FCC SAR Test Report

Report No.	:	**KES-SR-18T0005**
FCC ID	:	**NLMSEM3049W**
Applicant	:	**Hanwha Techwin Co., Ltd.**
Address	:	**6, Pangyo-ro 319 Beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do, 13488, KOREA**
DUT Type	:	**Wireless Video Baby Monitor**
Model No.	:	**SEM-3049W**
Additional Model(s)	:	**-**
FCC Rule Part(s)	:	**CFR §2.1093**
Sample Received Date	:	**2018-11-09**
Date of Testing	:	**2018-12-20 ~ 2018-12-21**
Issued Date	:	**2018-12-28**

CERTIFICATION: The above equipment have been tested by **KES Co., Ltd. Laboratory**, and found compliance with the requirement of the above standards. I attest to the accuracy of data. All measurements reported herein were performed by me of were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them. Test results reported herein relate only to the item(s) tested. It should not be reproduced except in full, without the written approval of our laboratory. The client should not use it to claim product certification, approval, or endorsement by any government agency.

Tested By :
Wihan Jeong / Engineer

Approved By :
Nogyun Im / Technical Manager

This test report is not related to KOLAS.

Revision history

Report No.	Reason for Change	Date Issued
KES-SR-18T0005	Initial release	2018-12-28

TABLE OF CONTENTS

1. General information

1.1. Highest SAR Summary

Equipment Class	Band & Mode	TX Frequency	Measured Conducted Power [dBm]	Reported SAR 1g Body (W/kg)
DSS	2.4 GHz Band GFSK	2409.5 ~ 2476 MHz	14.06	1.052

This wireless portable device has been shown to be capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment/general population exposure limits specified in ANSI/IEEE C95.1-1992.

1.2. Device Overview

Band & Mode	Operating Modes	Tx Frequency
2.4 GHz Band GFSK	Data	2409.5 ~ 2476 MHz

1.3. Power Reduction for SAR

This DUT does not support power reduction function.

1.4. Nominal and Maximum Output Power Specifications

This device operates using the following maximum and nominal output power specifications. SAR values were scaled to the maximum allowed power to determine compliance per KDB Publication 447498 D01v06.

Maximum GFSK Output Power

Mode / Band		Modulation Average (dBm)
2.4 GHz Band GFSK	Maximum	14.5
	Nominal	13.5

1.5. DUT Antenna Locations

DUT's antenna can be unfold until an angle of 90 degrees from the fold condition. A diagram showing the location of the device antennas can be found in Appendix F. And/or Exact antenna dimensions and separation distances are shown in the Technical Descriptions in the FCC Filing.

Table - Device Edges/Sides for SAR Testing

Mode	Antenna Status	Top Side	Bottom Side	Front Face	Rear Face	Right Side	Left Side
GFSK	Folded	O	X	O	O	O	O
GFSK	Unfolded	O	X	O	O	X	O

Note: Particular DUT edges were not required to be evaluated for SAR if the edges were greater than 2.5 cm from the transmitting antenna according to FCC KDB Publication 941225 D07 guidance.

1.6. Near Field Communications (NFC) Antenna

This DUT does not support NFC function.

1.7. Simultaneous Transmission Capabilities

This device does not support simultaneous transmission since device supports only 2.4 GHz band GFSK; therefore no simultaneous transmission was required to be evaluated.

1.8. Miscellaneous SAR Test Considerations

(A) 2.4 GHz Band GFSK

The modulation type of this DUT is GFSK and modulation technique is FHSS. This EUT does support hopping mode and the number of hopping channels is 20. During the SAR test, hopping mode was disabled.

Per FCC KDB 447498 D01v06, the 1g SAR exclusion threshold for distances < 50 mm is defined by the following equation:

$$\frac{Max\ Power\ of\ Channel\ (mW)}{Test\ Separation\ Dist\ (mm)} * \sqrt{Frequency(GHz)} \leq 3.0$$

Based on the maximum conducted power of GFSK (rounded to the nearest mW) and the antenna to user separation distance, body GFSK SAR was required; [(28/5) X SQRT(2.4095)] = 8.7 > 3.0. Per KDB Publication 447498 D01v06, the maximum power of the channel was rounded to the nearest mW before calculation.

1.9. Guidance Applied

- IEEE 1528-2013
- FCC KDB Publication 941225 D07v01r02 (UMPC Mini Tablet)
- FCC KDB Publication 447498 D01v06 (General SAR Guidance)
- FCC KDB Publication 865664 D01v01r04, D02v01r02 (SAR Measurements up to 6 GHz)

1.10. Device Serial Numbers

Several samples with identical hardware were used to support SAR testing. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units. The serial numbers used for each test are indicated alongside the results in Section 9.

2. Introduction

The FCC and Innovation, Science, and Economic Development Canada have adopted the guidelines for evaluating the environmental effects of radio frequency (RF) radiation in ET Docket 93-62 on Aug. 6, 1996 and Health Canada Safety Code 6 to protect the public and workers from the potential hazards of RF emissions due to FCC-regulated portable devices.
The safety limits used for the environmental evaluation measurements are based on the criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate (SAR) in IEEE/ANSI C95.1-1992 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3kHz to 300 GHz and Health Canada RF Exposure Guidelines Safety Code 6. The measurement procedure described in IEEE/ANSI C95.3-2002 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave is used for guidance in measuring the Specific Absorption Rate (SAR) due to the RF radiation exposure from the Equipment Under Test (EUT). These criteria for SAR evaluation are similar to those recommended by the International Committee for Non-Ionizing Radiation Protection (ICNIRP) in Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields," Report No. Vol 74. SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards.

2.1. SAR definition

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.

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:

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

SAR is expressed in units of Watts per kilogram (W/kg)
SAR measurement can be related to the electrical field in the tissue by

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

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

NOTE: The primary factors that control rate of energy absorption were found to be the wavelength of the incident field in relation to the dimensions and geometry of the irradiated organism, the orientation of the organism in relation to the polarity of field vectors, the presence of reflecting surfaces, and whether conductive contact is made by the organism with a ground plane.

2.2. SPEAG DASY System

DASY system consists of high precision robot, probe alignment sensor, phantom, robot controller, controlled measurement server and near-field probe. The robot includes six axes that can move to the precision position of the DASY software defined. The DASY software can define the area that is detected by the probe. The robot is connected to controlled box. Controlled measurement server is connected to the controlled robot box. The DAE includes amplifier, signal multiplexing, AD converter, offset measurement and surface detection. It is connected to the Electro-optical coupler (ECO). The ECO performs the conversion form the optical into digital electric signal of the DAE and transfers data to the PC.

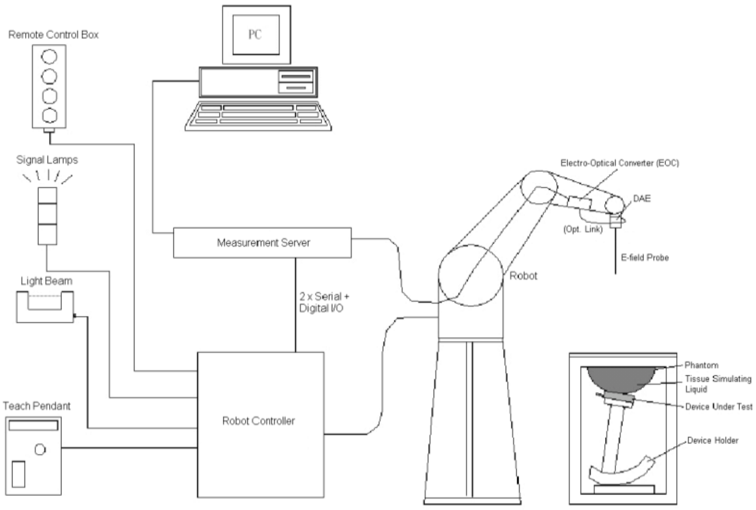


Figure 2. SPEAG DASY system configuration

2.3. Robot

The DASY system uses the high precision robots 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)

Figure 3. SPEAG DASY System

2.4. Probe

The SAR measurement is conducted with the dosimetric probe. 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.

Model	EX3DV4
Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Frequency	10 ㎒ to > 6 ㎓ Linearity: ± 0.2 ㏈ (30 ㎒ to 6 ㎓)
Directivity	± 0.3 dB in TSL (rotation around probe axis) ± 0.5 dB in TSL (rotation normal to probe axis)
Dynamic Range	10 µW/g to > 100 ㎽/g Linearity: ± 0.2 ㏈ (noise: typically < 1 µW/g)
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm

Figure 4. Probe

2.5. Data Acquisition Electronics (DAE)

Model	DAE4
Construction	Signal amplifier, multiplexer, A/D converter and control logic. Serial optical link for communication with DASY4/5 embedded system (fully remote controlled). Two step probe touch detector for mechanical surface detection and emergency robot stop.
Measurement Range	-100 to +300 mV (16 bit resolution and two range settings: 4 mV, 40 0mV)
Input Offset Voltage	± 0.2 ㏈ in HSL (rotation around probe axis) ± 0.3 ㏈ in tissue material (rotation normal to probe axis)
Input Bias Current	< 50 fA
Dimensions	60 x 60 x 68 mm

Figure 5. DAE

3.6. Phantoms

Model	Twin SAM
Construction	The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 and IEC 62209-1. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot.
Material	Vinylester, glass fiber reinforced (VE-GF)
Shell Thickness	2 ± 0.2 mm (6 ± 0.2 mm at ear point)
Dimensions	Length: 1000 mm Width: 500 mm Height: adjustable feet
Filling Volume	approx. 25 liters

Figure 6. Twin SAM

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

Figure 7. ELI

3.7. Device holder

Model	Mounting device
Construction	In combination with the Twin SAM Phantom or ELI4, the Mounting Device enables the rotation of the mounted transmitter device in spherical coordinates. Rotation point is the ear opening point. Transmitter devices can be easily and accurately positioned according to IEC, IEEE, FCC or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat).
Material	POM

Figure 8. Mounting device

Model	Laptop extensions kit
Construction	Simple but effective and easy-to-use extension for Mounting Device that facilitates the testing of larger devices according to IEC 62209-2 (e.g., laptops, cameras, etc.). It is lightweight and fits easily on the upper part of the Mounting Device in place of the phone positioner.
Material	POM, Acrylic glass, Foam

Figure 9. Laptop extensions kit

3.8. System Validation Dipoles

Model	D-Serial
Construction	Symmetrical dipole with l/4 balun. Enables measurement of feed point impedance with NWA. Matched for use near flat phantoms filled with tissue simulating solutions.
Frequency	750 MHz to 5800 MHz
Return Loss	> 20 dB
Power Capability	> 100 W (f < 1 GHz), > 40 W (f > 1 GHz)

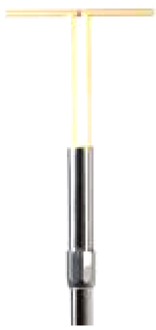


Figure 10. Dipole Antenna

3. Dosimetric Assessment

The evaluation was performed using the following procedure compliant to FCC KDB Publication 865664 D01v01r04 and IEEE 1528-2013:

1. The SAR distribution at the exposed side of the head or body was measured at a distance no greater than 5.0 mm from the inner surface of the shell. The area covered the entire dimension of the device-head and body interface and the horizontal grid resolution was determined per FCC KDB Publication 865664 D01v01r04 (See Table 4-1) and IEEE 1528-2013.

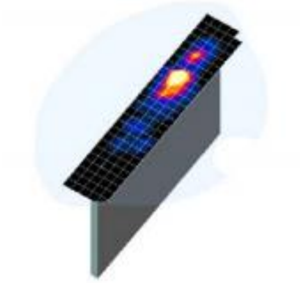


Figure 4-1 Sample SAR Area Scan

2. The point SAR measurement was taken at the maximum SAR region determined from Step 1 to enable the monitoring of SAR fluctuations/drifts during the 1g/10g cube evaluation. SAR at this fixed point was measured and used as a reference value.

3. Based on the area scan data, the peak of the region with maximum SAR was determined by spline interpolation. Around this point, a volume was assessed according to the measurement resolution and volume size requirements of FCC KDB Publication 865664 D01v01r04 (See Table 4-1) and IEEE 1528-2013. On the basis of this data set, the spatial peak SAR value was evaluated with the following procedure (see references or the DASY manual online for more details):

a. SAR values at the inner surface of the phantom are extrapolated from the measured values along the line away from the surface with spacing no greater than that in Table 4-1. The extrapolation was based on a least-squares algorithm. A polynomial of the fourth order was calculated through the points in the z-axis (normal to the phantom shell).

b. After the maximum interpolated values were calculated between the points in the cube, the SAR was averaged over the spatial volume (1g or 10g) using a 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the “Not a knot” condition (in x, y, and z directions). The volume was then integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were obtained through interpolation, in order to calculate the averaged SAR.

c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

4. The SAR reference value, at the same location as step 2, was re-measured after the zoom scan was complete to calculate the SAR drift. If the drift deviated by more than 5%, the SAR test and drift measurements were repeated.

Table 4-1 Area and Zoom Scan Resolutions per FCC KDB Publication 865664 D01v01r04*

Frequency	Maximum Area Scan Resolution (mm) (Δx_{area}, Δy_{area})	Maximum Zoom Scan Resolution (mm) (Δx_{zoom}, Δy_{zoom})	Maximum Zoom Scan Spatial Resolution (mm)			Minimum Zoom Scan Volume (mm) (x,y,z)
			Uniform Grid	Graded Grid		
			$\Delta z_{zoom}(n)$	$\Delta z_{zoom}(1)$*	$\Delta z_{zoom}(n>1)$*	
≤ 2 GHz	≤ 15	≤ 8	≤ 5	≤ 4	≤ 1.5*$\Delta z_{zoom}(n-1)$	≥ 30
2-3 GHz	≤ 12	≤ 5	≤ 5	≤ 4	≤ 1.5*$\Delta z_{zoom}(n-1)$	≥ 30
3-4 GHz	≤ 12	≤ 5	≤ 4	≤ 3	≤ 1.5*$\Delta z_{zoom}(n-1)$	≥ 28
4-5 GHz	≤ 10	≤ 4	≤ 3	≤ 2.5	≤ 1.5*$\Delta z_{zoom}(n-1)$	≥ 25
5-6 GHz	≤ 10	≤ 4	≤ 2	≤ 2	≤ 1.5*$\Delta z_{zoom}(n-1)$	≥ 22

*Also compliant to IEEE 1528-2013 Table 6

4. Test Configuration Positions

4.1. Device Holder

The device holder is made out of low-loss POM material having the following dielectric parameters: relative permittivity ε = 3 and loss tangent δ = 0.02.

4.2. SAR Testing for UMPC Mini Tablet per KDB Publication 941225 D07v01r02

Small hand-held tablets and devices of similar form factors that are designed primarily for interactive hand-held use next to or near the body of users. This type of mini-tablets is normally optimized for mobile web access and multimedia use. UMPC test procedures are applicable to devices with a display and overall diagonal dimension ≤ 20 cm. These devices are typically operated like a mini-tablet and are usually designed with certain UMPC features and operating characteristics; therefore, the term “UMPC Mini-Tablet” is used to identify the SAR test requirements for this category of devices. A composite test separation distance of 5 mm is applied to test UMPC mini-tablet transmitters and to maintain RF exposure conservativeness for the interactive operations associated with this type of devices. The same approach and concepts used for wireless routers (also known as hotspot mode) are applied to UMPC mini-tablet devices.1 Other than a smaller test separation distance of 5 mm, the same device test setup is used for UMPC mini-tablet devices and wireless routers.

Per KDB Publication 941225 D07, UMPC mini-tablet devices must be tested for 1-g SAR on all surfaces and side edges with a transmitting antenna located at ≤ 25 mm from that surface or edge, at 5 mm separation from a flat phantom, for the data modes, wireless technologies and frequency bands supported by the device to determine SAR compliance. When 1-g SAR is tested at 5 mm, 10-g SAR is not required. Devices are configured with maximum output power during SAR assessment for a worst-case SAR evaluation.

5. RF Exposure Limits

5.1. Uncontrolled Environment

UNCONTROLLED ENVIRONMENTS are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

5.2. Controlled Environment

CONTROLLED ENVIRONMENTS are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Table 7-1 SAR Human Exposure Specified in ANSI/IEEE C95.1-1992 and Health Canada Safety Code 6

Human Exposure Limits		
	Uncontrolled Environment General Population (W/kg) or (mW/g)	Controlled Environment Occupational (W/kg) or (mW/g)
Peak Spatial Average SAR Head	1.6	8.0
Whole Body SAR	0.08	0.4
Peak Spatial Average SAR Hands, Feet, Ankle, Wrists, etc.	4.0	20

1. The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.
2. The Spatial Average value of the SAR averaged over the whole body.
3. The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

6. FCC Measurement Procedures

6.1. Measured and Reported SAR

Per FCC KDB Publication 447498 D01v06, when SAR is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance. For simultaneous transmission, the measured aggregate SAR must be scaled according to the sum of the differences between the maximum tune-up tolerance and actual power used to test each transmitter. When SAR is measured at or scaled to the maximum tune-up tolerance limit, the results are referred to as *reported* SAR. The highest *reported* SAR results are identified on the grant of equipment authorization according to procedures in KDB 690783 D01v01r03.

6.2. SAR Testing with GFSK Transmitters

General Device Setup

Chipset based test mode software is hardware dependent and generally varies among manufacturers. The device operating parameters established in 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 reported SAR is scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit.

Power Measurement Procedures FCC Publication KDB 447498 D01v06

As required by §§ 2.1091(d)(2) and 2.1093(d)(5), RF exposure compliance must be determined at the maximum average power level according to source-based time-averaging requirements to determine compliance for general population exposure conditions. Unless it is specified differently in the *published RF exposure KDB procedures*, these requirements also apply to test reduction and test exclusion considerations. Time-averaged maximum conducted output power applies to SAR and, as required by § 2.1091(c), time-averaged effective radiated power applies to MPE. When an antenna port is not available on the device to support conducted power measurement, such as for FRS (Part 95) devices and certain Part 15 transmitters with built-in integral antennas, the maximum output power and tolerance allowed for production units should be used to determine RF exposure test exclusion and compliance.

7. RF Conducted Powers

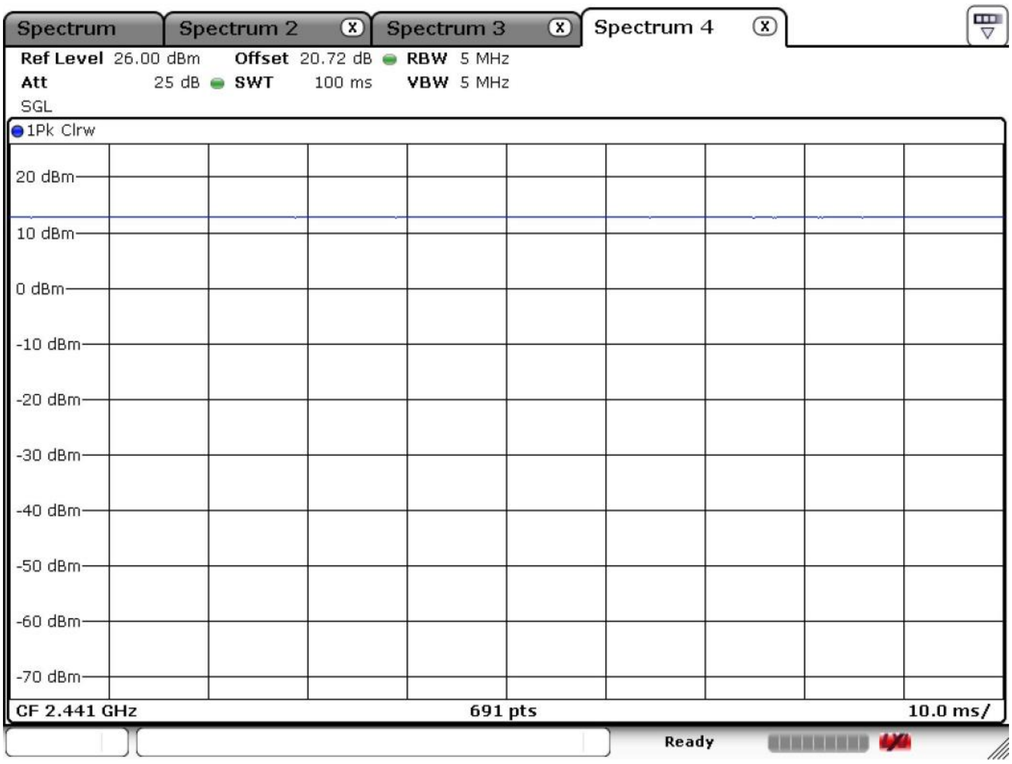
7.1. GFSK Conducted Powers

Table 7-1 GFSK Average RF Power

Frequency [MHz]	Modulation	Channel No.	Average Conducted Power	
			[dBm]	[mW]
2409.5	GFSK	1	**14.06**	**25.47**
2441	GFSK	10	13.45	22.13
2476	GFSK	20	12.85	19.28

Note: The Bolded data rates and channel above were tested for SAR.

Figure 7-1 GFSK Transmission Plot



Equation 7-1 GFSK Duty Cycle Calculation

- DUTY cycle of this device is 100 %.
- DUTY Cycle[%] = (Pulse / Period) X 100 = (1/1)X100 = 100 %

8. System Verification

Tissue Verification

The measuring results for tissue simulating liquid are shown as below.

Table 8-1 Measured Tissue Properties - Body

Tissue Type	Measured Frequency (MHz)	Tissue Temp During Calibration (℃)	Measured Conductivity (σ)	Measured Permittivity (ε_r)	Target Conductivity (σ)	Target Permittivity (ε_r)	Conductivity Deviation (%)	Permittivity Deviation (%)	Calibrated for Tests Performed On:
Body 2450	2450	21.9	1.996	52.907	1.95	52.7	2.36	0.39	2018-12-20
	2409.5	21.9	1.947	53.018	1.91	52.8	1.94	0.41	2018-12-20
	2441	21.9	1.986	52.927	1.94	52.7	2.37	0.43	2018-12-20
	2476	21.9	2.027	52.830	1.99	52.7	1.86	0.25	2018-12-20
Body 2450	2450	21.7	1.943	53.872	1.95	52.7	-0.36	2.22	2018-12-21
	2409.5	21.7	1.893	53.961	1.91	52.8	-0.89	2.20	2018-12-21
	2441	21.7	1.932	53.890	1.94	52.7	-0.41	2.26	2018-12-21
	2476	21.7	1.972	53.788	1.99	52.7	-0.90	2.06	2018-12-21

The above measured tissue parameters were used in the DASY software. The DASY software was used to perform interpolation to determine the dielectric parameters at the SAR test device frequencies (per KDB Publication 865664 D01v01r04 and IEEE 1528-2013 6.6.1.2). The tissue parameters listed in the SAR test plots may slightly differ from the table above due to significant digit rounding in the software.

System Verification

The measuring results for system check are shown as below. Prior to SAR assessment, the system is verified to ±10% of the SAR measurement on the reference dipole at the time of calibration by the calibration facility. Full system validation status and result summary can be found in Appendix A.

Table 8-3 System Verification Results

SAR System #	Test Date	Tissue Frequency (MHz)	Amb. Temp (℃)	Liquid Temp (℃)	Input Power (W)	Source SN	Probe SN	1W Target SAR-1 g (W/kg)	Measured SAR-1 g (W/kg)	Normalized to 1W SAR-1 g (W/kg)	Deviation (%)
2	2018-12-20	2450	22.7	21.9	100	896	7359	49.0	5.08	50.8	3.67
2	2018-12-21	2450	22.6	21.7	100	896	7359	49.0	4.95	49.5	1.02

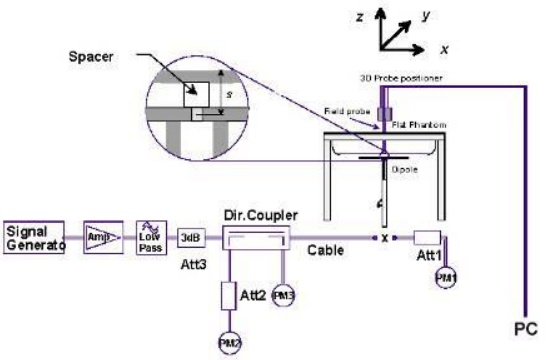


Figure 8-1 System Verification Setup Diagram

Figure 8-2 System Verification Setup Photo

9. SAR Data Summary

9.1. Standalone Body SAR Data

Table 9-1 GFSK Body SAR – Ant. Folded

Measurement Results															
Frequency MHz	Frequency Ch.	Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing [cm]	Test Position	Device Serial Number	Duty Cycle [%]	SAR (1g) W/kg	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR(1g) W/kg	Plot #
2409.5	1	2.4 GHz	GFSK	14.5	14.06	-0.130	0.5	Top Side	SAR#1	100	0.545	1.107	1.000	0.603	
2409.5	1	2.4 GHz	GFSK	14.5	14.06	0.050	0.5	Front Face	SAR#1	100	0.069	1.107	1.000	0.076	
2409.5	1	2.4 GHz	GFSK	14.5	14.06	-0.080	0.5	Rear Face(#1)	SAR#1	100	0.110	1.107	1.000	0.122	
2409.5	**1**	**2.4 GHz**	**GFSK**	**14.5**	**14.06**	**-0.010**	**0.5**	**Rear Face(#2)**	**SAR#1**	**100**	**0.951**	**1.107**	**1.000**	**1.052**	**04**
2409.5	1	2.4 GHz	GFSK	14.5	14.06	0.170	0.5	Right Side	SAR#1	100	0.038	1.107	1.000	0.042	
2409.5	1	2.4 GHz	GFSK	14.5	14.06	0.110	0.5	Left Side	SAR#1	100	0.013	1.107	1.000	0.014	
2441	10	2.4 GHz	GFSK	14.5	13.45	0.010	0.5	Rear Face(#2)	SAR#1	100	0.661	1.274	1.000	0.842	
2476	20	2.4 GHz	GFSK	14.5	12.85	-0.010	0.5	Rear Face(#2)	SAR#1	100	0.621	1.462	1.000	0.908	
2409.5	1	2.4 GHz	GFSK	14.5	14.06	-0.020	0.5	Rear Face(#2)	SAR#1	100	0.943	1.107	1.000	1.044	
ANSI / IEEE C95.1 1992 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General Population								Body 1.6 W/kg (mW/g) averaged over 1 gram							

Note: Blue entry represents variability measurement.

Table 9-2 GFSK Body SAR – Ant. Unfolded

Measurement Results															
Frequency MHz	Frequency Ch.	Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing [cm]	Test Position	Device Serial Number	Duty Cycle [%]	SAR (1g) W/kg	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR(1g) W/kg	Plot #
2409.5	1	2.4 GHz	GFSK	14.5	14.06	0.070	0.5	Top Side	SAR#1	100	0.042	1.107	1.000	0.046	
2409.5	1	2.4 GHz	GFSK	14.5	14.06	0.050	0.5	Front Face	SAR#1	100	0.516	1.107	1.000	0.571	
2409.5	1	2.4 GHz	GFSK	14.5	14.06	0.040	0.5	Rear Face(#1)	SAR#1	100	0.094	1.107	1.000	0.104	
2409.5	1	2.4 GHz	GFSK	14.5	14.06	0.110	0.5	Rear Face(#2)	SAR#1	100	0.801	1.107	1.000	0.886	
2409.5	1	2.4 GHz	GFSK	14.5	14.06	0.080	0.5	Left Side	SAR#1	100	0.095	1.107	1.000	0.105	
2441	10	2.4 GHz	GFSK	14.5	13.45	0.010	0.5	Rear Face(#2)	SAR#1	100	0.738	1.274	1.000	0.940	
2476	**20**	**2.4 GHz**	**GFSK**	**14.5**	**12.85**	**0.050**	**0.5**	**Rear Face(#2)**	**SAR#1**	**100**	**0.716**	**1.462**	**1.000**	**1.047**	**16**
2409.5	1	2.4 GHz	GFSK	14.5	14.06	0.030	0.5	Rear Face(#2)	SAR#1	100	0.796	1.107	1.000	0.881	
2409.5	1	2.4 GHz	GFSK	14.5	14.06	0.090	0.5	Rear Face(#2)	SAR#1	100	0.743	1.107	1.000	0.822	
2441	10	2.4 GHz	GFSK	14.5	13.45	0.100	0.5	Rear Face(#2)	SAR#1	100	0.715	1.274	1.000	0.911	
2476	20	2.4 GHz	GFSK	14.5	12.85	0.110	0.5	Rear Face(#2)	SAR#1	100	0.635	1.462	1.000	0.928	
ANSI / IEEE C95.1 1992 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General Population								Body 1.6 W/kg (mW/g) averaged over 1 gram							

Note: Blue entry represents variability measurement.
Yellow entry was tested by 45 degree folded antenna status on the worst case.

9.2. SAR Test Notes

General Notes:

1. The test data reported are the worst-case SAR values according to test procedures specified in IEEE 1528-2013, and FCC KDB Publication 447498 D01v06.
2. Batteries are fully charged at the beginning of the SAR measurements.
3. Liquid tissue depth was at least 15.0 cm for all frequencies.
4. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.
5. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D01v06.
6. Per FCC KDB 865664 D01v01r04, variability SAR tests were performed when the measured SAR results for a frequency band were greater than or equal to 0.8 W/kg. Repeated SAR measurements are highlighted in the tables above for clarity. Please see Section 10 for variability analysis.
7. Per FCC KDB Publication 941225 D07, at 0.5 cm separation from a flat phantom. For the data modes, wireless technologies and frequency bands supported by the device to determine SAR compliance. When 1-g SAR is tested at 0.5 cm, 10-g SAR is not required.
8. This device does not support simultaneous transmission since device supports only 2.4 GHz band GFSK; therefore no simultaneous transmission was required to be evaluated.
9. The SAR test was performed under different conditions(Folded/Unfolded) of antenna. The testing condition under which the antenna was extended 45° was the worst case among the result of preconditions.
10. The Rear Face(#1) means EUT is placed standard status against the phantom and the Rear Face(#2) means EUT is placed folded back holder against standard status to the phantom.

FHSS GFSK Notes:

1. FHSS GFSK SAR was measured Tx Tests test mode type. During the SAR test, hopping mode was disabled. The reported SAR was scaled to the 100% transmission duty factor to determine compliance. See Section 7.1 for the time domain plot and calculation for the duty factor of the device.

10. SAR Measurement Variability

10.1. Measurement Variability

Per FCC KDB Publication 865664 D01v01r04, SAR measurement variability was assessed for each frequency band, which was determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media were required for SAR measurements in a frequency band, the variability measurement procedures were applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. These additional measurements were repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device was returned to ambient conditions (normal room temperature) with the battery fully charged before it was re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

SAR Measurement Variability was assessed using the following procedures for each frequency band:

1) When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.
2) A second repeated measurement was performed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1g SAR limit).
3) A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.
4) Repeated measurements are not required when the original highest measured SAR is < 0.80 W/kg

Table 10-1 Body SAR Measurement Variability Results

Body Variability Results													
Band	Frequency		Mode/Band	Service	Test Position [Spacing]	Ant. Status	Measured SAR (1g)	1 st Repeated SAR(1g)	Ratio	2 st Repeated SAR(1g)	Ratio	3 st Repeated SAR(1g)	Ratio
	MHz	Ch.					(W/kg)	(W/kg)		(W/kg)		(W/kg)	
2450	2409.5	1	2.4 GHz	GFSK	Rear Face(#2) [0.5 cm]	Folded	0.951	0.943	1.008	N/A	N/A	N/A	N/A
2450	2409.5	1	2.4 GHz	GFSK	Rear Face(#2) [0.5 cm]	Unfolded	0.801	0.796	1.006	N/A	N/A	N/A	N/A
ANSI / IEEE C95.1 1992 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General Population						Head 1.6 W/kg (mW/g) averaged over 1 gram							

10.2. Measurement Uncertainty

The measured SAR was <1.5 W/kg for all frequency bands. Therefore, per KDB Publication 865664 D01v01r04, the extended measurement uncertainty analysis per IEEE 1528-2013 was not required.

11. Equipment List

Equipment	Manufacturer	Model	Serial No.	Cal. Date	Next Cal. Date	Cal. interval
SAR Chamber	Dymstec	N/A	N/A	N/A	N/A	N/A
Thermo-Hygrostat	㈜한국문터스	HK-030-AU1	1506231	N/A	N/A	N/A
Staubli Robot Unit	Staubli	TX60L	F15/5Y7QA1/A/01	N/A	N/A	N/A
Electro Optical Converter	SPEAG	EOC60	1096	N/A	N/A	N/A
2mm Oval Phantom V6.0	SPEAG	QD OVA 003 AA	2036	N/A	N/A	N/A
Device Holder	SPEAG	Mounting Device	SD 000 H01 KA	N/A	N/A	N/A
Device Holder	SPEAG	Laptop Holder	SM LH1 001 CD	N/A	N/A	N/A
Data Acquisition Electronics	SPEAG	DAE4	1460	2018-05-28	2019-05-28	1 Year
E-Field Probe	SPEAG	EX3DV4	7359	2018-01-25	2019-01-25	1 Year
Dipole Antenna	SPEAG	D2450V2	896	2018-05-30	2020-05-30	2 Years
Vector Signal Generator	R&S	SMBV100A	256397	2018-06-28	2019-06-28	1 Year
RF POWER AMPLIFIER	NONE	RFSPA24	001	2018-06-29	2019-06-29	1 Year
DUAL DIRECTIONAL COUPLER	HP	11692D	1212A03523	2018-06-29	2019-06-29	1 Year
EPM Series Power Meter	HP	E4419B	GB40202055	2018-01-19	2019-01-19	1 Year
E-Series AVG Power Sensor	Agilent	E9300H	MY41495967	2018-01-19	2019-01-19	1 Year
E-Series AVG Power Sensor	Agilent	E9300H	US39215405	2018-01-19	2019-01-19	1 Year
POWER METER	ANRITSU	ML2495A	1438001	2018-01-25	2019-01-25	1 Year
Pulse Power Sensor	ANRITSU	MA2411B	1339205	2018-01-25	2019-01-25	1 Year
Attenuator	HP	8491B	22234	2018-04-02	2019-04-02	1 Year
Attenuator	MINI-CIRCUITS	UNAT-10+	VUU38501715	2018-04-02	2019-04-02	1 Year
Low Pass Filter	FILTRON	F-LPCA-KOO1410	1408004S	2018-04-02	2019-04-02	1 Year
DIELECTRIC ASSESSMENT KIT	SPEAG	DAK3.5	1092	2018-11-20	2019-11-20	1 Year
S-Parameter Network Analyzer	Agilent	8753ES	MY40000210	2018-06-28	2019-06-28	1 Year
HYGRO-THERMOMETER	DAEKWANG	811CE	NONE	2018-07-19	2019-07-19	1 Year
Spectrum Analyzer	R&S	FSV40	101002	2018-06-29	2019-06-29	1 Year

Note: CBT (Calibrated Before Testing). Prior to testing, the measurement paths containing a cable, amplifier, attenuator, coupler or filter were connected to a calibrated source (i.e. a signal generator) to determine the losses of the measurement path. The power meter offset was then adjusted to compensate for the measurement system losses. This level offset is stored within the power meter before measurements are made. This calibration verification procedure applies to the system verification and output power measurements. The calibrated reading is then taken directly from the power meter after compensation of the losses for all final power measurements.

12. Conclusion

The SAR evaluation indicates that the EUT complies with the RF radiation exposure limits of the FCC and Innovation, Science, and Economic Development Canada, with respect to all parameters subject to this test. These measurements were taken to simulate the RF effects of RF exposure under worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests. The results and statements relate only to the item(s) tested.

Please note that the absorption and distribution of electromagnetic energy in the body are very complex phenomena that depend on the mass, shape, and size of the body, the orientation of the body with respect to the field vectors, and the electrical properties of both the body and the environment. Other variables that may play a substantial role in possible biological effects are those that characterize the environment (e.g. ambient temperature, air velocity, relative humidity, and body insulation) and those that characterize the individual (e.g. age, gender, activity level, debilitation, or disease). Because various factors may interact with one another to vary the specific biological outcome of an exposure to electromagnetic fields, any protection guide should consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables.

13. References

[1] Federal Communications Commission, ET Docket 93-62, Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation, Aug. 1996.

[2] ANSI/IEEE C95.1-2005, American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 3kHz to 300GHz, New York: IEEE, 2006.

[3] ANSI/IEEE C95.1-1992, American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 3kHz to 300GHz, New York: IEEE, Sept. 1992.

[4] ANSI/IEEE C95.3-2002, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave, New York: IEEE, December 2002.

[5] IEEE Standards Coordinating Committee 39 –Standards Coordinating Committee 34 – IEEE Std. 1528-2013, IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques. [6] NCRP, National Council on Radiation Protection and Measurements, Biological Effects and Exposure Criteria for RadioFrequency Electromagnetic Fields, NCRP Report No. 86, 1986. Reprinted Feb. 1995.

[7] T. Schmid, O. Egger, N. Kuster, Automated E-field scanning system for dosimetric assessments, IEEE Transaction on Microwave Theory and Techniques, vol. 44, Jan. 1996, pp. 105-113.

[8] K. Pokovic, T. Schmid, N. Kuster, Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequencies, ICECOM97, Oct. 1997, pp. 1 -124.

[9] K. Pokovic, T. Schmid, and N. Kuster, E-field Probe with improved isotropy in brain simulating liquids, Proceedings of the ELMAR, Zadar, Croatia, June 23-25, 1996, pp. 172-175.

[10] Schmid & Partner Engineering AG, Application Note: Data Storage and Evaluation, June 1998, p2.

[11] V. Hombach, K. Meier, M. Burkhardt, E. Kuhn, N. Kuster, The Dependence of EM Energy Absorption upon Human Modeling at 900 MHz, IEEE Transaction on Microwave Theory and Techniques, vol. 44 no. 10, Oct. 1996, pp. 1865-1873.

[12] N. Kuster and Q. Balzano, Energy absorption mechanism by biological bodies in the near field of dipole antennas above 300 MHz, IEEE Transaction on Vehicular Technology, vol. 41, no. 1, Feb. 1992, pp. 17-23.

[13] G. Hartsgrove, A. Kraszewski, A. Surowiec, Simulated Biological Materials for Electromagnetic Radiation Absorption Studies, University of Ottawa, Bioelectromagnetics, Canada: 1987, pp. 29-36.

[14] Q. Balzano, O. Garay, T. Manning Jr., Electromagnetic Energy Exposure of Simulated Users of Portable Cellular Telephones, IEEE Transactions on Vehicular Technology, vol. 44, no.3, Aug. 1995.

[15] W. Gander, Computermathematick, Birkhaeuser, Basel, 1992.

[16] W.H. Press, S.A. Teukolsky, W.T. Vetterling, and B.P. Flannery, Numerical Recipes in C, The Art of Scientific Computing, Second edition, Cambridge University Press, 1992.

[17] N. Kuster, R. Kastle, T. Schmid, Dosimetric evaluation of mobile communications equipment with known precision, IEEE Transaction on Communications, vol. E80-B, no. 5, May 1997, pp. 645-652.

[18] CENELEC CLC/SC111B, European Prestandard (prENV 50166-2), Human Exposure to Electromagnetic Fields Highfrequency: 10 kHz-300 GHz, Jan. 1995.

[19] Prof. Dr. Niels Kuster, ETH, Eidgenössische Technische Hoschschule Zürich, Dosimetric Evaluation of the Cellular Phone.

[20] IEC 62209-1, Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Part 1: Devices used next to the ear (Frequency range of 300 MHz to 6 GHz), July 2016.

[21] Innovation, Science, Economic Development Canada RSS-102 Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) Issue 5, March 2015.

[22] Health Canada Safety Code 6 Limits of Human Exposure to Radio Frequency Electromagnetic Fields in the Frequency Range from 3 kHz – 300 GHz, 2015

[23] FCC SAR Test Procedures for 2G-3G Devices, Mobile Hotspot and UMPC Devices KDB Publications 941225, D01-D07

[24] SAR Measurement Guidance for IEEE 802.11 Transmitters, KDB Publication 248227 D01

[25] FCC SAR Considerations for Handsets with Multiple Transmitters and Antennas, KDB Publications 648474 D03-D04

[26] FCC SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers, FCC KDB Publication 616217 D04

[27] FCC SAR Measurement and Reporting Requirements for 100MHz – 6 GHz, KDB Publications 865664 D01-D02

[28] FCC General RF Exposure Guidance and SAR Procedures for Dongles, KDB Publication 447498, D01-D02

[29] Anexo à Resolução No. 533, de 10 de Septembro de 2009.

[30] IEC 62209-2, Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - Part 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), Mar. 2010.

Appendix A. SAR Plots for System Verification

The plots for system verification with largest deviation for each SAR system combination are shown as follows.

Test Laboratory: KES Co., Ltd. Date: 12/20/2018 Time: 9:35:56 AM

System Verification for 2450 MHz

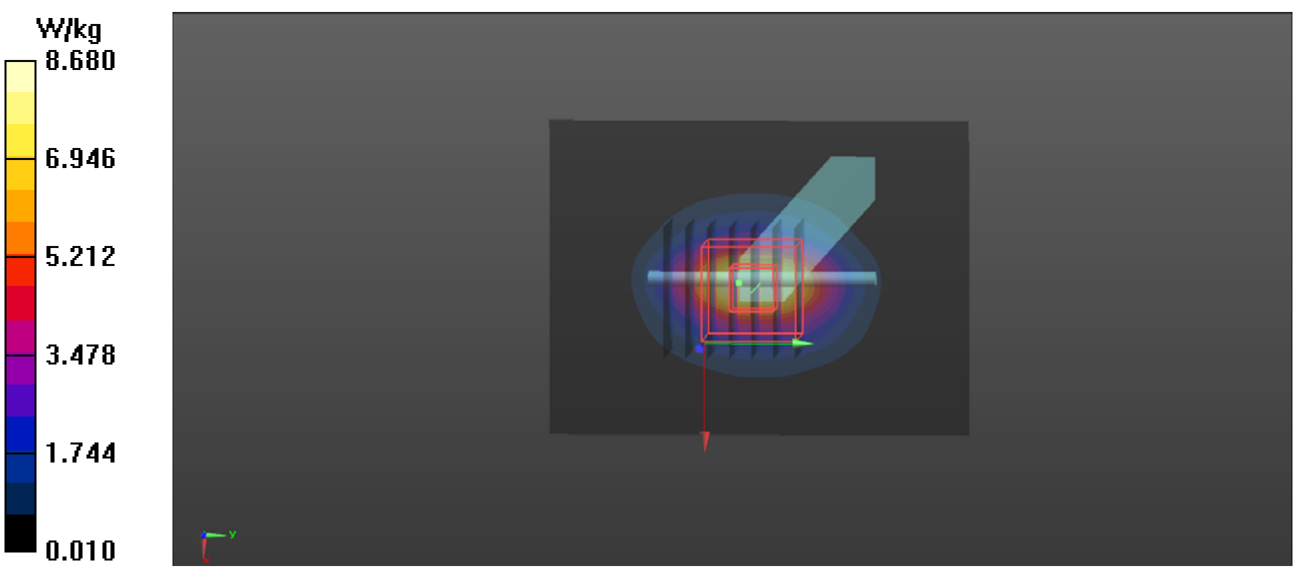
DUT: Dipole D2450V2-SN: 896

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: MSL2450 Medium parameters used: f = 2450 MHz; σ = 1.996 S/m; ε_r = 52.907; ρ = 1000 kg/m^3
Ambient Temperature：22.7 ℃; Liquid Temperature：21.9 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN7359; ConvF(7.4, 7.4, 7.4); Calibrated: 1/25/2018;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1460; Calibrated: 5/28/2018
- Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2036
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Pin=100 mW/Area Scan (61x81x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 8.68 W/kg

Pin=100 mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 67.94 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 10.7 W/kg
SAR(1 g) = 5.08 W/kg; SAR(10 g) = 2.34 W/kg
Maximum value of SAR (measured) = 8.54 W/kg



Test Laboratory: KES Co., Ltd. Date: 12/21/2018 Time: 9:46:56 AM

System Verification for 2450 MHz

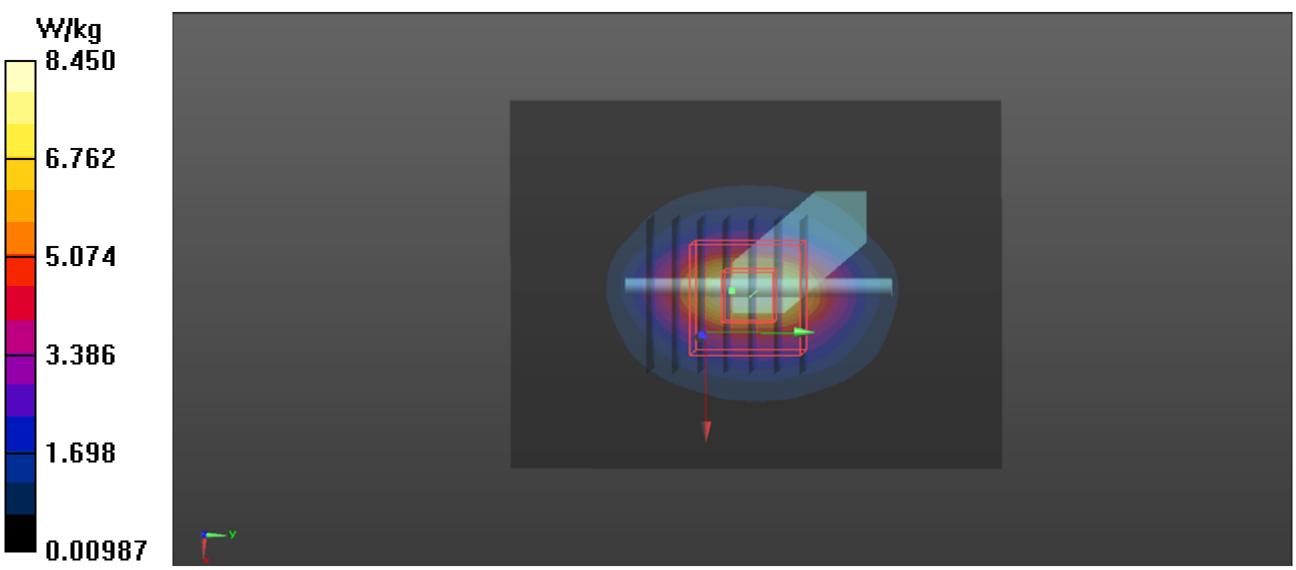
DUT: Dipole D2450V2-SN: 896

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: MSL2450 Medium parameters used: f = 2450 MHz; σ = 1.943 S/m; ε_r = 53.872; ρ = 1000 kg/m^3
Ambient Temperature : 22.6 ℃; Liquid Temperature : 21.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN7359; ConvF(7.4, 7.4, 7.4); Calibrated: 1/25/2018;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1460; Calibrated: 5/28/2018
- Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2036
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Pin=100 mW/Area Scan (61x81x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 8.45 W/kg

Pin=100 mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 67.94 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 10.4 W/kg
SAR(1 g) = 4.95 W/kg; SAR(10 g) = 2.28 W/kg
Maximum value of SAR (measured) = 8.31 W/kg



Appendix B. SAR Plots for SAR Measurement

The plots for SAR measurement are shown as follows.

Test Laboratory: KES Co., Ltd. Date: 12/20/2018 Time: 11:47:04 AM

P04_2.4 GHz Band_GFSK_Rear Face(#2)_0.5 cm_Ch.1_Ant Folded

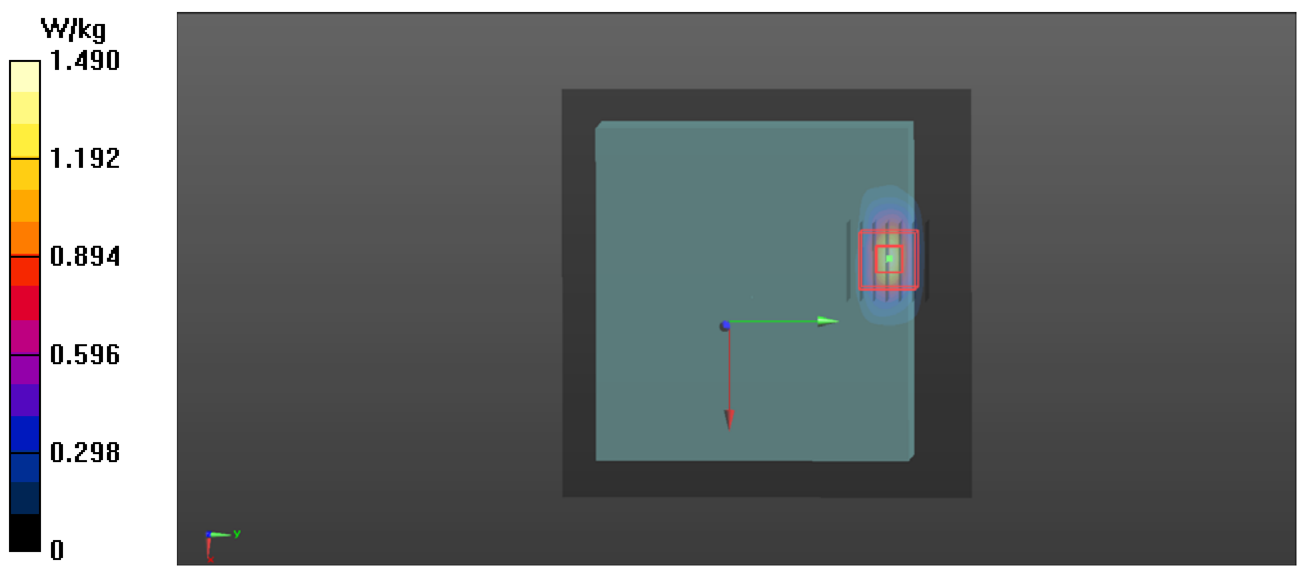
DUT: SEM-3049W

Communication System: GFSK; Frequency: 2409.5 MHz;Duty Cycle: 1:1
Medium: MSL2450 Medium parameters used: f = 2409.5 MHz; σ = 1.947 S/m; ε_r = 53.018; ρ = 1000 kg/m^3
Ambient Temperature : 22.7 ℃; Liquid Temperature : 21.9 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN7359; ConvF(7.4, 7.4, 7.4); Calibrated: 1/25/2018;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1460; Calibrated: 5/28/2018
- Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2036
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

- Area Scan (131x131x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 1.49 W/kg

- Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 30.92 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 2.08 W/kg
SAR(1 g) = 0.951 W/kg; SAR(10 g) = 0.387 W/kg
Maximum value of SAR (measured) = 1.53 W/kg



Test Laboratory: KES Co., Ltd. Date: 12/21/2018 Time: 2:13:45 PM

P16_2.4 GHz Band_GFSK_Rear Face(#2)_0.5 cm_Ch.20_Ant Unfolded

DUT: SEM-3049W

Communication System: GFSK; Frequency: 2476 MHz;Duty Cycle: 1:1
Medium: MSL2450 Medium parameters used: f = 2476 MHz; σ = 1.972 S/m; ε_r = 53.788; ρ = 1000 kg/m^3
Ambient Temperature : 22.6 ℃; Liquid Temperature : 21.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN7359; ConvF(7.4, 7.4, 7.4); Calibrated: 1/25/2018;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1460; Calibrated: 5/28/2018
- Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2036
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

- Area Scan (131x181x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 1.22 W/kg

- Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 24.22 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 1.48 W/kg
SAR(1 g) = 0.716 W/kg; SAR(10 g) = 0.347 W/kg
Maximum value of SAR (measured) = 1.18 W/kg