quadratic Shepard's method. The algorithm will find the global maximum and all local maxima within -2dB of the global maxima for all SAR distributions.

(b) Extrapolation

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. Several measurements at different distances are necessary for the extrapolation.

Extrapolation routines require at least 10 measurement points in 3D space. They are used in the Cube Scan to obtain SAR values between the lowest measurement points and the inner phantom surface. The routine uses the modified Quadratic Shepard's method for extrapolation. For a grid using 5*5*5 measurement points with 5mm resolution amounting to 343 measurement points, the uncertainty of the extrapolation routines is less than 1% for 1g and 10 cubes.

(c) Boundary effect

For measurements in the immediate vicinity of a phantom surface, the field coupling effects between the probe and the boundary influence the probe characteristics. Boundary effect errors of different dosi-metric probe types have been analyzed by measurements and using a numerical probe model. As expected, both methods showed an enhanced sensitivity in the immediate vicinity of the boundary. The effect strongly depends on the probe dimensions and disappears with increasing distance from the boundary. The sensitivity can be approximately given as:

$$S \approx So + Sb * \exp\left(-\frac{z}{a}\right) * \cos\left(\pi\frac{z}{\lambda}\right)$$

Since the decay of the boundary effect dominates for small probe (a≪ λ), the cos-term can be omitted. Factors Sb (parameter Alpha in the DASY software) and a (parameter Delta in the DASY software) and assessed during probe calibration and used for numerical compensation of the boundary effect. Several simulations and measurements have confirmed that the compensation is valid for different field and boundary configurations.

This simple compensation procedure can largely reduce the probe uncertainty near boundaries. It works well as long as:

- The boundary curvature is small
- The probe axis is angled less than 30_to the boundary normal
- The distance between probe and boundary is larger than 25% of the probe diameter
- The probe is symmetric (all sensors have the same offset from the probe tip)

Since all of these requirements are fulfilled in a DASY system, the correction of the probe boundary effect in the vicinity of the phantom surface is performed in a fully automated manner via the measurement data extraction during post processing.

11.3 General Measurement Procedure

The area and zoom scan resolutions specified in the table below must be applied to the SAR measurements and fully documented in SAR reports to qualify for TCB approval. Probe boundary effect error compensation is required for measurements with the probe tip closer than half a probe tip diameter to the phantom surface. Both the probe tip diameter and sensor offset distance must satisfy measurement protocols; to ensure probe boundary effect errors are minimized and the higher fields closest to the phantom surface can be correctly measured and extrapolated to the phantom surface for computing 1-g SAR. Tolerances of the post-processing algorithms must be verified by the test laboratory for the scan resolutions used in the SAR measurements, according to the reference distribution functions specified in IEEE Std 1528-2013. The results should be documented as part of the system validation records and may be requested to support test results when all the measurement parameters in the following table are not satisfied.

Table 11.3-1: Test Resolution Requirement

Items			**≤3GHz**	**>3GHz**
Maximum Distance			5mm ±1mm	$\frac{1}{2} * \delta * \ln(2)$ mm ±0.5mm
Maximum probe angle			30±1°	20±1°
Maximum Area Scan spatial resolution: Δx_{Area} , Δy_{Area}			≤2GHz: ≤15mm	3-4GHz: ≤12mm
			2-3GHz: ≤12mm	4-6GHz: ≤10mm
			when the x or y dimension of the device , in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the device with at least one measurement point on the device	
Maximum Zoom Scan spatial resolution: Δx_{Zoom} , Δy_{Zoom}			≤2GHz: ≤8mm	3-4GHz: ≤5mm
			2-3GHz: ≤5mm	4-6GHz: ≤4mm
maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤5mm	3-4GHz: ≤4mm 4-5GHz: ≤3mm 5-6GHz: ≤2mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤4mm	3-4GHz: ≤3mm 4-5GHz: ≤2.5mm 5-6GHz: ≤2mm
		$\Delta z_{Zoom}(n>1)$ between subsequent points	≤1.5*	
minimum zoom scan volume	x, y, z		≥30mm	3-4GHz: ≥28mm 4-5GHz: ≥25mm 5-6GHz: ≥22mm

Notes:
δ is the penetration depth of a plane-wave at normal incidence to the tissue medium in IEEE Std 1528-2013.
When Zoom Scan is required and reported SAR from the Area Scan based 1-g SAR estimation procedure of KDB publication 447498 is ≤1.4 W/kg, ≤8mm for 2GHz-3GHz, ≤7mm for 3GHz-4GHz, ≤5mm for 4GHz-6GHz Zoom Scan resolution may be applied.

11.4 Bluetooth & Wi-Fi Measurement Procedures

Normal network operating configurations are not suitable for measuring the SAR of IEEE 802.11 transmitters in general. Unpredictable fluctuations in network traffic and antenna diversity conditions can introduce undesirable variations in SAR results. The SAR for these devices should be measured using chipset based test mode software to ensure that the results are consistent and reliable.

Chipset based test mode software is hardware dependent and generally varies among manufacturers. The device operating parameters established in a test mode for SAR measurements must be identical to those programmed in production units, including output power levels, amplifier gain settings and other RF performance tuning parameters. The test frequencies should correspond to actual channel frequencies defined for domestic use. SAR for devices with switched diversity should be measured with only one antenna transmitting at a time during each SAR measurement, according to a fixed modulation and data rate. The same data pattern should be used for all measurements.

Per KDB 248227 D01v02r02, for 2.4GHz 802.11g/n SAR testing is not required 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.

Per KDB 248227 D01v02r02, U-NII-1 SAR testing is not required when the U-NII-2A band highest reported SAR for a test configuration is ≤1.2 W/kg, SAR is not required for U-NII-1 band. For all positions / configurations, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions / configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤1.2 W/kg or all required channels are tested.

11.5 Area Scan Based 1g SAR

According to the KDB447498 D01, a first class of fast SAR techniques is based on a modified measurement procedure and post processing algorithms. In practice, these methods require a special software, for example DASY52 form SPEAG.

When the implementation is based the specific polynomial fit algorithm as presented at the 29th Bio-electromagnetics Society meeting (2007) and the estimated 1-g SAR is ≤ 1.2 W/kg, a zoom scan measurement is not required provided it is also not needed for any other purpose; for example, if the peak SAR location required for simultaneous transmission SAR test exclusion can be determined accurately by the SAR system or manually to discriminate between distinctive peaks and scattered noisy SAR distributions from area scans.

There must not be any warning or alert messages due to various measurement concerns identified by the SAR system; for example, noise in measurements, peaks too close to scan boundary, peaks are too sharp, spatial resolution and uncertainty issues etc. When all the SAR results for each exposure condition in a frequency band and wireless mode are based on estimated 1-g SAR, the 1-g SAR for the highest SAR configuration must be determined by a zoom scan.

The approach is based on the area scan measurement applying a frequency dependent attenuation parameter. This attenuation parameter was empirically determined by analyzing a large number of phones. The MOTOROLA FAST SAR was developed and validated by the MOTOROLA Research Group in Ft. Lauderdale.

In the initial study, an approximation algorithm based on Linear fit was developed. The accuracy of the algorithm has been demonstrated across a broad frequency range (136-2450 MHz) and for both 1-g and 10-g averaged SAR using a sample of 264 SAR measurements from 55 wireless handsets. For the sample size studied, the root-mean-squared errors of the algorithm are 1.2% and 5.8% for 1- and 10-g averaged SAR, respectively. The paper describing the algorithm in detail is expected to be published in August 2004 within the Special Issue of Transactions on MTT.

In the second step, the same research group optimized the fitting algorithm to an Polynomial fit whereby the frequency validity was extended to cover the range 30MHz-6000MHz. Details of this study can be found in the BEMS 2007 Proceedings.

12 Simultaneous Transmission SAR Considerations

12.1 Reference Document

The following procedures adopted from "FCC SAR Considerations for Cell Phones with Multiple Transmitters" are applicable to handsets with built-in unlicensed transmitters such as IEEE 802.11 a/b/g/n/ac/ax and Bluetooth devices which may simultaneously transmit with the licensed transmitter.

12.2 Antenna Separation Distances

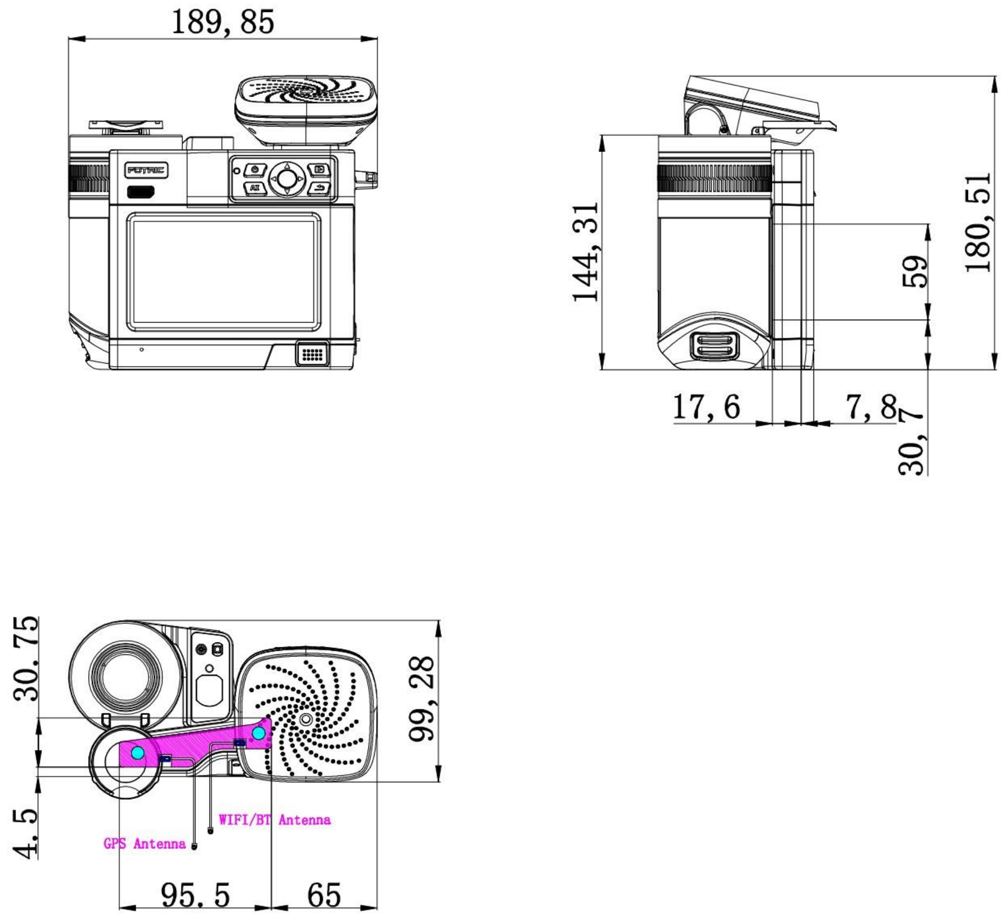


Figure 12.2-1 Antenna Locations

12.3 SAR Measurement Positions

According to KDB 447498 D01, the SAR test exclusion condition is based on source-based time-averaged maximum conducted output power, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions. The SAR exclusion threshold is determined by the following formula.

(a) For 100 MHz to 6 GHz and test separation distances ≤ 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following:

$$\frac{(max.power\ of\ channel, including\ tune-up\ tolerance, mW)}{(min.test\ separation\ distance, mm)} \times \sqrt{Frequency(GHz)} \leq 3.0$$

(b) For 100 MHz to 6 GHz and test separation distances > 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following:

1) for 100 MHz to 1500 MHz

{[Power allowed at numeric threshold for 50 mm in step a)] + [(test separation distance – 50 mm)·(f(MHz)/150)]} mW

2) for > 1500 MHz and ≤ 6 GHz

{[Power allowed at numeric threshold for 50 mm in step a)] + [(test separation distance – 50 mm)·10]} mW

When the separation distance from the antenna to an adjacent edge is ≤ 5mm, a distance of 5 mm is applied to determine SAR test exclusion.

When the separation distance from the antenna to an adjacent edge is > 5mm, the actual antenna-to-edge separation distance is applied to determine SAR test exclusion.

Table 12.3-1: SAR measurement Positions

Band	Frequency (MHz)	Max. Tune-up Power (dBm)	Max. Tune-up Power (mW)	Bottom Side		
				Separation distance (mm)	Calculated exclusion thresholds (mW)	SAR test exclusion
Wi-Fi 2.4G	2462	15.00	31.62	144.31	1038.60	Yes
Wi-Fi 5G U-NII-1	5240	13.00	19.95	144.31	1008.56	Yes
Wi-Fi 5G U-NII-2A	5320	13.00	19.95	144.31	1008.11	Yes
Wi-Fi 5G U-NII-2C	5720	14.50	28.18	144.31	1005.76	Yes
Wi-Fi 5G U-NII-3	5825	13.00	19.95	144.31	1005.19	Yes
BT	2480	9.00	7.94	144.31	1038.16	Yes

12.4 Simultaneous Transmission Table

The device does not support Simultaneous Transmission.

13 Conducted Output Power

13.1 BT Measurement result

Table 13.1-1: The conducted power for Bluetooth

BlueTooth	Maximum Output Power (dBm)					
Channel/Frequency(MHz)	0/2402		39/2441		78/2480	
Mode	Tune up	Output Power	Tune up	Output Power	Tune up	Output Power
1-DH5	8.00	6.60	9.00	7.95	8.00	6.80
2-DH5	8.00	6.61	9.00	7.99	8.00	6.83
3-DH5	8.00	6.93	9.00	8.25	8.00	6.96
Mode	Channel/Frequency(MHz)		Tune up		Output Power	
BLE(1M)	0/2402		0.00		-2.20	
	19/2440		0.00		-1.47	
	39/2480		0.00		-1.78	

13.2 Wi-Fi Measurement result

Table 13.2-1: The average conducted power for Wi-Fi 2.4G

Wi-Fi 2.4G			Maximum Conducted Power (dBm)	
Mode	BW	Channel/Frequency(MHz)	Tune up(dBm)	Conducted Power(dBm)
802.11b	20M	1/2412	15.00	**14.15**
		6/2437	14.00	13.34
		11/2462	15.00	14.04
802.11g	20M	1/2412	12.00	10.70
		6/2437	11.00	9.56
		11/2462	12.00	10.50
802.11n	20M	1/2412	11.00	9.51
		6/2437	10.00	8.95
		11/2462	11.00	9.46
	40M	3/2422	11.00	9.09
		6/2437	11.00	9.57
		9/2452	10.00	8.57

Table 13.2-2: The average conducted power for Wi-Fi 5G

Wi-Fi 5G				Maximum Conducted Power (dBm)	
	Mode	BW	Channel/Frequency(MHz)	Tune up(dBm)	Conducted Power(dBm)
U-NII-1	802.11a	20M	36/5180	13.00	11.45
			40/5200	13.00	11.48
			48/5240	13.00	11.97
	802.11n	20M	36/5180	13.00	11.50
			40/5200	13.00	11.35
			48/5240	13.00	12.02
		40M	38/5190	13.00	11.68
			46/5230	13.00	12.08
	802.11ac	20M	36/5180	13.00	11.30
			40/5200	13.00	11.11
			48/5240	13.00	11.78
		40M	38/5190	13.00	11.49
			46/5230	13.00	12.36
		80M	42/5210	13.00	11.37
U-NII-2A	802.11a	20M	52/5260	13.00	12.02
			56/5280	13.00	12.04
			64/5320	13.00	11.94
	802.11n	20M	52/5260	13.00	12.21
			56/5280	13.00	12.13
			64/5320	13.00	12.10
		40M	54/5270	13.00	12.73
			62/5310	13.00	12.28
	802.11ac	20M	52/5260	13.00	12.08
			56/5280	13.00	11.80
			64/5320	13.00	11.75
		40M	54/5270	13.00	12.23
			62/5310	13.00	11.99
		80M	58/5290	13.00	11.37
U-NII-2C	802.11a	20M	100/5500	14.50	13.66
			120/5600	14.00	13.14

			140/5700	14.00	12.77
			144/5720	13.50	12.52
	802.11n	20M	100/5500	14.50	13.72
			120/5600	14.00	13.41
			140/5700	14.00	12.65
			144/5720	13.50	12.48
		40M	102/5510	14.50	14.17
			118/5590	14.50	14.30
			134/5670	14.00	13.10
			142/5710	13.50	13.22
	802.11ac	20M	100/5500	14.00	13.69
			120/5600	14.00	13.29
			140/5700	14.00	12.90
			144/5720	13.50	12.23
		40M	102/5510	14.50	14.01
			118/5590	14.50	14.09
			134/5670	14.00	12.84
			142/5710	14.00	12.99
		80M	106/5530	14.00	13.10
			122/5610	14.00	12.48
			138/5690	13.00	11.85
U-NII-3	802.11a	20M	149/5745	13.00	12.04
			157/5785	13.00	11.67
			165/5825	13.00	11.91
	802.11n	20M	149/5745	13.00	12.20
			157/5785	13.00	11.68
			165/5825	13.00	11.85
		40M	151/5755	13.00	12.52
			159/5795	13.00	12.47
	802.11ac	20M	149/5745	13.00	11.71
			157/5785	13.00	11.54
			165/5825	13.00	11.72
		40M	151/5755	13.00	12.07

			159/5795	13.00	11.74
		80M	155/5775	13.00	11.07

14 Test Results

14.1 Standalone SAR Test Result

14.1.1 Limit/Criterion

At frequencies between 100 kHz and 6 GHz, the MPE (Maximum Permissible Exposure) in population/ uncontrolled environments for electromagnetic field strengths may be exceeded if

(a) The exposure conditions can be shown by appropriate techniques to produce SARs below 0.08W/kg, as averaged over the whole body, and spatial peak SAR values not exceeding 1.6 W/kg, as averaged over any 1g of tissue (defined as a tissue volume in the shape of a cube), except for the hands, wrists, feet, and ankles where the spatial peak SAR shall not exceed 4 W/kg, as averaged over any 10g of tissue (defined as a tissue volume in the shape of a cube); and

(b) The induced currents in the body confirm with the MPE in table 2, Part B in ANSI/IEEE C95.1-1992.

14.1.2 Test Results

Table 14.1.2-1: SAR Values for Wi-Fi 2.4G

Test Position	Cover Type	Mode	BW(MHz)	Duty Cycle	Channel	Frequency (MHz)	Measured power (dBm)	Tune-up (dBm)	Power Drift (dB)	Limit of 1gSAR 1.6 W/kg (mW/g)				Figure No.
										Measured SAR1g	Duty Cycle Scaling Factor	Tune-up Scaling Factor	Report SAR1g	
Body SAR (0mm)														
Front Side-1	Standard	802.11b	20	97.72%	1	2412	14.15	15.00	0.00	0.000	1.02	1.22	0.000	/
Front Side-2	Standard	802.11b	20	97.72%	1	2412	14.15	15.00	0.00	0.000	1.02	1.22	0.000	/
Back Side-1	Standard	802.11b	20	97.72%	1	2412	14.15	15.00	0.00	0.005	1.02	1.22	0.007	/
Back Side-2	Standard	802.11b	20	97.72%	1	2412	14.15	15.00	0.10	0.006	1.02	1.22	0.008	/
Left Side-1	Standard	802.11b	20	97.72%	1	2412	14.15	15.00	0.10	0.000	1.02	1.22	0.000	/
Left Side-2	Standard	802.11b	20	97.72%	1	2412	14.15	15.00	0.00	0.000	1.02	1.22	0.000	/
Right Side-1	Standard	802.11b	20	97.72%	1	2412	14.15	15.00	0.00	0.008	1.02	1.22	0.010	A.1-1
Right Side-2	Standard	802.11b	20	97.72%	1	2412	14.15	15.00	0.00	0.000	1.02	1.22	0.000	/
Top Side-1	Standard	802.11b	20	97.72%	1	2412	14.15	15.00	0.04	0.006	1.02	1.22	0.007	/
Top Side-2	Standard	802.11b	20	97.72%	1	2412	14.15	15.00	0.10	0.004	1.02	1.22	0.004	/
Top Side-3	Standard	802.11b	20	97.72%	1	2412	14.15	15.00	0.00	0.000	1.02	1.22	0.000	/
Top Side-4	Standard	802.11b	20	97.72%	1	2412	14.15	15.00	0.00	0.000	1.02	1.22	0.000	/

Table 14.1.2-2: SAR Values for Wi-Fi 5G U-NII-1

Test Position	Cover Type	Mode	BW(MHz)	Duty Cycle	Channel	Frequency (MHz)	Measured power (dBm)	Tune-up (dBm)	Power Drift (dB)	Limit of 1gSAR 1.6 W/kg (mW/g)				Figure No.
										Measured SAR1g	Duty Cycle Scaling Factor	Tune-up Scaling Factor	Report SAR1g	
Body SAR (0mm)														
Front Side-1	Standard	802.11ac	40	71.45%	46	5230	12.36	13.00	0.00	0.000	1.40	1.16	0.000	/
Front Side-2	Standard	802.11ac	40	71.45%	46	5230	12.36	13.00	0.00	0.000	1.40	1.16	0.000	/
Back Side-1	Standard	802.11ac	40	71.45%	46	5230	12.36	13.00	0.00	0.000	1.40	1.16	0.000	/
Back Side-2	Standard	802.11ac	40	71.45%	46	5230	12.36	13.00	0.00	0.000	1.40	1.16	0.000	/
Left Side-1	Standard	802.11ac	40	71.45%	46	5230	12.36	13.00	0.00	0.000	1.40	1.16	0.000	/
Left Side-2	Standard	802.11ac	40	71.45%	46	5230	12.36	13.00	0.00	0.000	1.40	1.16	0.000	/
Right Side-1	Standard	802.11ac	40	71.45%	46	5230	12.36	13.00	0.00	0.000	1.40	1.16	0.000	/
Right Side-2	Standard	802.11ac	40	71.45%	46	5230	12.36	13.00	0.18	0.001	1.40	1.16	0.001	/
Top Side-1	Standard	802.11ac	40	71.45%	46	5230	12.36	13.00	0.15	0.043	1.40	1.16	0.070	/
Top Side-2	Standard	802.11ac	40	71.45%	46	5230	12.36	13.00	-0.09	0.187	1.40	1.16	0.303	A.1-2
Top Side-3	Standard	802.11ac	40	71.45%	46	5230	12.36	13.00	0.10	0.008	1.40	1.16	0.013	/
Top Side-4	Standard	802.11ac	40	71.45%	46	5230	12.36	13.00	-0.10	0.007	1.40	1.16	0.012	/

Table 14.1.2-3: SAR Values for Wi-Fi 5G U-NII-2A

Test Position	Cover Type	Mode	BW(MHz)	Duty Cycle	Channel	Frequency (MHz)	Measured power (dBm)	Tune-up (dBm)	Power Drift (dB)	Limit of 1gSAR 1.6 W/kg (mW/g)				Figure No.
										Measured SAR1g	Duty Cycle Scaling Factor	Tune-up Scaling Factor	Report SAR1g	
Body SAR (0mm)														
Front Side-1	Standard	802.11n	40	76.38%	54	5270	12.73	13.00	0.00	0.000	1.31	1.06	0.000	/
Front Side-2	Standard	802.11n	40	76.38%	54	5270	12.73	13.00	0.00	0.000	1.31	1.06	0.000	/
Back Side-1	Standard	802.11n	40	76.38%	54	5270	12.73	13.00	0.00	0.000	1.31	1.06	0.000	/
Back Side-2	Standard	802.11n	40	76.38%	54	5270	12.73	13.00	0.00	0.000	1.31	1.06	0.000	/
Left Side-1	Standard	802.11n	40	76.38%	54	5270	12.73	13.00	0.00	0.002	1.31	1.06	0.002	/
Left Side-2	Standard	802.11n	40	76.38%	54	5270	12.73	13.00	0.00	0.000	1.31	1.06	0.000	/
Right Side-1	Standard	802.11n	40	76.38%	54	5270	12.73	13.00	0.00	0.000	1.31	1.06	0.000	/
Right Side-2	Standard	802.11n	40	76.38%	54	5270	12.73	13.00	0.00	0.000	1.31	1.06	0.000	/
Top Side-1	Standard	802.11n	40	76.38%	54	5270	12.73	13.00	-0.06	0.044	1.31	1.06	0.061	/
Top Side-2	Standard	802.11n	40	76.38%	54	5270	12.73	13.00	-0.11	0.202	1.31	1.06	0.281	A.1-3
Top Side-3	Standard	802.11n	40	76.38%	54	5270	12.73	13.00	0.10	0.014	1.31	1.06	0.019	/
Top Side-4	Standard	802.11n	40	76.38%	54	5270	12.73	13.00	0.15	0.008	1.31	1.06	0.011	/

Table 14.1.2-4: SAR Values for Wi-Fi 5G U-NII-2C

Test Position	Cover Type	Mode	BW(MHz)	Duty Cycle	Channel	Frequency (MHz)	Measured power (dBm)	Tune-up (dBm)	Power Drift (dB)	Limit of 1gSAR 1.6 W/kg (mW/g)				Figure No.
										Measured SAR1g	Duty Cycle Scaling Factor	Tune-up Scaling Factor	Report SAR1g	
Body SAR (0mm)														
Front Side-1	Standard	802.11n	40	76.56%	118	5590	14.30	14.50	0.00	0.066	1.31	1.05	0.091	/
Front Side-2	Standard	802.11n	40	76.56%	118	5590	14.30	14.50	0.10	0.073	1.31	1.05	0.100	/
Back Side-1	Standard	802.11n	40	76.56%	118	5590	14.30	14.50	0.06	0.028	1.31	1.05	0.038	/
Back Side-2	Standard	802.11n	40	76.56%	118	5590	14.30	14.50	-0.04	0.032	1.31	1.05	0.044	/
Left Side-1	Standard	802.11n	40	76.56%	118	5590	14.30	14.50	0.00	0.000	1.31	1.05	0.000	/
Left Side-2	Standard	802.11n	40	76.56%	118	5590	14.30	14.50	0.00	0.000	1.31	1.05	0.000	/
Right Side-1	Standard	802.11n	40	76.56%	118	5590	14.30	14.50	0.00	0.000	1.31	1.05	0.000	/
Right Side-2	Standard	802.11n	40	76.56%	118	5590	14.30	14.50	0.00	0.000	1.31	1.05	0.000	/
Top Side-1	Standard	802.11n	40	76.56%	118	5590	14.30	14.50	0.09	0.260	1.31	1.05	0.356	/
Top Side-2	Standard	802.11n	40	76.56%	118	5590	14.30	14.50	-0.10	0.999	1.31	1.05	1.366	A.1-4
Top Side-3	Standard	802.11n	40	76.56%	118	5590	14.30	14.50	0.02	0.034	1.31	1.05	0.046	/
Top Side-4	Standard	802.11n	40	76.56%	118	5590	14.30	14.50	0.06	0.059	1.31	1.05	0.081	/
Top Side-2	Standard	802.11n	40	76.38%	102	5510	14.17	14.50	-0.04	0.559	1.31	1.08	0.790	/
Top Side-2	Standard	802.11n	40	76.38%	142	5710	13.22	13.50	-0.06	0.871	1.31	1.07	1.216	/
Repeat														
Top Side-2	Standard	802.11n	40	76.56%	118	5590	14.30	14.50	-0.02	0.954	1.31	1.05	1.305	/

Table 14.1.2-5: SAR Values for Wi-Fi 5G U-NII-3

Test Position	Cover Type	Mode	BW(MHz)	Duty Cycle	Channel	Frequency (MHz)	Measured power (dBm)	Tune-up (dBm)	Power Drift (dB)	Limit of 1gSAR 1.6 W/kg (mW/g)				Figure No.
										Measured SAR1g	Duty Cycle Scaling Factor	Tune-up Scaling Factor	Report SAR1g	
Body SAR (0mm)														
Front Side-1	Standard	802.11n	40	76.21%	151	5755	12.52	13.00	0.10	0.082	1.31	1.12	0.120	/
Front Side-2	Standard	802.11n	40	76.21%	151	5755	12.52	13.00	0.00	0.086	1.31	1.12	0.126	/
Back Side-1	Standard	802.11n	40	76.21%	151	5755	12.52	13.00	0.00	0.000	1.31	1.12	0.000	/
Back Side-2	Standard	802.11n	40	76.21%	151	5755	12.52	13.00	0.00	0.000	1.31	1.12	0.000	/
Left Side-1	Standard	802.11n	40	76.21%	151	5755	12.52	13.00	0.00	0.000	1.31	1.12	0.000	/
Left Side-2	Standard	802.11n	40	76.21%	151	5755	12.52	13.00	0.00	0.000	1.31	1.12	0.000	/
Right Side-1	Standard	802.11n	40	76.21%	151	5755	12.52	13.00	0.00	0.000	1.31	1.12	0.000	/
Right Side-2	Standard	802.11n	40	76.21%	151	5755	12.52	13.00	0.00	0.000	1.31	1.12	0.000	/
Top Side-1	Standard	802.11n	40	76.21%	151	5755	12.52	13.00	0.07	0.286	1.31	1.12	0.419	/
Top Side-2	Standard	802.11n	40	76.21%	151	5755	12.52	13.00	-0.09	0.979	1.31	1.12	1.435	/
Top Side-3	Standard	802.11n	40	76.21%	151	5755	12.52	13.00	0.08	0.050	1.31	1.12	0.073	/
Top Side-4	Standard	802.11n	40	76.21%	151	5755	12.52	13.00	0.02	0.067	1.31	1.12	0.098	/
Top Side-2	Standard	802.11n	40	76.21%	159	5795	12.47	13.00	-0.10	0.994	1.31	1.13	1.474	A.1-5
Repeat														
Top Side-2	Standard	802.11n	40	76.21%	159	5795	12.47	13.00	-0.05	0.947	1.31	1.13	1.404	/

Table 14.1.2-6: SAR Values for BT

Test Position	Cover Type	Mode	Duty Cycle	Channel	Frequency (MHz)	Measured power (dBm)	Tune-up (dBm)	Power Drift (dB)	Limit of 1gSAR 1.6 W/kg (mW/g)				Figure No.
									Measured SAR1g	Duty Cycle Scaling Factor	Tune-up Scaling Factor	Report SAR1g	
Body SAR (0mm)													
Front Side-1	Standard	3-DH5	100%	39	2441	8.25	9.00	0.00	0.000	1.00	1.19	0.000	/
Front Side-2	Standard	3-DH5	100%	39	2441	8.25	9.00	0.00	0.000	1.00	1.19	0.000	/
Back Side-1	Standard	3-DH5	100%	39	2441	8.25	9.00	0.00	0.000	1.00	1.19	0.000	/
Back Side-2	Standard	3-DH5	100%	39	2441	8.25	9.00	0.00	0.000	1.00	1.19	0.000	/
Left Side-1	Standard	3-DH5	100%	39	2441	8.25	9.00	0.00	0.000	1.00	1.19	0.000	/
Left Side-2	Standard	3-DH5	100%	39	2441	8.25	9.00	0.00	0.000	1.00	1.19	0.000	/
Right Side-1	Standard	3-DH5	100%	39	2441	8.25	9.00	0.04	0.003	1.00	1.19	0.004	/
Right Side-2	Standard	3-DH5	100%	39	2441	8.25	9.00	0.10	0.003	1.00	1.19	0.004	/
Top Side-1	Standard	3-DH5	100%	39	2441	8.25	9.00	0.00	0.005	1.00	1.19	0.006	/
Top Side-2	Standard	3-DH5	100%	39	2441	8.25	9.00	0.00	0.008	1.00	1.19	0.009	A.1-6
Top Side-3	Standard	3-DH5	100%	39	2441	8.25	9.00	-0.14	0.003	1.00	1.19	0.003	/
Top Side-4	Standard	3-DH5	100%	39	2441	8.25	9.00	-0.03	0.001	1.00	1.19	0.001	/

14.2 SAR Measurement Variability

SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media are required for SAR measurements in a frequency band, the variability measurement procedures should be applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium.

The following procedures are applied to determine if repeated measurements are required.

(a) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps(b) through (d) do not apply.

(b) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.

(c) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45W/kg (~ 10% from the 1-g SAR limit).

(d) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

Table 14.2-1: SAR Measurement Variability (1g)

Frequency		Configuration	Test Position	Original SAR (W/kg)	First Repeated SAR (W/kg)	The Ratio
MHz	Ch.					
5590	118	802.11 n40	Top Side-2	0.999	0.954	1.047
5795	159	802.11 n40	Top Side-2	0.994	0.947	1.050

Note: According to the KDB 865664 D01 repeated measurement is not required when the original highest measured SAR is < 0.8 W/kg.

Annex A: Measurement Data

A.1 SAR Graph Results

Wi-Fi 2.4G 802.11b Right Side-1 Mode Low 0mm

Date/Time: 2024/5/20

Electronics: DAE4 Sn1581

Medium parameters used: f = 2412 MHz; σ = 1.806 S/m; ε_r = 38.287; ρ = 1000 kg/m^3

Ambient Temperature:21.5°C   Liquid Temperature:20.4°C

Communication System: Wifi 2450 2.4GHz;   Frequency: 2412 MHz; Duty Cycle: 1:1

Probe: EX3DV4 - SN7634ConvF(8.05, 8.05, 8.05) @ 2412 MHz

Wi-Fi 2.4G 802.11b Right Side-1 Mode Low 0mm/Area Scan (5x10x1):

Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 0.00464 W/kg

Wi-Fi 2.4G 802.11b Right Side-1 Mode Low 0mm/Zoom Scan (7x7x7)/Cube 0:

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

Reference Value = 0.2910 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 0.0130 W/kg

SAR(1 g) = 0.00811 W/kg; SAR(10 g) = 0.00384 W/kg

Maximum of SAR (measured) = 0.0120 W/kg

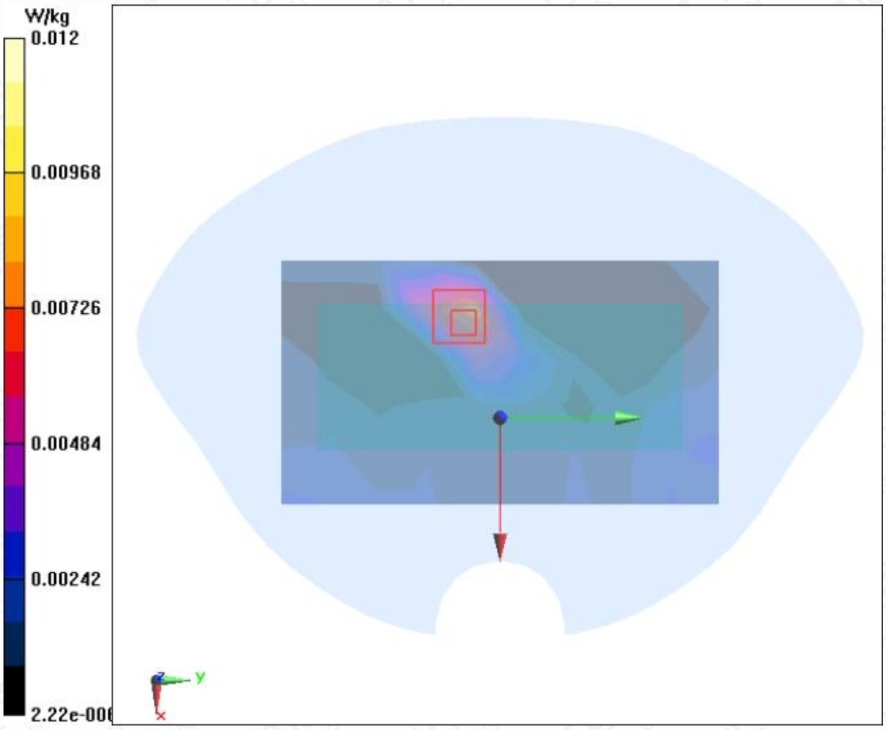
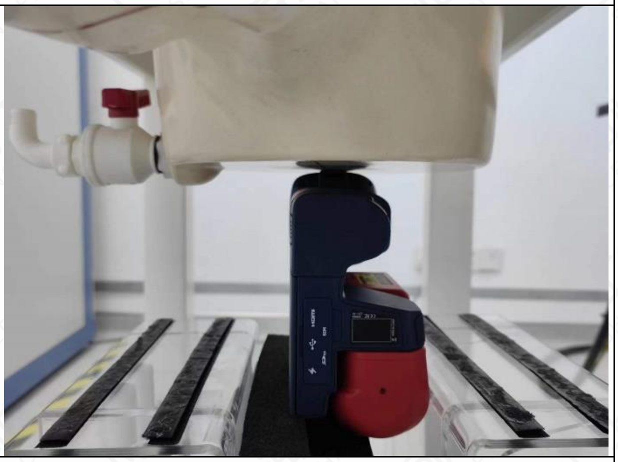


Figure A.1-1 Wi-Fi 2.4G 802.11b Right Side-1 Mode Low 0mm

Right Side-1 Mode 0mm(Front view)

Right Side-1 Mode 0mm(Back view)

Right Side-1 Mode 0mm(Left view)



Right Side-1 Mode 0mm(Right view)

Wi-Fi 5G U-NII-1 802.11ac40 Top Side-2 Mode High 0mm

Date/Time: 2024/5/21

Electronics: DAE4 Sn1581

Medium parameters used: f = 5230 MHz; σ = 4.715 S/m; ε_r = 35.426; ρ = 1000 kg/m^3

Ambient Temperature:21.3°C Liquid Temperature:20.3°C

Communication System: 5GHz U-NII-1 5GHz; Frequency: 5230 MHz; Duty Cycle: 1:1

Probe: EX3DV4 - SN7634ConvF(5.75, 5.75, 5.75) @ 5230 MHz

Wi-Fi 5G U-NII-1 802.11ac40 Top Side-2 Mode High 0mm/Area Scan (8x13x1):

Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.327 W/kg

Wi-Fi 5G U-NII-1 802.11ac40 Top Side-2 Mode High 0mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 9.806 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 1.22 W/kg

SAR(1 g) = 0.187 W/kg; SAR(10 g) = 0.036 W/kg

Maximum of SAR (measured) = 0.576 W/kg

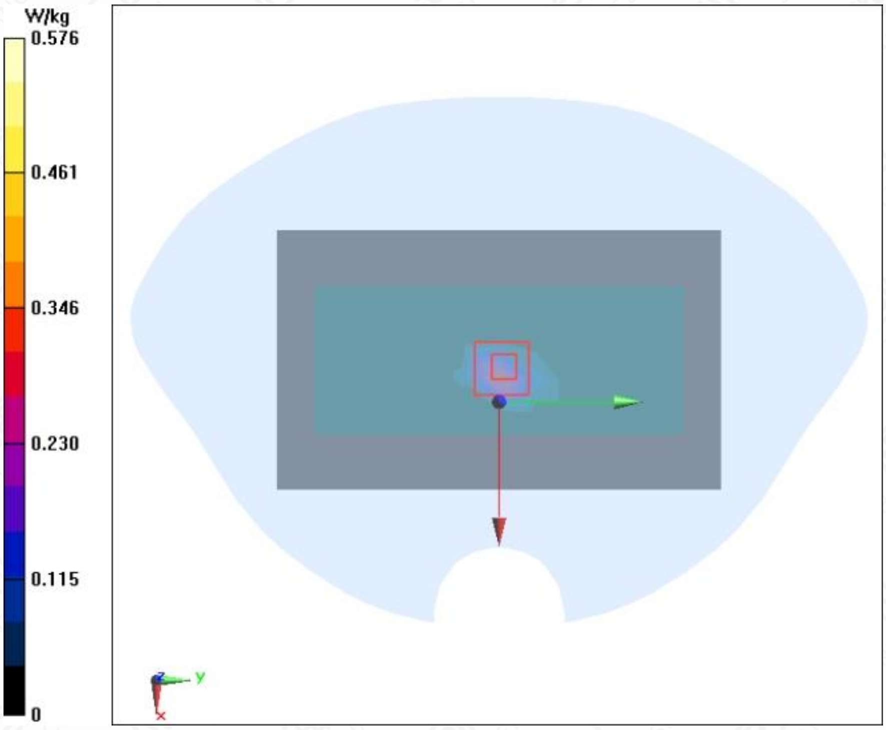
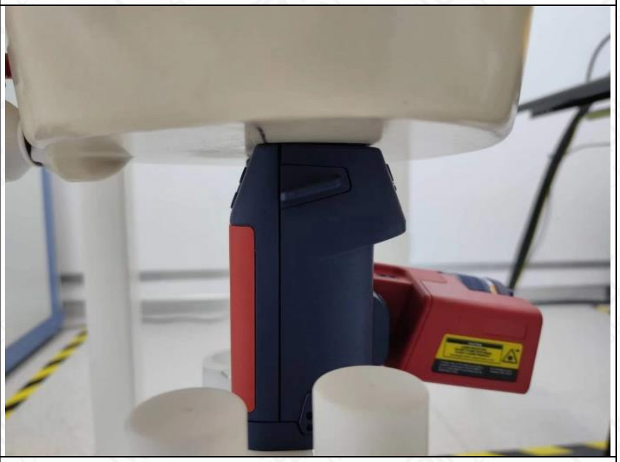


Figure A.1-2 Wi-Fi 5G U-NII-1 802.11ac40 Top Side-2 Mode High 0mm

	
Top Side-2 Mode 0mm(Front view)	Top Side-2 Mode 0mm(Back view)
	
Top Side-2 Mode 0mm(Left view)	Top Side-2 Mode 0mm(Right view)

Wi-Fi 5G U-NII-2A 802.11n40 Top Side-2 Mode Low 0mm
Date/Time: 2024/5/21
Electronics: DAE4 Sn1581
Medium parameters used: f = 5270 MHz; σ = 4.757 S/m; ε_r = 35.341; ρ = 1000 kg/m^3
Ambient Temperature:21.3°C   Liquid Temperature:20.2°C
Communication System: 5GHz U-NII-2A 5GHz; Frequency: 5270 MHz; Duty Cycle: 1:1
Probe: EX3DV4 - SN7634ConvF(5.75, 5.75, 5.75) @ 5270 MHz
Wi-Fi 5G U-NII-2A 802.11n40 Top Side-2 Mode Low 0mm/Area Scan (6x10x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.0939 W/kg
Wi-Fi 5G U-NII-2A 802.11n40 Top Side-2 Mode Low 0mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 10.15 V/m; Power Drift = -0.11 dB
Peak SAR (extrapolated) = 1.66 W/kg
SAR(1 g) = 0.202 W/kg; SAR(10 g) = 0.041 W/kg
Maximum of SAR (measured) = 0.513 W/kg

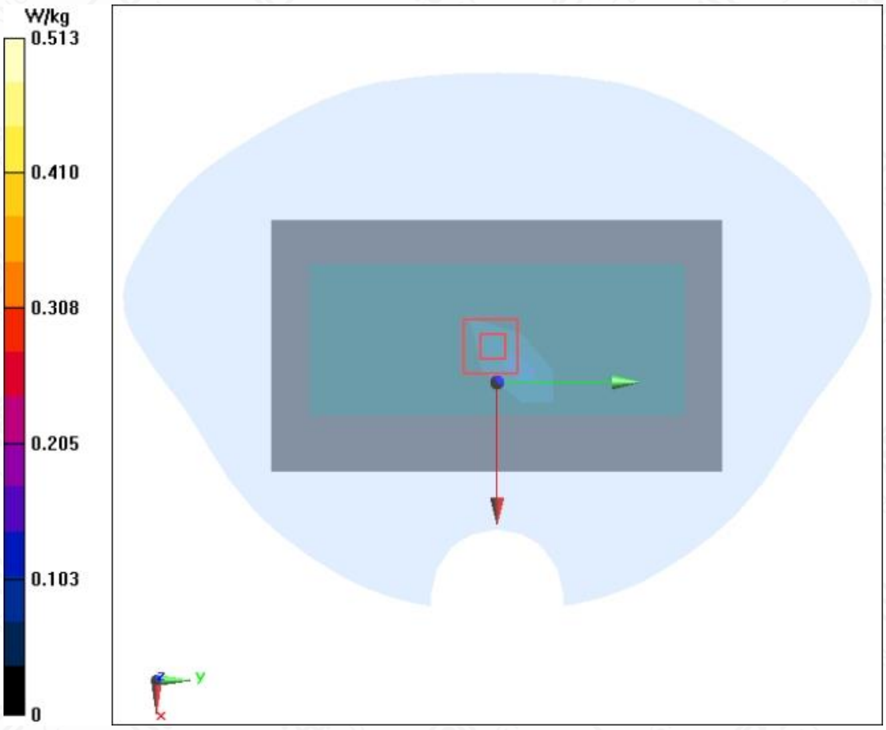
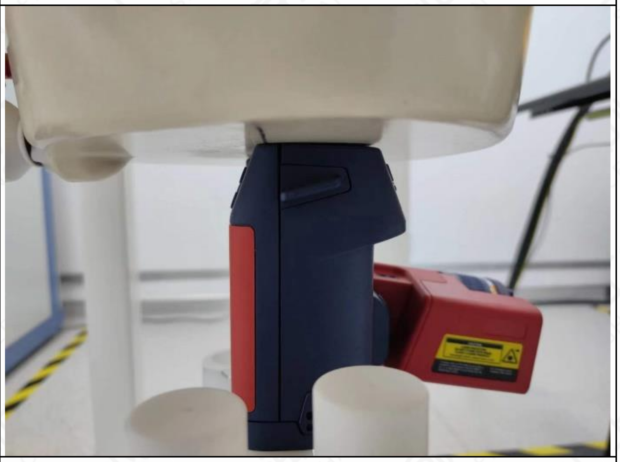


Figure A.1-3 Wi-Fi 5G U-NII-2A 802.11n40 Top Side-2 Mode Low 0mm

	
Top Side-2 Mode 0mm(Front view)	Top Side-2 Mode 0mm(Back view)
	
Top Side-2 Mode 0mm(Left view)	Top Side-2 Mode 0mm(Right view)

Wi-Fi 5G U-NII-2C 802.11n40 Top Side-2 Mode Middle 0mm
Date/Time: 2024/5/23
Electronics: DAE4 Sn1581
Medium parameters used: f = 5590 MHz; σ = 5.121 S/m; ε_r = 34.673; ρ = 1000 kg/m^3
Ambient Temperature:21.6°C Liquid Temperature:20.5°C
Communication System: 5GHz U-NII-2C 5GHz; Frequency: 5590 MHz; Duty Cycle: 1:1
Probe: EX3DV4 - SN7634ConvF(5.1, 5.1, 5.1) @ 5590 MHz
Wi-Fi 5G U-NII-2C 802.11n40 Top Side-2 Mode Middle 0mm/Area Scan (6x10x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.271 W/kg
Wi-Fi 5G U-NII-2C 802.11n40 Top Side-2 Mode Middle 0mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 21.82 V/m; Power Drift = -0.10 dB
Peak SAR (extrapolated) = 5.62 W/kg
SAR(1 g) = 0.999 W/kg; SAR(10 g) = 0.238 W/kg
Maximum of SAR (measured) = 2.35 W/kg

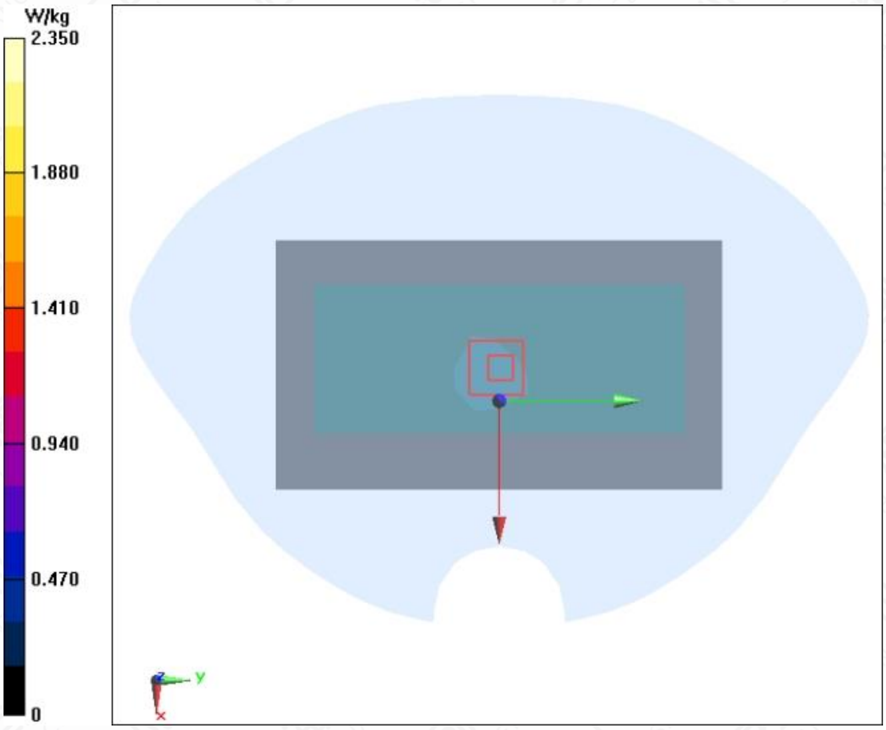
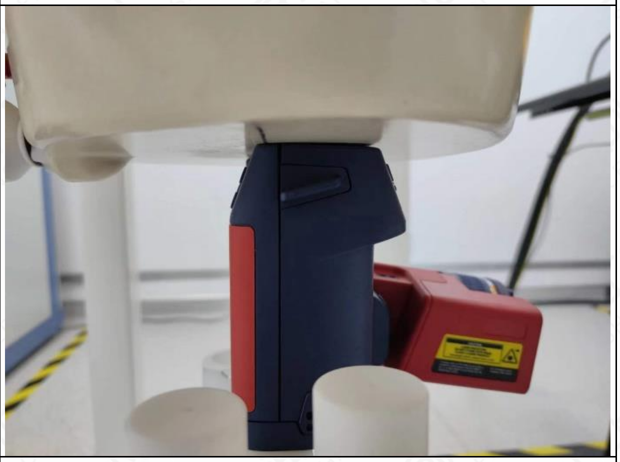


Figure A.1-4 Wi-Fi 5G U-NII-2C 802.11n40 Top Side-2 Mode Middle 0mm

	
Top Side-2 Mode 0mm(Front view)	Top Side-2 Mode 0mm(Back view)
	
Top Side-2 Mode 0mm(Left view)	Top Side-2 Mode 0mm(Right view)

Wi-Fi 5G U-NII-3 802.11n40 Top Side-2 Mode High 0mm
Date/Time: 2024/5/23
Electronics: DAE4 Sn1581
Medium parameters used: f = 5795 MHz; σ = 5.364 S/m; ε_r = 34.257; ρ = 1000 kg/m^3
Ambient Temperature:21.6°C   Liquid Temperature:20.5°C
Communication System: 5GHz U-NII-3 5GHz;   Frequency: 5795 MHz; Duty Cycle: 1:1
Probe: EX3DV4 - SN7634ConvF(5.25, 5.25, 5.25) @ 5795 MHz
Wi-Fi 5G U-NII-3 802.11n40 Top Side-2 Mode High 0mm/Area Scan (6x10x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.469 W/kg
Wi-Fi 5G U-NII-3 802.11n40 Top Side-2 Mode High 0mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 23.56 V/m; Power Drift = -0.10 dB
Peak SAR (extrapolated) = 7.22 W/kg
SAR(1 g) = 0.994 W/kg; SAR(10 g) = 0.233 W/kg
Maximum of SAR (measured) = 2.27 W/kg

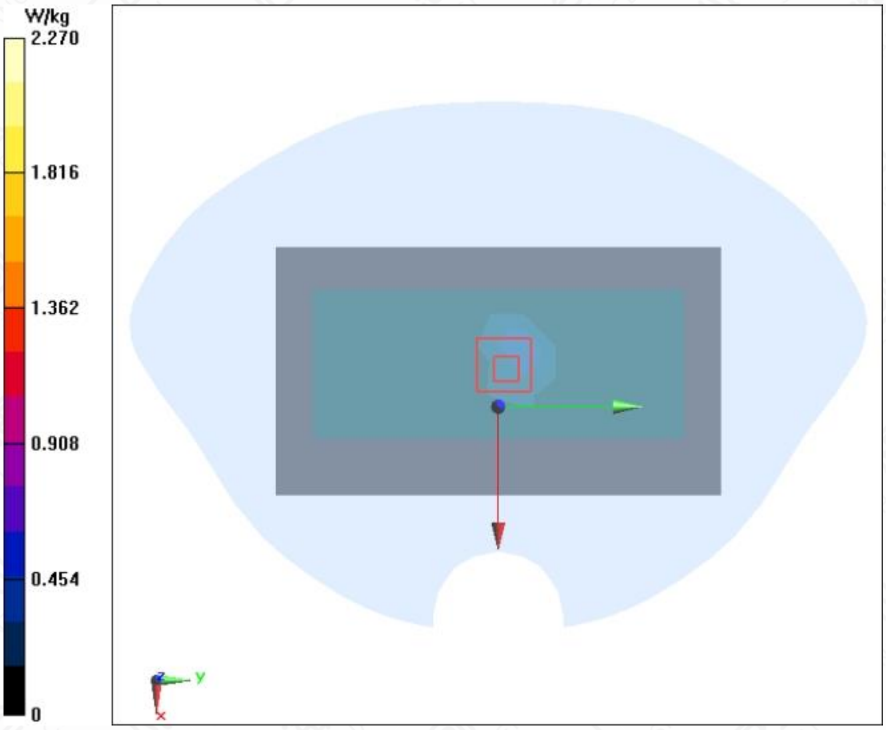
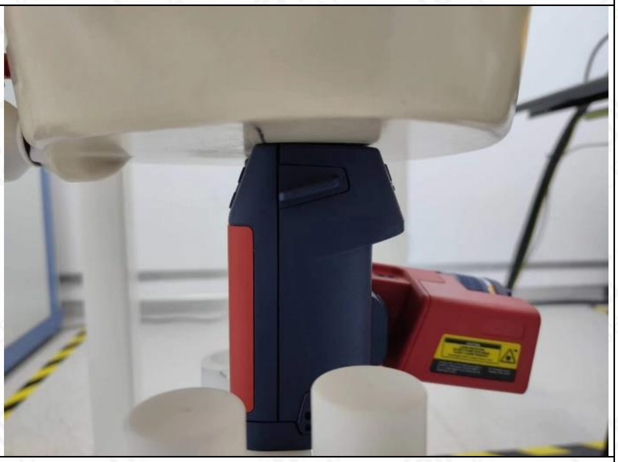


Figure A.1-5 Wi-Fi 5G U-NII-3 802.11n40 Top Side-2 Mode High 0mm

	
Top Side-2 Mode 0mm(Front view)	Top Side-2 Mode 0mm(Back view)
	
Top Side-2 Mode 0mm(Left view)	Top Side-2 Mode 0mm(Right view)

BT 3-DH5 Top Side-2 Mode Middle 0mm

Date/Time: 2024/5/20

Electronics: DAE4 Sn1581

Medium parameters used: f = 2441 MHz; σ = 1.829 S/m; ε_r = 38.232; ρ = 1000 kg/m^3

Ambient Temperature:21.5°C Liquid Temperature:20.4°C

Communication System: BT 2.4GHz; Frequency: 2441 MHz; Duty Cycle: 1:1

Probe: EX3DV4 - SN7634ConvF(8.05, 8.05, 8.05) @ 2441 MHz

BT 3-DH5 Top Side-2 Mode Middle 0mm/Area Scan (7x11x1):

Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 0.00638 W/kg

BT 3-DH5 Top Side-2 Mode Middle 0mm/Zoom Scan (7x7x7)/Cube 0:

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

Reference Value = 0 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 0.00908 W/kg

SAR(1 g) = 0.00753 W/kg; SAR(10 g) = 0.00667 W/kg

Maximum of SAR (measured) = 0.00908 W/kg

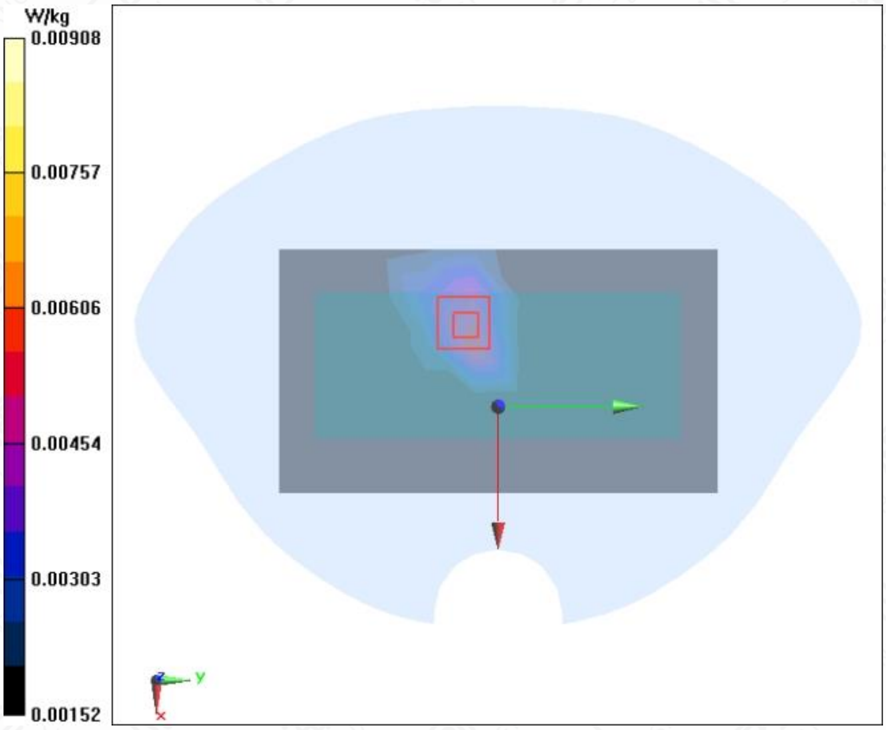
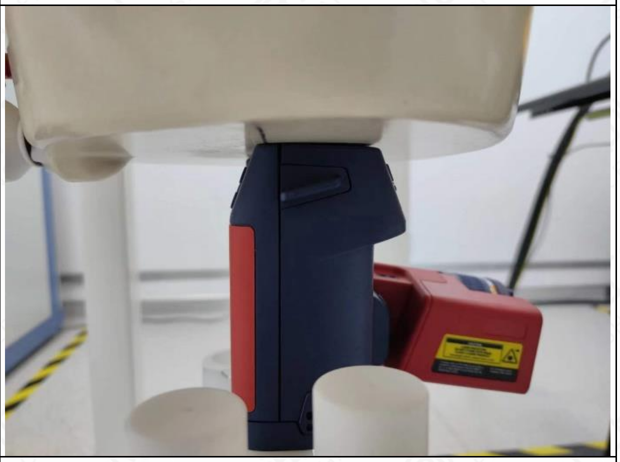


Figure A.1-6 BT 3-DH5 Top Side-2 Mode Middle 0mm

	
Top Side-2 Mode 0mm(Front view)	Top Side-2 Mode 0mm(Back view)
	
Top Side-2 Mode 0mm(Left view)	Top Side-2 Mode 0mm(Right view)

A.2 System Check Graph Results

System Check 2450MHz

Date/Time: 2024/5/20

Electronics: DAE4 Sn1581

Medium parameters used: f = 2450 MHz; σ = 1.836 S/m; ε_r = 38.216; ρ = 1000 kg/m^3

Ambient Temperature:21.5°C   Liquid Temperature:20.2°C

Communication System: CW 2600MHz; Frequency: 2450 MHz; Duty Cycle: 1:1

Probe: EX3DV4 - SN7634ConvF(8.05, 8.05, 8.05) @ 2450 MHz

System Check 2450MHz/Area Scan (8x8x1):

Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 16.4 W/kg

System Check 2450MHz/Zoom Scan (7x7x7)/Cube 0:

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

Reference Value = 110.2 V/m; Power Drift = 0.18 dB

Peak SAR (extrapolated) = 27.6 W/kg

SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.1 W/kg

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

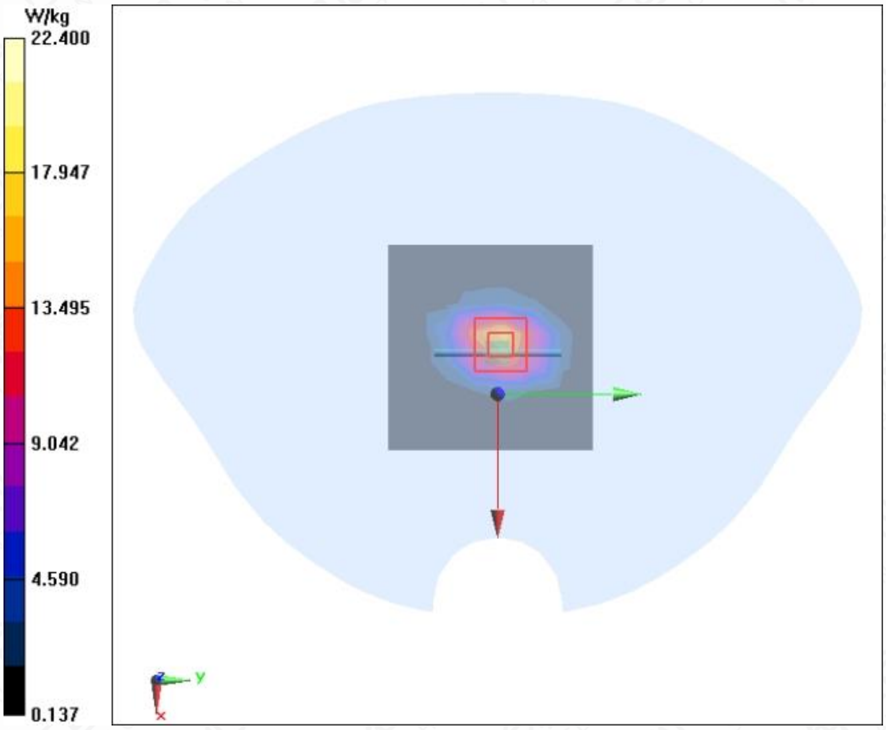


Figure A.2-1 System Check 2450MHz

System Check 5200MHz
Date/Time: 2024/5/21
Electronics: DAE4 Sn1581
Medium parameters used: f = 5200 MHz; σ = 4.68 S/m; ε_r = 35.484; ρ = 1000 kg/m^3
Ambient Temperature:21.3°C   Liquid Temperature:20.1°C
Communication System: CW 5000MHz; Frequency: 5200 MHz; Duty Cycle: 1:1
Probe: EX3DV4 - SN7634ConvF(5.75, 5.75, 5.75) @ 5200 MHz
System Check 5200MHz/Area Scan (10x10x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 17.0 W/kg
System Check 5200MHz/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 60.90 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 32.5 W/kg
SAR(1 g) = 7.85 W/kg; SAR(10 g) = 2.24 W/kg
Maximum of SAR (measured) = 20.0 W/kg

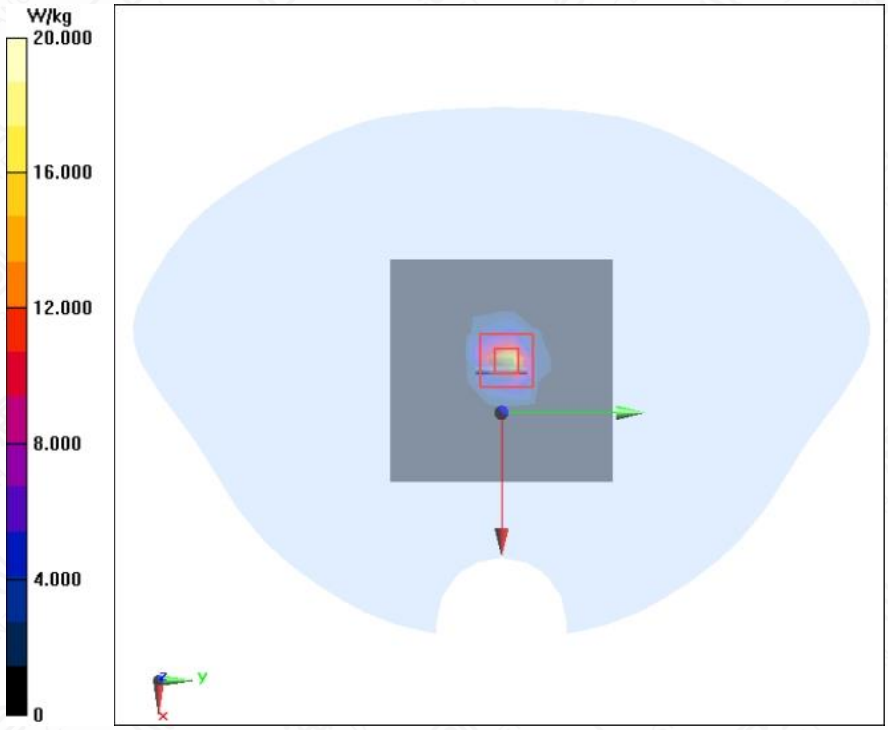


Figure A.2-2 System Check 5200MHz

System Check 5300MHz
Date/Time: 2024/5/21
Electronics: DAE4 Sn1581
Medium parameters used: f = 5300 MHz; σ = 4.788 S/m; ε_r = 35.274; ρ = 1000 kg/m^3
Ambient Temperature:21.3°C Liquid Temperature:20.1°C
Communication System: CW 5000MHz; Frequency: 5300 MHz; Duty Cycle: 1:1
Probe: EX3DV4 - SN7634ConvF(5.75, 5.75, 5.75) @ 5300 MHz
System Check 5300MHz/Area Scan (8x8x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 19.7 W/kg
System Check 5300MHz/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 67.31 V/m; Power Drift = 0.16 dB
Peak SAR (extrapolated) = 32.4 W/kg
SAR(1 g) = 7.84 W/kg; SAR(10 g) = 2.24 W/kg
Maximum of SAR (measured) = 19.7 W/kg

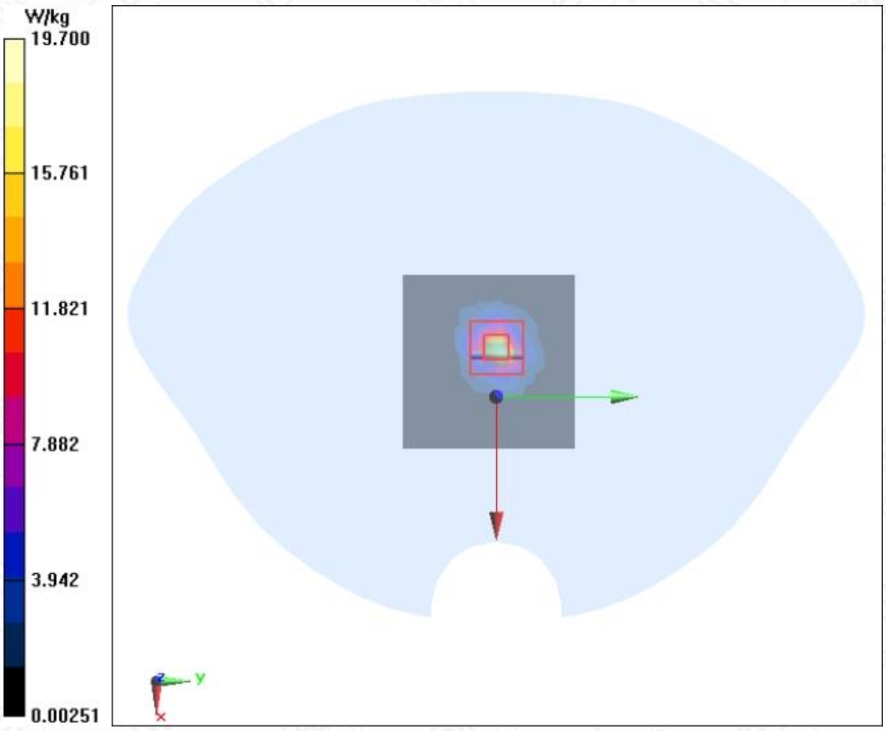


Figure A.2-3 System Check 5300MHz

System Check 5600MHz
Date/Time: 2024/5/23
Electronics: DAE4 Sn1581
Medium parameters used: f = 5600 MHz; σ = 5.132 S/m; ε_r = 34.653; ρ = 1000 kg/m^3
Ambient Temperature:21.4°C Liquid Temperature:20.3°C
Communication System: CW 5GHz; Frequency: 5600 MHz; Duty Cycle: 1:1
Probe: EX3DV4 - SN7634ConvF(5.1, 5.1, 5.1) @ 5600 MHz
System Check 5600MHz/Area Scan (10x10x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 17.4 W/kg
System Check 5600MHz/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 65.84 V/m; Power Drift = 0.16 dB
Peak SAR (extrapolated) = 36.5 W/kg
SAR(1 g) = 8.17 W/kg; SAR(10 g) = 2.3 W/kg
Maximum of SAR (measured) = 21.1 W/kg

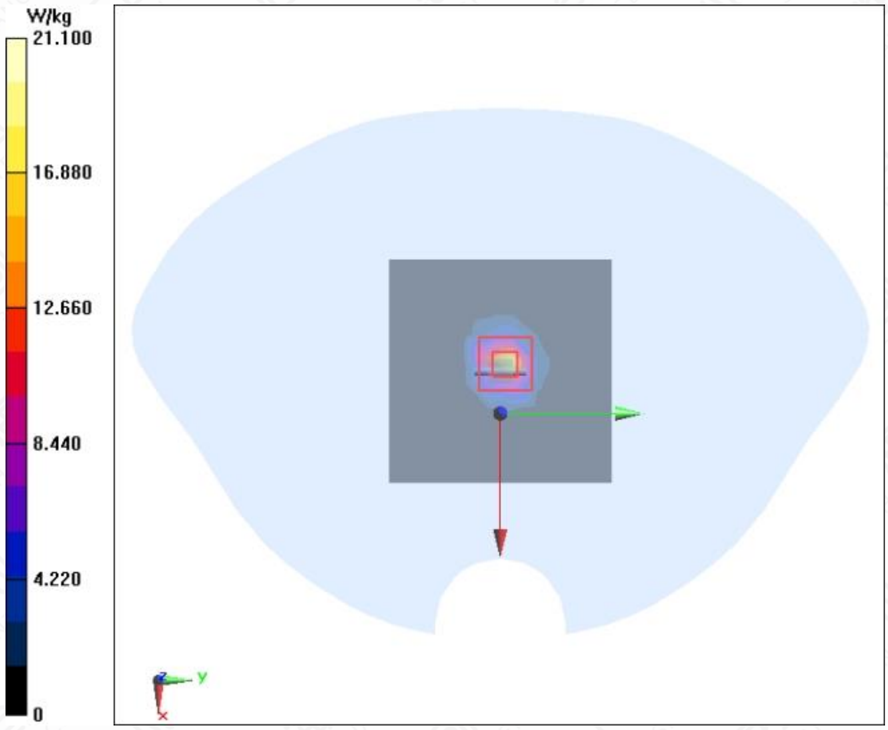


Figure A.2-4 System Check 5600MHz

System Check 5800MHz
Date/Time: 2024/5/23
Electronics: DAE4 Sn1581
Medium parameters used: f = 5800 MHz; σ = 5.369 S/m; ε_r = 34.247; ρ = 1000 kg/m^3
Ambient Temperature:21.4°C   Liquid Temperature:20.3°C
Communication System: CW 5G; Frequency: 5800 MHz; Duty Cycle: 1:1
Probe: EX3DV4 - SN7634ConvF(5.25, 5.25, 5.25) @ 5800 MHz
System Check 5800MHz/Area Scan (10x10x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 18.5 W/kg
System Check 5800MHz/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 61.09 V/m; Power Drift = 0.10 dB
Peak SAR (extrapolated) = 35.3 W/kg
SAR(1 g) = 7.8 W/kg; SAR(10 g) = 2.2 W/kg
Maximum of SAR (measured) = 20.5 W/kg

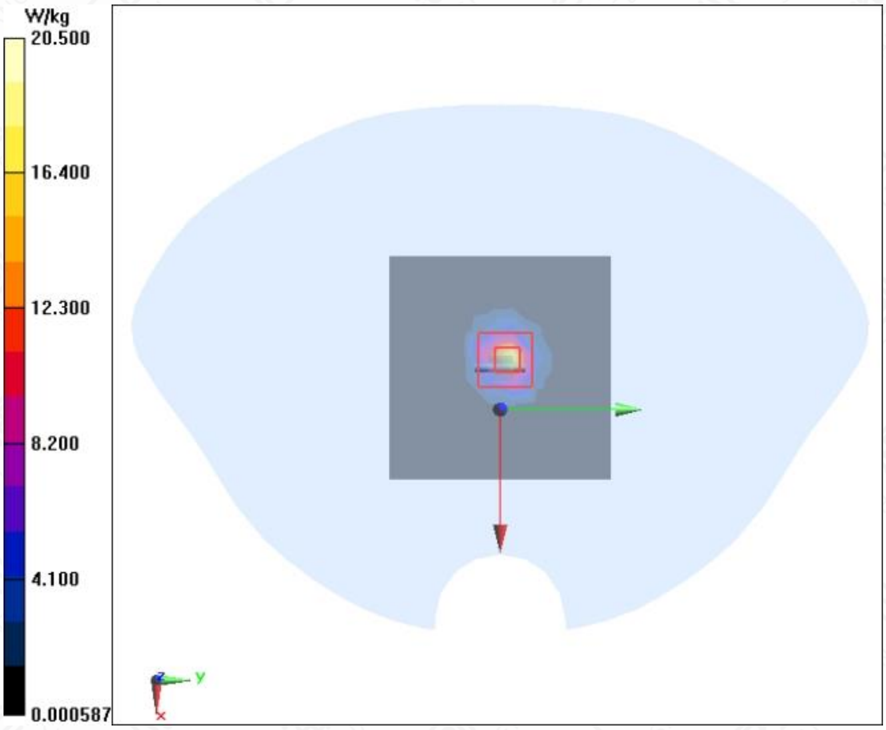


Figure A.2-5 System Check 5800MHz

Annex B: Calibration Certificate

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Client : 3in

Certificate No: 24J02Z000044

CALIBRATION CERTIFICATE

Object	DAE4 - SN: 1581
Calibration Procedure(s)	FF-Z11-002-01 Calibration Procedure for the Data Acquisition Electronics (DAEx)
Calibration date:	February 22, 2024

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
Process Calibrator 753	1971018	12-Jun-23 (CTTL, No.J23X05436)	Jun-24

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

Issued: February 26, 2024

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

Certificate No: 24J02Z000044 Page 1 of 3

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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 report provide only calibration results for DAE, it does not contain other performance test results.

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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	405.345 ± 0.15% (k=2)	405.593 ± 0.15% (k=2)	405.846 ± 0.15% (k=2)
Low Range	3.99569 ± 0.7% (k=2)	3.99961 ± 0.7% (k=2)	4.00455 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	13° ± 1 °

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Certificate No: 24J02Z000043

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN : 7634
Calibration Procedure(s)	FF-Z11-004-02 Calibration Procedures for Dosimetric E-field Probes
Calibration date:	March 20, 2024

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	12-Jun-23(CTTL, No.J23X05435)	Jun-24
Power sensor NRP-Z91	101547	12-Jun-23(CTTL, No.J23X05435)	Jun-24
Power sensor NRP-Z91	101548	12-Jun-23(CTTL, No.J23X05435)	Jun-24
Reference 10dBAttenuator	18N50W-10dB	19-Jan-23(CTTL, No.J23X00212)	Jan-25
Reference 20dBAttenuator	18N50W-20dB	19-Jan-23(CTTL, No.J23X00211)	Jan-25
Reference Probe EX3DV4	SN 3846	31-May-23(SPEAG, No.EX-3846_May23)	May-24
DAE4	SN 1555	24-Aug-23(SPEAG, No.DAE4-1555_Aug23)	Aug-24
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
SignalGenerator MG3700A	6201052605	12-Jun-23(CTTL, No.J23X05434)	Jun-24
Network Analyzer E5071C	MY46110673	25-Dec-23(CTTL, No.J23X13425)	Dec-24
Reference 10dBAttenuator	BT0520	11-May-23(CTTL, No.J23X04061)	May-25
Reference 20dBAttenuator	BT0267	11-May-23(CTTL, No.J23X04062)	May-25
OCP DAK-12	SN 1174	25-Oct-23(SPEAG, No.OCP-DAK12-1174_Oct23)	Oct-24

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

Issued: March 24, 2024

Certificate No: 24J02Z000043 Page 1 of 22

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Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A,B,C,D	modulation dependent linearization parameters
Polarization Φ	Φ rotation around probe axis
Polarization θ	θ rotation around an axis that is in the plane normal to probe axis (at measurement center), i θ=0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013

b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016

c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010

d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization θ=0 (f≤900MHz in TEM-cell; f>1800MHz: waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect the E^2-field uncertainty inside TSL (see below ConvF).
- *NORM(f)x,y,z = NORMx,y,z* frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics.
- *Ax,y,z; Bx,y,z; Cx,y,z;VRx,y,z:*A,B,C are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f≤800MHz) and inside waveguide using analytical field distributions based on power measurements for f >800MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty valued are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORMx,y,z* ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from±50MHz to±100MHz.
- *Spherical isotropy (3D deviation from isotropy):* in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset:* The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle:* The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

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DASY/EASY – Parameters of Probe: EX3DV4 – SN: 7634

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (*k*=2)
Norm($\mu V/(V/m)^2$)[A]	0.62	0.64	0.62	±10.0%
DCP(mV)[B]	109.5	111.3	108.6	

Calibration Results for Modulation Response

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Max Dev.	Max Unc[E] (*k*=2)
0	CW	X	0.0	0.0	1.0	0.00	211.2	±2.1%	±4.7%
		Y	0.0	0.0	1.0		218.3		
		Z	0.0	0.0	1.0		208.3		
10352-AAA	Pulse Waveform (200Hz, 10%)	X	1.55	60.28	5.97		60	±4.1%	±9.6%
		Y	1.60	60.70	6.22	10.00	60		
		Z	1.50	60.31	6.08		60		
10353-AAA	Pulse Waveform (200Hz, 20%)	X	92.00	82.00	11.00		80	±3.7%	±9.6%
		Y	0.82	60.00	4.71	6.99	80		
		Z	0.78	60.00	4.72		80		
10354-AAA	Pulse Waveform (200Hz, 40%)	X	0.50	154.57	2.16		95	±3.5%	±9.6%
		Y	0.06	131.17	0.46	3.98	95		
		Z	0.18	140.02	0.50		95		
10355-AAA	Pulse Waveform (200Hz, 60%)	X	10.60	157.68	19.93		120	±2.1%	±9.6%
		Y	6.46	159.99	3.69	2.22	120		
		Z	7.47	159.97	15.20		120		
10387-AAA	QPSK Waveform, 1 MHz	X	0.63	63.29	11.08		150	±4.7%	±9.6%
		Y	0.53	62.60	11.41	1.00	150		
		Z	0.69	65.82	13.23		150		
10388-AAA	QPSK Waveform, 10 MHz	X	1.38	65.14	13.29		150	±1.3%	±9.6%
		Y	1.38	65.93	13.87	0.00	150		
		Z	1.49	66.99	14.56		150		
10396-AAA	64-QAM Waveform, 100 kHz	X	1.91	66.04	17.25		150	±0.9%	±9.6%
		Y	1.93	66.82	17.73	3.01	150		
		Z	1.94	67.19	18.27		150		
10414-AAA	WLAN CCDF, 64-QAM, 40MHz	X	3.98	65.94	15.17		150	±4.0%	±9.6%
		Y	3.98	66.49	15.48	0.00	150		
		Z	4.09	66.85	15.78		150		

Note: For details on UID parameters see Appendix

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

[A] The uncertainties of Norm X, Y, Z do not affect the E^2-field uncertainty inside TSL (see Page 5).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainly is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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DASY/EASY – Parameters of Probe: EX3DV4 – SN: 7634

Sensor Model Parameters

	C1 fF	C2 fF	α V^{-1}	T1 $ms.V^{-2}$	T2 $ms.V^{-1}$	T3 ms	T4 V^{-2}	T5 V^{-1}	T6
X	12.14	87.63	33.20	2.74	0.00	4.90	0.08	0.09	1.01
Y	10.73	76.37	32.48	2.58	0.00	4.90	0.57	0.00	1.01
Z	10.91	78.80	33.39	1.51	0.00	4.90	0.39	0.00	1.01

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	62.1
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	9mm
Tip Diameter	2.5mm
Probe Tip to Sensor X Calibration Point	1mm
Probe Tip to Sensor Y Calibration Point	1mm
Probe Tip to Sensor Z Calibration Point	1mm
Recommended Measurement Distance from Surface	1.4mm

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DASY/EASY – Parameters of Probe: EX3DV4 – SN:7634

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz][C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha[G]	Depth[G] (mm)	Unct. (*k*=2)
750	41.9	0.89	10.60	10.60	10.60	0.17	1.19	±12.7%
835	41.5	0.90	10.19	10.19	10.19	0.16	1.39	±12.7%
900	41.5	0.97	10.15	10.15	10.15	0.18	1.31	±12.7%
1750	40.1	1.37	8.86	8.86	8.86	0.22	1.11	±12.7%
1900	40.0	1.40	8.51	8.51	8.51	0.25	1.12	±12.7%
2000	40.0	1.40	8.46	8.46	8.46	0.26	1.08	±12.7%
2300	39.5	1.67	8.32	8.32	8.32	0.66	0.68	±12.7%
2450	39.2	1.80	8.05	8.05	8.05	0.61	0.70	±12.7%
2600	39.0	1.96	7.85	7.85	7.85	0.66	0.68	±12.7%
3300	38.2	2.71	7.40	7.40	7.40	0.42	1.05	±13.9%
3500	37.9	2.91	7.20	7.20	7.20	0.45	1.03	±13.9%
3700	37.7	3.12	7.03	7.03	7.03	0.45	1.05	±13.9%
3900	37.5	3.32	6.79	6.79	6.79	0.40	1.48	±13.9%
4100	37.2	3.53	6.85	6.85	6.85	0.40	1.15	±13.9%
4200	37.1	3.63	6.78	6.78	6.78	0.35	1.35	±13.9%
4400	36.9	3.84	6.68	6.68	6.68	0.40	1.25	±13.9%
4600	36.7	4.04	6.63	6.63	6.63	0.50	1.10	±13.9%
4800	36.4	4.25	6.56	6.56	6.56	0.45	1.25	±13.9%
4950	36.3	4.40	6.36	6.36	6.36	0.45	1.25	±13.9%
5250	35.9	4.71	5.75	5.75	5.75	0.40	1.50	±13.9%
5600	35.5	5.07	5.10	5.10	5.10	0.45	1.40	±13.9%
5750	35.4	5.22	5.25	5.25	5.25	0.50	1.30	±13.9%

[C] Frequency validity above 300 MHz of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequency up to 6 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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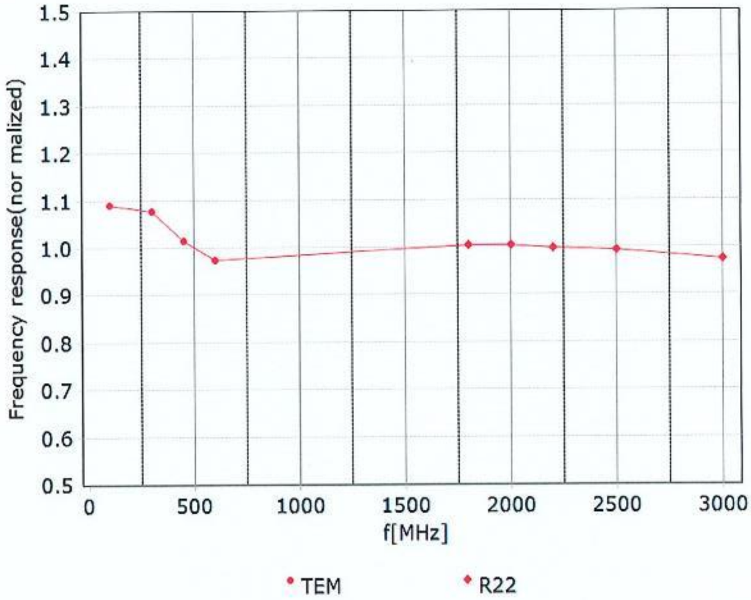
Frequency Response of E-Field
(TEM-Cell: ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: ±7.4% (*k*=2)

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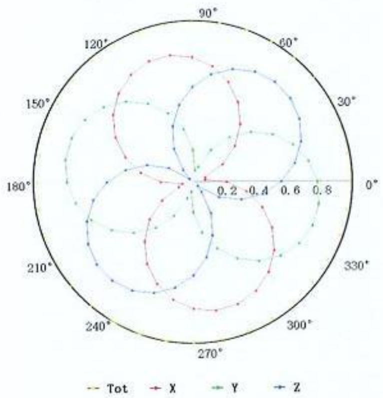
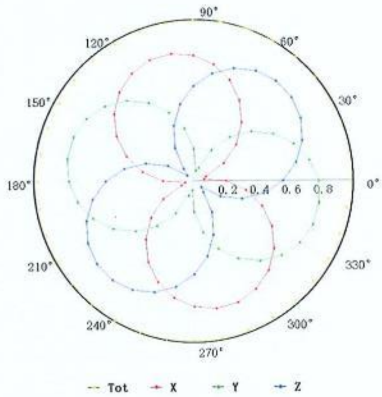
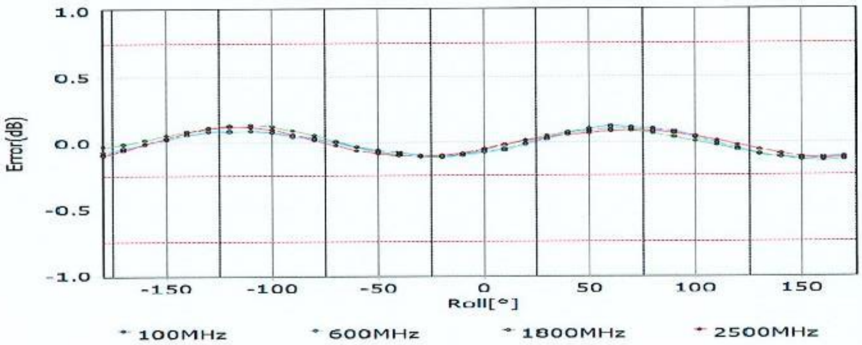
Receiving Pattern (Φ), θ=0°

f=600 MHz, TEM **f=1800 MHz, R22**







Uncertainty of Axial Isotropy Assessment: ±1.2% (k=2)

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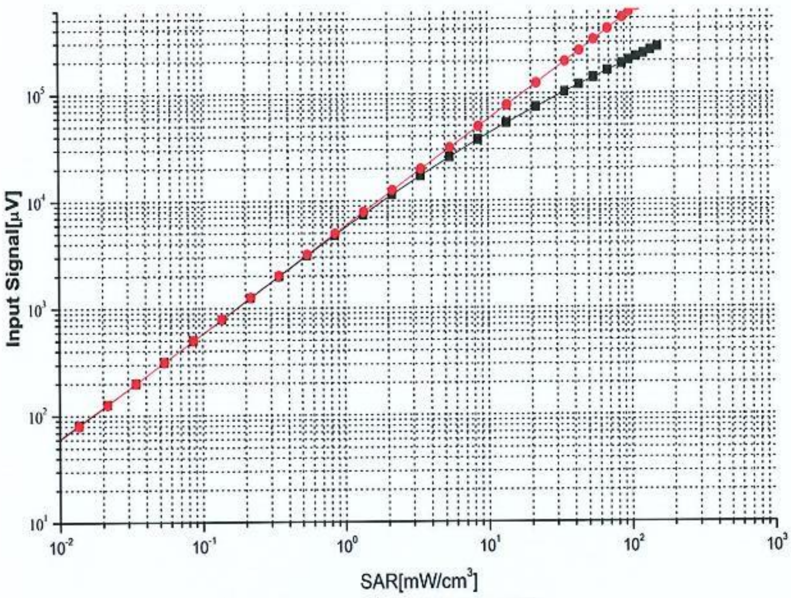
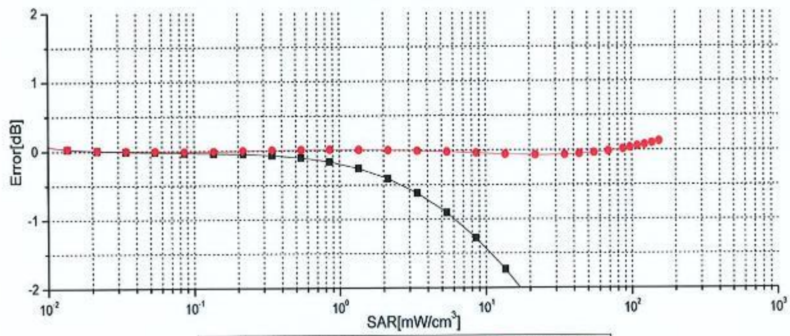
Dynamic Range f(SAR$_{head}$)
(TEM cell, f = 900 MHz)





Uncertainty of Linearity Assessment: ±0.9% (*k*=2)

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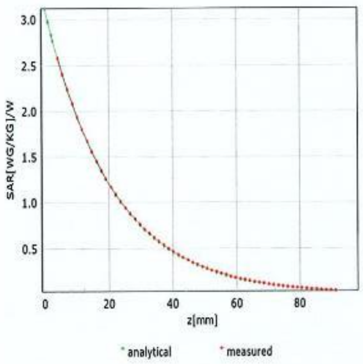
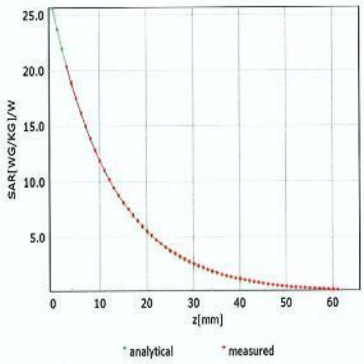
Conversion Factor Assessment

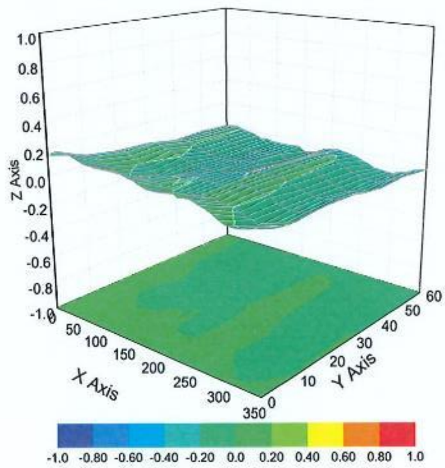
f=750 MHz,WGLS R9(H_convF)



f=1750 MHz,WGLS R22(H_convF)



Deviation from Isotropy in Liquid



Uncertainty of Spherical Isotropy Assessment: ±3.2% (*k*=2)

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Appendix: Modulation Calibration Parameters

UID	Rev	Communication System Name	Group	PAR (dB)	UncE (k=2)
0		CW	CW	0.00	± 4.7 %
10010	CAA	SAR Validation (Square, 100ms, 10ms)	Test	10.00	± 9.6 %
10011	CAB	UMTS-FDD (WCDMA)	WCDMA	2.91	± 9.6 %
10012	CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	WLAN	1.87	± 9.6 %
10013	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	WLAN	9.46	± 9.6 %
10021	DAC	GSM-FDD (TDMA, GMSK)	GSM	9.39	± 9.6 %
10023	DAC	GPRS-FDD (TDMA, GMSK, TN 0)	GSM	9.57	± 9.6 %
10024	DAC	GPRS-FDD (TDMA, GMSK, TN 0-1)	GSM	6.56	± 9.6 %
10025	DAC	EDGE-FDD (TDMA, 8PSK, TN 0)	GSM	12.62	± 9.6 %
10026	DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1)	GSM	9.55	± 9.6 %
10027	DAC	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	GSM	4.80	± 9.6 %
10028	DAC	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	GSM	3.55	± 9.6 %
10029	DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1-2)	GSM	7.78	± 9.6 %
10030	CAA	IEEE 802.15.1 Bluetooth (GFSK, DH1)	Bluetooth	5.30	± 9.6 %
10031	CAA	IEEE 802.15.1 Bluetooth (GFSK, DH3)	Bluetooth	1.87	± 9.6 %
10032	CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	Bluetooth	1.16	± 9.6 %
10033	CAA	IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH1)	Bluetooth	7.74	± 9.6 %
10034	CAA	IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH3)	Bluetooth	4.53	± 9.6 %
10035	CAA	IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH5)	Bluetooth	3.83	± 9.6 %
10036	CAA	IEEE 802.15.1 Bluetooth (8-DPSK, DH1)	Bluetooth	8.01	± 9.6 %
10037	CAA	IEEE 802.15.1 Bluetooth (8-DPSK, DH3)	Bluetooth	4.77	± 9.6 %
10038	CAA	IEEE 802.15.1 Bluetooth (8-DPSK, DH5)	Bluetooth	4.10	± 9.6 %
10039	CAB	CDMA2000 (1xRTT, RC1)	CDMA2000	4.57	± 9.6 %
10042	CAB	IS-54 / IS-136 FDD (TDMA/FDM, PI/4-DQPSK, Halfrate)	AMPS	7.78	± 9.6 %
10044	CAA	IS-91/EIA/TIA-553 FDD (FDMA, FM)	AMPS	0.00	± 9.6 %
10048	CAA	DECT (TDD, TDMA/FDM, GFSK, Full Slot, 24)	DECT	13.80	± 9.6 %
10049	CAA	DECT (TDD, TDMA/FDM, GFSK, Double Slot, 12)	DECT	10.79	± 9.6 %
10056	CAA	UMTS-TDD (TD-SCDMA, 1.28 Mcps)	TD-SCDMA	11.01	± 9.6 %
10058	DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1-2-3)	GSM	6.52	± 9.6 %
10059	CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps)	WLAN	2.12	± 9.6 %
10060	CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps)	WLAN	2.83	± 9.6 %
10061	CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps)	WLAN	3.60	± 9.6 %
10062	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps)	WLAN	8.68	± 9.6 %
10063	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps)	WLAN	8.63	± 9.6 %
10064	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps)	WLAN	9.09	± 9.6 %
10065	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps)	WLAN	9.00	± 9.6 %
10066	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps)	WLAN	9.38	± 9.6 %
10067	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps)	WLAN	10.12	± 9.6 %
10068	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps)	WLAN	10.24	± 9.6 %
10069	CAD	IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps)	WLAN	10.56	± 9.6 %
10071	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 9 Mbps)	WLAN	9.83	± 9.6 %
10072	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 12 Mbps)	WLAN	9.62	± 9.6 %
10073	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 18 Mbps)	WLAN	9.94	± 9.6 %
10074	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 24 Mbps)	WLAN	10.30	± 9.6 %
10075	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 36 Mbps)	WLAN	10.77	± 9.6 %
10076	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 48 Mbps)	WLAN	10.94	± 9.6 %
10077	CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 54 Mbps)	WLAN	11.00	± 9.6 %
10081	CAB	CDMA2000 (1xRTT, RC3)	CDMA2000	3.97	± 9.6 %
10082	CAB	IS-54 / IS-136 FDD (TDMA/FDM, PI/4-DQPSK, Fullrate)	AMPS	4.77	± 9.6 %
10090	DAC	GPRS-FDD (TDMA, GMSK, TN 0-4)	GSM	6.56	± 9.6 %
10097	CAC	UMTS-FDD (HSDPA)	WCDMA	3.98	± 9.6 %
10098	DAC	UMTS-FDD (HSUPA, Subtest 2)	WCDMA	3.98	± 9.6 %
10099	CAC	EDGE-FDD (TDMA, 8PSK, TN 0-4)	GSM	9.55	± 9.6 %
10100	CAC	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	LTE-FDD	5.67	± 9.6 %
10101	CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM)	LTE-FDD	6.42	± 9.6 %