SAR EVALUATION REPORT

Equipment under test	Bodyworn Camera
Model name	GPBW-180CA1GN
FCC ID	ZGPRECKONX
Applicant	GPI Korea, Inc.
Manufacturer	GPI Korea, Inc.
Date of test(s)	2016.12.23 ~ 2016.12.23, 2017.01.17
Date of issue	2017.01.17

Issued to

GPI Korea, Inc.

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Test and report completed by :	**Report approval by :**
Wi-han Jeong Test engineer	Jeff Do Technical manager

Revision history

Revision	Date of issue	Test report No.	Description
-	2016.12.29	KES-SR-16T0019	Initial
R1	2017.01.17	KES-SR-16T0019-R1	According to KDB 447498 D01, other channel is additional tested

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1. General information

Applicant:	GPI Korea, Inc.
Applicant address:	10355 B-201, 158, Haneulmaeul-ro, Ilsandong-gu, Goyang-si, Gyeonggi-do, Korea
Test site:	KES Co., Ltd.
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Test device serial No.:	☒ Production ☐ Pre-production ☐ Engineering
Application purpose:	☒ Original grant ☐ Class I permissive change ☐ Class II permissive change

1.1. EUT description

Model:	GPBW-180CA1GN
Equipment under test	Bodyworn Camera
Frequency range	WIFI: 2412 ㎒ ~ 2462 ㎒(11b/g/n_HT20) BLE: 2402 ㎒ ~ 2480 ㎒
Modulation technique	WIFI: DSSS, OFDM. BLE: GFSK
Number of channels	WIFI: 11. BLE: 40
Antenna specification	WIFI: PCB Antenna, Peak gain: 2.84 ㏈i BLE: Chip Antenna, Peak gain: 0.5 ㏈i
Power source	DC 3.7 V (Rechargeable Battery)

Notes:

1. The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power output.
2. Duty cycle ≥ 98%.

1.2. Accessories of EUT

Accessory	Description	Other
Body Worn Accessory	Belt clip	Standard

1.3. Highest SAR summary

Equipment class	Frequency band	Tissue type	Reported SAR value 1g-SAR (W/kg)
DTS	2.4 GHz	Body	0.164

Notes:
- This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications.
- This device can not transmit WIFI and BT simultaneously.

1.4. Guidance applied

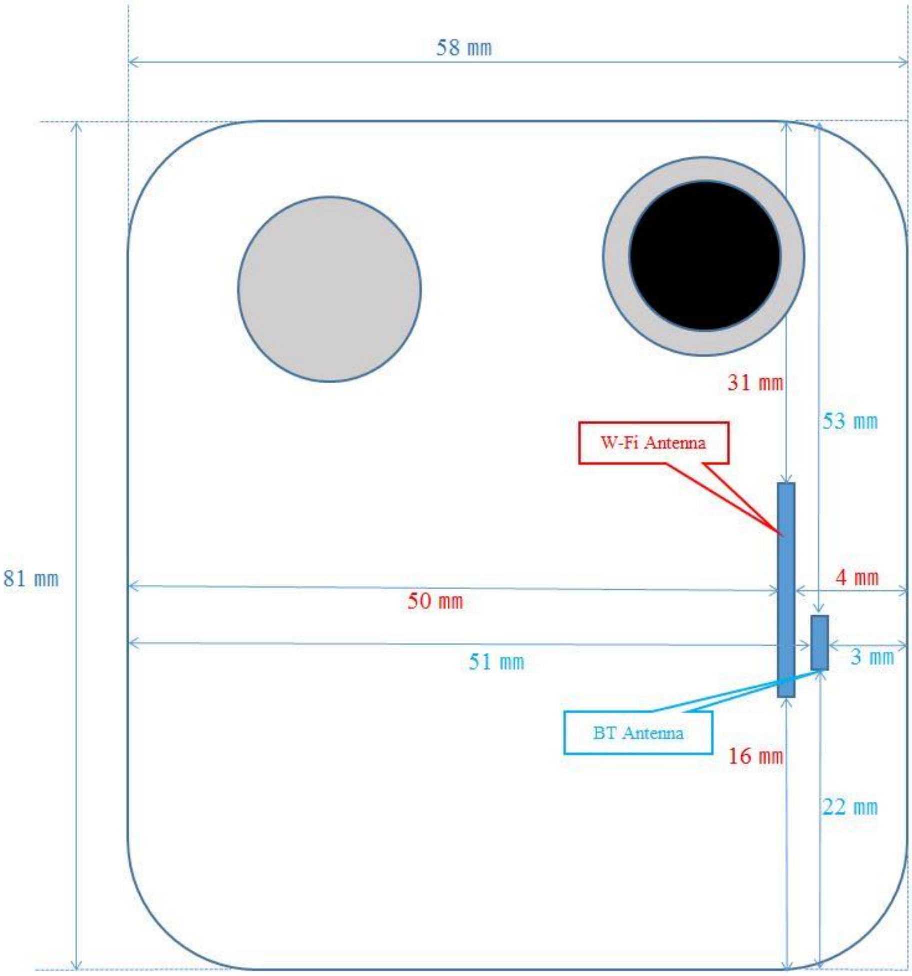
The Specific Absorption Rate (SAR) testing specification, method, and procedure for this device is in accordance with the following standards:

- IEEE 1528-2013
- FCC KDB Publication 865664 D01 v01r04 (SAR measurement up to 6 ㎓)
- FCC KDB Publication 865664 D02 v01r02 (SAR reporting)
- FCC KDB Publication 447498 D01 v06 (General SAR Guidance)
- FCC KDB Publication 941225 D07 v01r02(UMPC Mini Tablet)
- FCC KDB Publication 248227 D01 v02r02 (802.11 Wi-Fi SAR)

1.5. Test conditions

Ambient temperature	(22 ± 2) ℃
Tissue simulating liquid	(22 ± 2) ℃
Humidity	(55 ± 5) % R.H.

1.6. DUT Antenna Locations



Antenna	To Front (㎜)	To Rear (㎜)	To Top Side (㎜)	To Bottom Side (㎜)	To Left Side (㎜)	To Right Side (㎜)
WLAN	14	8	31	16	50	4
SAR Exemption	MEASURE	MEASURE	EXEMPT	MEASURE	EXEMPT	MEASURE
BT	11	12	53	22	51	3
SAR Exemption	EXEMPT	EXEMPT	EXEMPT	EXEMPT	EXEMPT	EXEMPT

Note:

- According to 941225 D07 UMPC Mini Table, 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.
  Average power should be ≥ 10㎽ in 2450㎒, 5mm Test serperation distance.

SAR Test Exclusion Thresholds for 100 MHz – 6 GHz and ≤ 50 mm

Approximate SAR Test Exclusion Power Thresholds at Selected Frequencies and Test Separation Distances are illustrated in the following Table. The equation and threshold in 4.3.1 must be applied to determine SAR test exclusion.

MHz	5	10	15	20	25	mm
150	39	77	116	155	194	*SAR Test Exclusion Threshold* (mW)
300	27	55	82	110	137	
450	22	45	67	89	112	
835	16	33	49	66	82	
900	16	32	47	63	79	
1500	12	24	37	49	61	
1900	11	22	33	44	54	
2450	10	19	29	38	48	
3600	8	16	24	32	40	
5200	7	13	20	26	33	
5400	6	13	19	26	32	
5800	6	12	19	25	31	

MHz	30	35	40	45	50	mm
150	232	271	310	349	387	*SAR Test Exclusion Threshold* (mW)
300	164	192	219	246	274	
450	134	157	179	201	224	
835	98	115	131	148	164	
900	95	111	126	142	158	
1500	73	86	98	110	122	
1900	65	76	87	98	109	
2450	57	67	77	86	96	
3600	47	55	63	71	79	
5200	39	46	53	59	66	
5400	39	45	52	58	65	
5800	37	44	50	56	62	

Note:

- Bluetooth antenna is located at ≤ 25 mm from that surface or edge in Front, Rear, Right.
  But BT's the highest average power is -6.84 ㏈m(=0.20 ㎽). According to *447498 D01 Appendix A*, Average power should be higher than 10㎽ in 2450㎒, 5mm Test separation distance.

1.7. SAR definition

Specific Absorption Rate is defined as the time derivative (rate) of the incremental energy (dU) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dV) of a given density (ρ). It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body (see Figure 1).

$$SAR = \frac{d}{dt}\left(\frac{dU}{dm}\right) = \frac{d}{dt}\left(\frac{dU}{\rho d\upsilon}\right)$$

Figure 1. SAR Mathematical equation

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

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

Where:

σ = Conductivity of the tissue-simulating material (S/m)

ρ = Mass density of the tissue-simulating material (kg/㎥)

E = Total RMS electric field strength (V/m)

Note:

The primary factors that control rate of energy absorption were found to be the wavelength of the incident field in relations 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. SAR measurement system

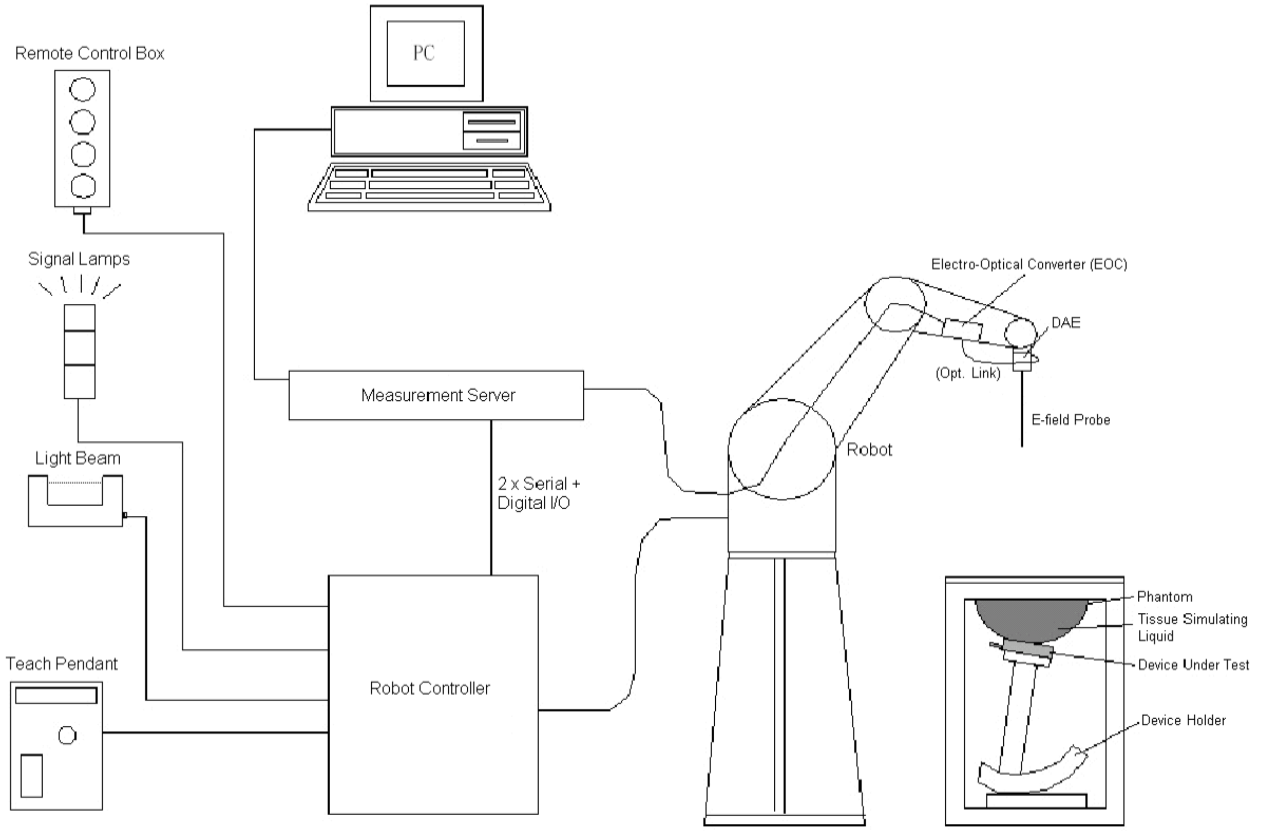


Figure 2. SPEAG DASY system configuration

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

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

2.1. Robot

The DASY system uses the high precision robots 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 ±0.035 mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallic construction shields against motor control fields)

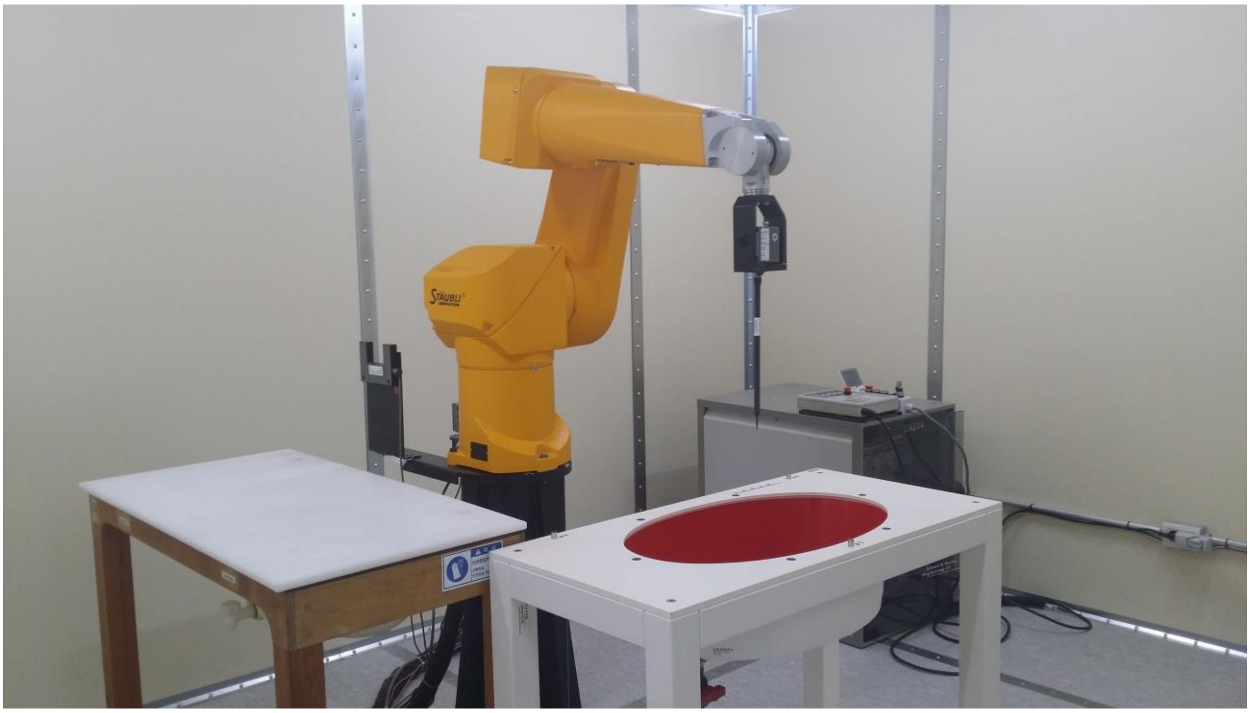


Figure 3. SPEAG DASY 4

2.2. 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

2.3. 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 dB in HSL (rotation around probe axis) ± 0.3 dB in tissue material (rotation normal to probe axis)
Input Bias Current	< 50 fA
Dimensions	60 x 60 x 68 mm

Figure 5. DAE

2.4. 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

2.5. 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. SAR measurement procedure

Step 1: Power reference measurement

The power reference measurement and power reference measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 2 ㎜. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

Step 2 and 3: Area scan & zoom scan procedures

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

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

			≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface			5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location			30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}			≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
			When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	≤ 1.5·$\Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.

* When zoom scan is required and the *reported* SAR from the *area scan based 1-g SAR estimation* procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

Figure 10. Area and zoom scan resolutions per FCC KDB Publication 865664 D01v01r04

Step 4: Power drift measurement

The power drift measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The power drift measurement gives the field difference in dB from the reading conducted within the last power reference measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

4. Tissue simulating liquids

For the measurement of the field distribution inside the phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in figure 11.

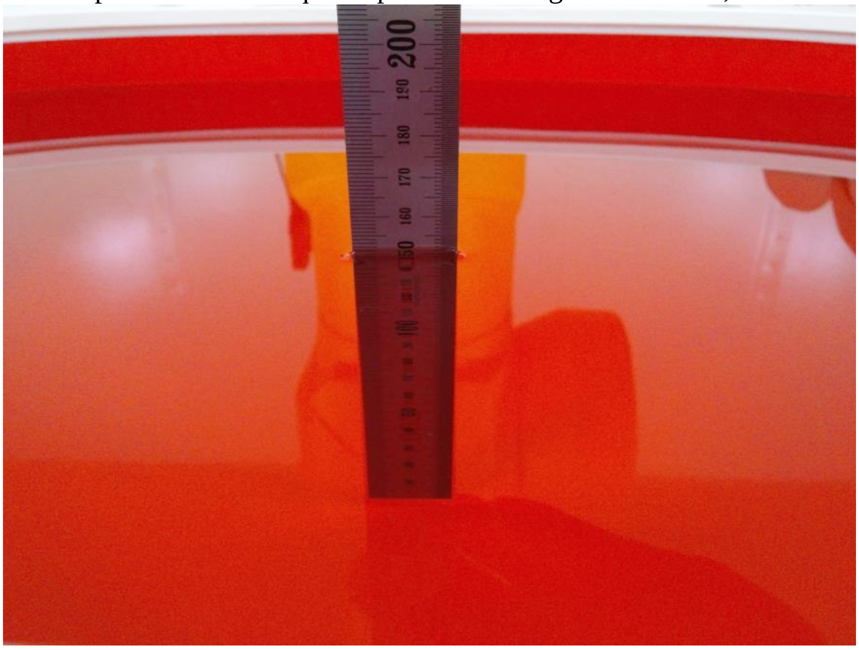


Figure 11. Liquid height photo

The dielectric parameters of the liquids were verified prior to the SAR evaluation using an Agilent dielectric probe kit and an Agilent network analyzer.

The following table shows the measuring results for simulating liquid.

Frequency (MHz)	Tissue type	Liquid temp.(℃)	Parameters	Target value	Measured value	Deviation (%)	Limit (%)	Data
2450	Body	22.3	Permittivity (εr)	52.7	52.7	0.00	±5	2016.12.23
			Conductivity (σ)	1.95	1.96	0.51	±5	2016.12.23
2412	Body	22.3	Permittivity (εr)	52.7	52.8	0.19	±5	2016.12.23
			Conductivity (σ)	1.95	1.91	-2.05	±5	2016.12.23
2450	Body	22.4	Permittivity (εr)	52.7	52.6	-0.19	±5	2017.01.17
			Conductivity (σ)	1.95	1.94	-0.51	±5	2017.01.17

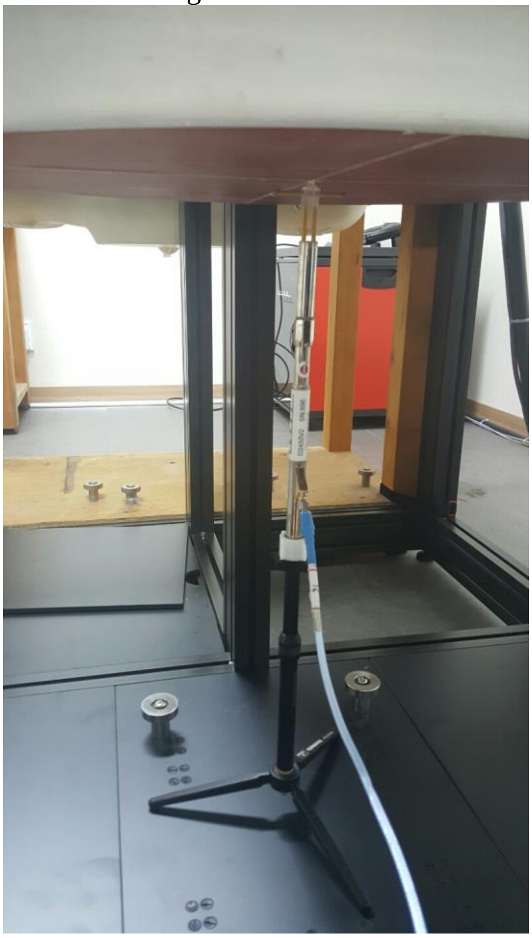
5. System verification

5.1. Procedure

SAR measurement was prior to assessment, the system is verified to the ±10 % of the specifications at each frequency band by using the system verification kit.

- Cabling the system, using the verification kit equipment.
- Generate about 250 ㎽ input level from the signal generator to the dipole antenna.
- Dipole antenna was placed below the flat phantom.
- The measured one-gram SAR at the surface of the phantom above the dipole feed-point should be within 10 % of the target reference value.
- The results are normalized to 1 W input power.

Note; SAR verification was performed according to the FCC KDB 865664 D01v01r04.



5.2. System verification

Frequency (㎒)	Tissue type	Probe (S/N)	Antenna (S/N)	1 W Target SAR_{1g} (W/kg)	Measured SAR_{1g} (250mW)	1 W Normalized SAR_{1g} (W/kg)	Deviation (%)	Limit (%)	Data
2450	Body	3879	896	49.5	12.5	50.0	1.01	±10	2016.12.23
2450	Body	3879	896	49.5	11.8	47.2	-4.65	±10	2017.01.17

Date/Time: 2016-12-23 2:02:37 PM

Test Laboratory: KES Co., Ltd.

GPI Korea_System Verification_2450MSL

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:896

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

Medium parameters used: f = 2450 MHz; σ = 1.96 mho/m; ε_r = 52.7; ρ = 1000 kg/m^3

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: EX3DV4 - SN7359; ConvF(7.2, 7.2, 7.2); Calibrated: 2016-05-31
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1344; Calibrated: 2016-11-22
- Phantom: ELI v5.0_2013_01_23; Type: QDOVA002AA; Serial: TP:1190
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

GPI Korea_System Verification_2450MSL/Area Scan (6x8x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 19.1 mW/g

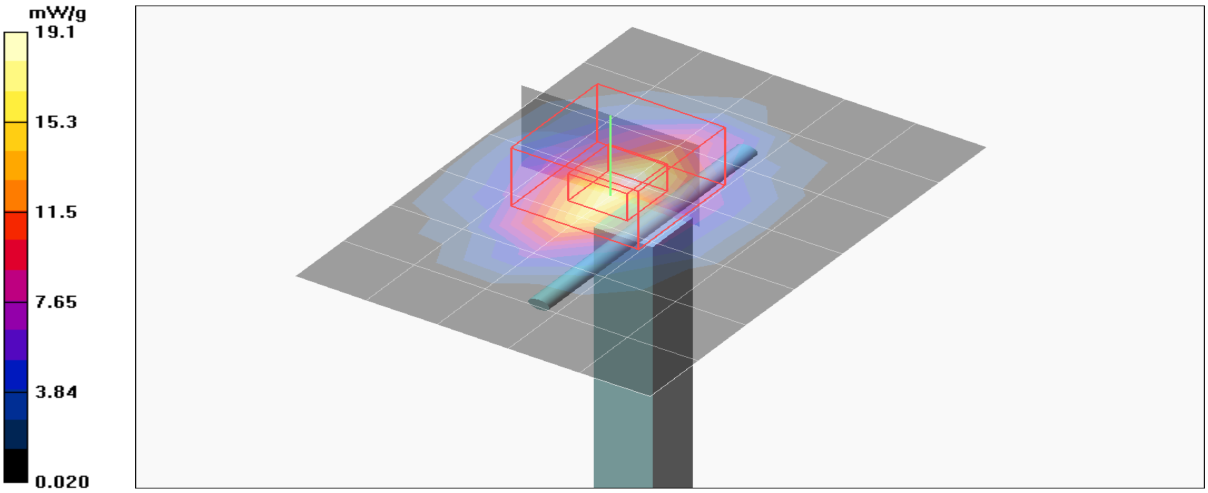
GPI Korea_System Verification_2450MSL/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 86.8 V/m; Power Drift = 0.071 dB

Peak SAR (extrapolated) = 26.4 W/kg

SAR(1 g) = 12.5 mW/g; SAR(10 g) = 5.79 mW/g

Maximum value of SAR (measured) = 19.2 mW/g



Date/Time: 2017-01-17 10:58:55 AM

Test Laboratory: KES Co., Ltd.

GPI Korea_System Verification_2450MSL

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:896

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

Medium parameters used: f = 2450 MHz; σ = 1.94 mho/m; ε_r = 52.6; ρ = 1000 kg/m^3

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: EX3DV4 - SN7359; ConvF(7.2, 7.2, 7.2); Calibrated: 2016-05-31
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1344; Calibrated: 2016-11-22
- Phantom: ELI v5.0_2013_01_23; Type: QDOVA002AA; Serial: TP:1190
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

GPI Korea_System Verification_2450MSL/Area Scan (6x8x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 17.2 mW/g

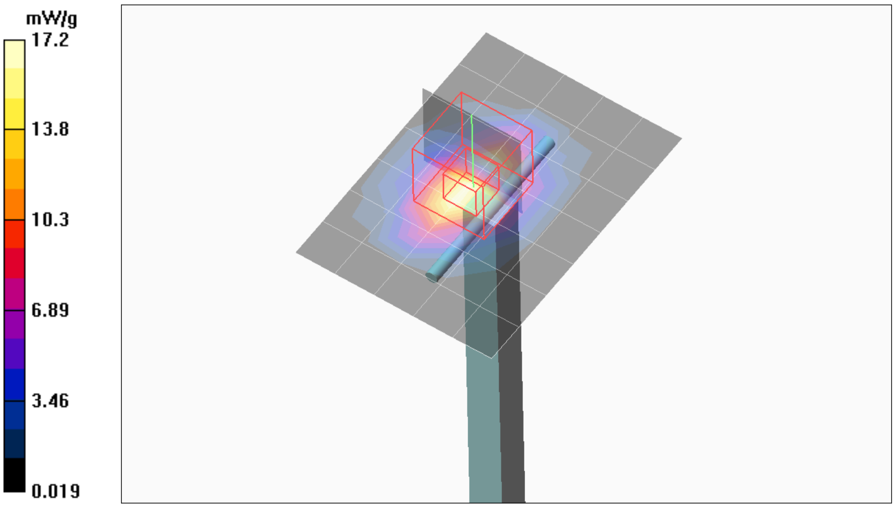
GPI Korea_System Verification_2450MSL/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 89.1 V/m; Power Drift = 0.160 dB

Peak SAR (extrapolated) = 25.5 W/kg

SAR(1 g) = 11.8 mW/g; SAR(10 g) = 5.31 mW/g

Maximum value of SAR (measured) = 18.5 mW/g



6. RF exposure limits

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.

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.

	Uncontrolled environment general population (W/kg) or (㎽/g)	**Controlled environment occupational (W/kg) or (㎽/g)**
Spatial peak SAR head	1.60	8.00
Spatial average SAR whole body	0.08	0.40
Spatial peak SAR hands, feet, ankles, wrists	4.00	20.00

Figure 12. RF exposure limits

7. Test results summary

7.1. RF conducted power

7.1.1. Power measurement procedures

According KDB 447498 D01 General RF Exposure Guidance v06 Section 4.1 b) states that “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 ERP applies to MPE. When an antenna port is not correct one available on the device to support conducted power measurement, such as FRS and certain Part 15 transmitters with built-in integral antennas, the maximum output power allowed for production units should be used to determine RF exposure test exclusion and compliance.”

7.1.2. RF conducted power

Frequency (㎒)	Channel	Measured Average power (㏈m)		
		802.11b (5.5 Mbps)	802.11g (18 Mbps)	802.11n (MCS3)
2 412	1	15.81	14.90	15.09
2 437	6	15.20	14.31	14.32
2 462	11	14.42	14.03	13.69

Mode	Frequency (㎒)	Channel	Measured Average power (㏈m)
LE	2402	0	-7.17
LE	2442	20	-6.84
LE	2480	39	-7.02

7.1.3. Target power and Tune-up limits

Mode	Frequency (㎒)	Channel	Tune-up Power(㏈m)	Tune-up limits(㏈m)
802.11b	2412	1	15.0	16.0
	2437	6	14.5	15.5
	2462	11	13.5	14.5
802.11g	2412	1	14.0	15.0
	2437	6	14.0	15.0
	2462	11	14.0	15.0
802.11n	2412	1	14.5	15.5
	2437	6	13.5	14.5
	2462	11	13.0	14.0

Mode	Frequency (㎒)	Channel	Tune-up Power(㏈m)	Tune-up limits(㏈m)
LE	2402	0	-7.50	-6.50
	2442	20	-7.50	-6.50
	2480	39	-7.50	-6.50

Note:
Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02:

1. Power measurements were performed for the transmission mode configuration with the highest maximum output power specified for production units.
2. For transmission modes with the same maximum output power specification, powers were measured for the largest channel bandwidth, lowest order modulation and lowest data rate.
3. For transmission modes with identical maximum specified output power, channel bandwidth, modulation and data rates, power measurements were required for all identical configurations.
4. For each transmission mode configuration, powers were measured for the highest and lowest channels; and at the mid-band channel(s) when there were at least 3 channels supported. For configurations with multiple mid-band channels, due to an even number of channels, both channels were measured.
5. Tune up tolerance is ±1.0 ㏈.

7.2. SAR results

7.2.1. SAR measurement results

Plot No.	EUT position	Frequency (㎒) / Ch.	Mod.	Distance (mm)	Power(㏈m)		Tune-up Scaling Factor	SAR_{1g}(W/kg)	
					Measured power	Tune up limit		Measured SAR	Scaled SAR
1	Bottom	2412 / 1	DSSS	5	15.81	16.0	1.04	0	0
2	Right	2412 / 1	DSSS	5	15.81	16.0	1.04	0.00866	0.009
3	Front	2412 / 1	DSSS	5	15.81	16.0	1.04	0.0025	0.003
4	Rear	2412 / 1	DSSS	5	15.81	16.0	1.04	0.001	0.001
5	Rear (Belt clip)	2412 / 1	DSSS	0	15.81	16.0	1.04	0.00176	0.002
6	Right	2412 / 1	DSSS	0	15.81	16.0	1.04	0.156	0.163
7	Right (Belt clip)	2412 / 1	DSSS	0	15.81	16.0	1.04	0.157	0.164

Note:

1. The test data reported are worst case SAR values according to test procedure specified in IEEE 1528-2003,FCC KDB publication 865664 D01v01r04 and 447498 D01v06.
2. All mode of operation were investigated and worst case results are reported.
3. Battery is fully charged at the beginning of the SAR measurements
4. Liquid tissue depth was at least 15 cm for all frequencies.
5. The manufacturer has confirmed that device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.
6. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB publication 447498 D01v06.

8. Measurement equipment

Equipment	Manufacturer	Model	Serial No.	Calibration interval	Calibration due.
Stäubli Robot Unit	Stäubli	TX60L	F15/5Y7QA1/A/01	N/A	N/A
Data Acquisition Electronics	SPEAG	DAE4	1344	1year	2017.11.22
E-Field Probe	SPEAG	EX3DV4	7359	1year	2017.05.31
Electro Optical Converter	SPEAG	EOC60	1096	N/A	N/A
2mm Oval Phantom V6.0	SPEAG	QD OVA 003 A	1190	N/A	N/A
Dipole Antenna	SPEAG	D2450V2	896	2years	2018.05.24
S-Parameter Network Analyzer	Agilent	8753ES	MY40000210	1year	2017.07.04
Calibration Kit	Agilent	85033D	3423A02429	N/A	N/A
EPM Series Power Meter	HP	E4419B	GB37290599	1year	2017.07.04
E-Series AVG Power Sensor	HP	E9300H	MY41495967	1year	2017.07.04
E-Series AVG Power Sensor	HP	E9300H	US39215405	1year	2017.07.04
Power Meter	Anritsu	ML2495A	1438001	1year	2017.01.25
Pulse Power Sensor	Anritsu	MA2411B	1339205	1year	2017.01.25
BROADBAND HIGH POWER AMPLIFIER	EMPOWER	1138	1030	1year	2017.07.04
Dual Directional Coupler	HP	11692D	1212A03523	1year	2017.07.04
Vector Signal Generator	R&S	SMBV100A	SMBV100A	1year	2017.07.04
Signal Analyzer	R&S	FSV30	101389	1year	2017.01.25
Attenuator	HP	8494B	2630A12857	1year	2017.01.21
Hygro-Thermometer	BODYCOM	BJ5478	N/A	1year	2017.07.05
Dielectric Probe Kit	Agilent	85070E	MY44300696	N/A	N/A

Appendix list

Appendix A. DASY4 report

Appendix B. Calibration certificate