# FCC SAR Test Report

| | | |
|---|---|---|
| **APPLICANT** | : | **Buffalo Inc.** |
| **EQUIPMENT** | : | **AirStation** |
| **BRAND NAME** | : | **Buffalo Inc.** |
| **MODEL NAME** | : | **WMR-433** |
| **FCC ID** | : | **FDI000000024** |
| **STANDARD** | : | **FCC 47 CFR Part 2 (2.1093)**<br>**ANSI/IEEE C95.1-1992**<br>**IEEE 1528-2003** |

**We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures and shown the compliance with the applicable technical standards.**

**The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.**

**Reviewed by: Eric Huang / Deputy Manager**

Testing Laboratory
1190

**Approved by: Jones Tsai / Manager**

***SPORTON INTERNATIONAL INC.***
***No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.***

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# Revision History

| REPORT NO. | VERSION | DESCRIPTION | ISSUED DATE |
|---|---|---|---|
| FA422815 | Rev. 01 | Initial issue of report | Apr. 03, 2014 |
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# 1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **Buffalo Inc., AirStation, WMR-433**, are as follows.

| Equipment Class | Frequency Band | Operating Mode | Highest SAR Summary |
|---|---|---|---|
| | | | Body 1g SAR (W/kg) |
| DTS | WLAN 2.4GHz Band | Data | 0.17 |
| | WLAN 5.8GHz Band | Data | **0.48** |
| NII | WLAN 5.2GHz Band | Data | **0.53** |
| Date of Testing: | | 03/20/2014 ~ 03/20/2014 | |

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 1528-2003.

# 2. Administration Data

| Testing Laboratory | |
|---|---|
| **Test Site** | SPORTON INTERNATIONAL INC. |
| **Test Site Location** | No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park,<br>Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.<br>TEL: +886-3-327-3456<br>FAX: +886-3-328-4978 |

| Applicant | |
|---|---|
| **Company Name** | Buffalo Inc. |
| **Address** | Akamon-dori Bldg, 30-20, Ohsu 3-chome, Naka-ku, Nagoya 460-8315, Japan |

| Manufacturer | |
|---|---|
| **Company Name** | Buffalo Inc. |
| **Address** | Akamon-dori Bldg, 30-20, Ohsu 3-chome, Naka-ku, Nagoya 460-8315, Japan |

# 3. Guidance Standard

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

- FCC 47 CFR Part 2 (2.1093)
- ANSI/IEEE C95.1-1992
- IEEE 1528-2003
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r03
- FCC KDB 865664 D02 SAR Reporting v01r01
- FCC KDB 447498 D01 General RF Exposure Guidance v05r02
- FCC KDB 248227 D01 SAR meas for 802 11abg v01r02
- FCC KDB 644545 D01 Guidance for IEEE 802 11ac v01r02

# 4. Equipment Under Test (EUT)

## 4.1 General Information

| Product Feature & Specification | |
|---|---|
| **Equipment Name** | AirStation |
| **Brand Name** | Buffalo Inc. |
| **Model Name** | WMR-433 |
| **FCC ID** | FDI000000024 |
| **Wireless Technology and Frequency Range** | WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz<br>WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz<br>WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz |
| **Mode** | • 802.11a/b/g/n/ac HT20/HT40/VHT20/VHT40/VHT80 |
| **HW Version** | V00 |
| **SW Version** | V1.00 |
| **EUT Stage** | Production Unit |

**Remark:**
1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

## 4.2 Maximum Tune-up Limit

| Band / Frequency (MHz) | IEEE 802.11 Average Power (dBm) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 11b | 11g | 11a | HT20 | HT40 | VHT20 | VHT40 | VHT80 |
| 2.4GHz Band | 18.5 | 16.5 | | 16.5 | 16.5 | | | |
| 5.2GHz Band | | | 14.5 | | | | | |
| 5.8GHz Band | | | 14.5 | | | | | |

# 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. The 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.

**Limits for Occupational/Controlled Exposure (W/kg)**

| Whole-Body | Partial-Body | Hands, Wrists, Feet and Ankles |
|---|---|---|
| 0.4 | 8.0 | 20.0 |

**Limits for General Population/Uncontrolled Exposure (W/kg)**

| Whole-Body | Partial-Body | Hands, Wrists, Feet and Ankles |
|---|---|---|
| 0.08 | 1.6 | 4.0 |

1. Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

# 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:

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

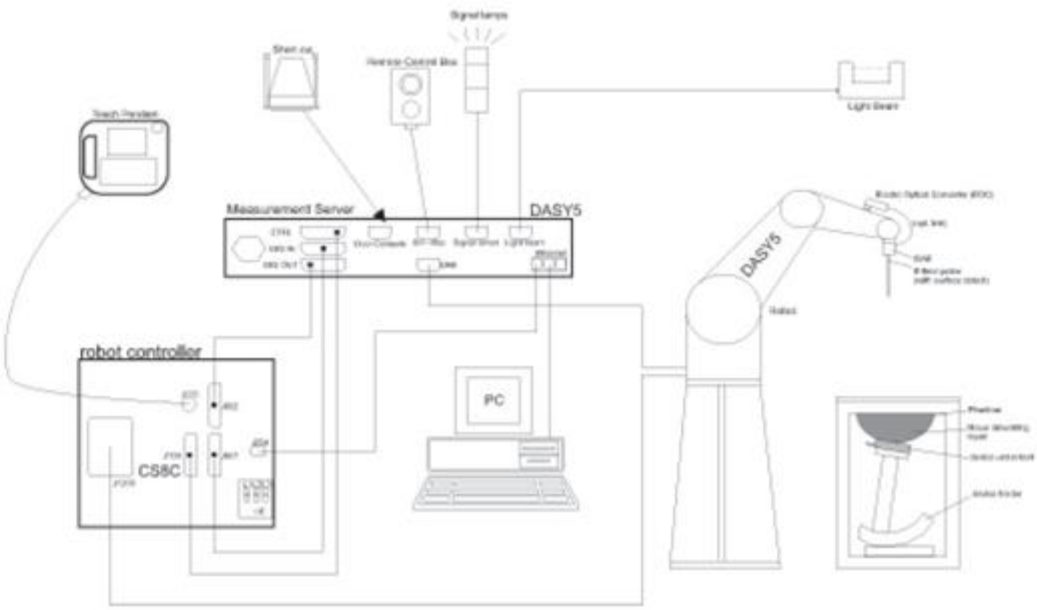
SAR is expressed in units of Watts per kilogram (W/kg)

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

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

# 7. System Description and Setup

**The DASY system used for performing compliance tests consists of the following items:**




- A standard high precision 6-axis robot 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 or Win7 and the DASY5 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.

# 8. Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

(a) For WWAN power measurement, use base station simulator to configure EUT WWAN transmission in conducted connection with RF cable, at maximum power in each supported wireless interface and frequency band.
(b) Read the WWAN RF power level from the base station simulator.
(c) For WLAN/BT power measurement, use engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power in each supported wireless interface and frequency band
(d) Connect EUT RF port through RF cable to the power meter, and measure WLAN/BT output power

<SAR measurement>

(a) Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power, in the highest power channel.
(b) Place the EUT in the positions as Appendix D demonstrates.
(c) Set scan area, grid size and other setting on the DASY software.
(d) Measure SAR results for the highest power channel on each testing position.
(e) Find out the largest SAR result on these testing positions of each band
(f) 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

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

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

## 8.1 Spatial Peak SAR Evaluation

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

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

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

(a) Extraction of the measured data (grid and values) from the Zoom Scan
(b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
(c) Generation of a high-resolution mesh within the measured volume
(d) Interpolation of all measured values form the measurement grid to the high-resolution grid
(e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
(f) Calculation of the averaged SAR within masses of 1g and 10g

## 8.2 Power Reference Measurement

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

## 8.3 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 fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum found in the scanned area, within a range of the global maximum. The range (in dB0 is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan), if only one zoom scan follows the area scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of zoom scans has to be increased accordingly.

Area scan parameters extracted from FCC KDB 865664 D01v01r03 SAR measurement 100 MHz to 6 GHz v01r01.

| | ≤ 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: $\Delta x_{Area}$, $\Delta y_{Area}$ | ≤ 2 GHz: ≤ 15 mm<br>2 – 3 GHz: ≤ 12 mm | 3 – 4 GHz: ≤ 12 mm<br>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. | |

## 8.4 Zoom Scan

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

Zoom scan parameters extracted from FCC KDB 865664 D01v01r03 SAR measurement 100 MHz to 6 GHz v01r01.

| | | | ≤ 3 GHz | > 3 GHz |
|---|---|---|---|---|
| Maximum zoom scan spatial resolution: $\Delta x_{Zoom}$, $\Delta y_{Zoom}$ | | | ≤ 2 GHz: ≤ 8 mm<br>2 – 3 GHz: ≤ 5 mm* | 3 – 4 GHz: ≤ 5 mm*<br>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<br>4 – 5 GHz: ≤ 3 mm<br>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<br>4 – 5 GHz: ≤ 2.5 mm<br>5 – 6 GHz: ≤ 2 mm |
| | | $\Delta z_{Zoom}(n>1)$: between subsequent points | $\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$ | |
| Minimum zoom scan volume | x, y, z | | ≥ 30 mm | 3 – 4 GHz: ≥ 28 mm<br>4 – 5 GHz: ≥ 25 mm<br>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.<br>* 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. | | | | |

## 8.5 Volume Scan Procedures

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

## 8.6 Power Drift Monitoring

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

# 9. Test Equipment List

| Manufacturer | Name of Equipment | Type/Model | Serial Number | Calibration | |
|---|---|---|---|---|---|
| | | | | Last Cal. | Due Date |
| SPEAG | 2450MHz System Validation Kit | D2450V2 | 924 | Nov. 13, 2013 | Nov. 12, 2014 |
| SPEAG | 5GHz System Validation Kit | D5GHzV2 | 1128 | Jul. 24, 2013 | Jul. 23, 2014 |
| SPEAG | Data Acquisition Electronics | DAE4 | 1279 | Jan. 30, 2014 | Jan. 29, 2015 |
| SPEAG | Dosimetric E-Field Probe | EX3DV4 | 3954 | Nov. 04, 2013 | Nov. 03, 2014 |
| Wisewind | Thermometer | HTC-1 | TM281 | Oct. 22, 2013 | Oct. 21, 2014 |
| SPEAG | Device Holder | N/A | N/A | NCR | NCR |
| R&S | Signal Generator | SMF 100A | 101107 | May. 27, 2013 | May. 26, 2014 |
| SPEAG | Dielectric Probe Kit | DAK-3.5 | 1126 | Jul. 23, 2013 | Jul. 22, 2014 |
| Agilent | ENA Network Analyzer | E5071C | MY46316648 | Feb. 07, 2014 | Feb. 06, 2015 |
| Anritsu | Power Meter | ML2495A | 1349001 | Dec. 04, 2013 | Dec. 03, 2014 |
| Anritsu | Power Sensor | MA2411B | 1306099 | Dec. 03, 2013 | Dec. 02, 2014 |
| Agilent | Dual Directional Coupler | 778D | 50422 | Note 2 | |
| Woken | Attenuator 1 | WK0602-XX | N/A | Note 2 | |
| PE | Attenuator 2 | PE7005-10 | N/A | Note 2 | |
| PE | Attenuator 3 | PE7005- 3 | N/A | Note 2 | |
| AR | Power Amplifier | 5S1G4M2 | 0328767 | Note 3 | |
| Mini-Circuits | Power Amplifier | ZVE-3W | 162601250 | Note 3 | |
| Mini-Circuits | Power Amplifier | ZHL-42W+ | 13440021344 | Note 3 | |
| R&S | Spectrum Analyzer | FSP 7 | 101131 | Jul. 09, 2013 | Jul. 08, 2014 |

**General Note:**

1. The calibration certificate of DASY can be referred to appendix C of this report.
2. The Insertion Loss calibration of Dual Directional Coupler and Attenuator were characterized via the network analyzer and compensated during system check.
3. In system check we need to monitor the level on the power meter, and adjust the power amplifier level to have precise power level to the dipole; the measured SAR will be normalized to 1W input power according to the ratio of 1W to the input power to the dipole. For system check, the calibration of the power amplifier is deemed not critically required for correct measurement; the power meter is critical and we do have calibration for it
4. Attenuator 1 insertion loss is calibrated by the network Analyzer, which the calibration is valid, before system check.

# 10. System Verification

## 10.1 Tissue Verification

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

| Frequency (MHz) | Water (%) | Sugar (%) | Cellulose (%) | Salt (%) | Preventol (%) | DGBE (%) | Conductivity (σ) | Permittivity (εr) |
|---|---|---|---|---|---|---|---|---|
| For Head | | | | | | | | |
| 750 | 41.1 | 57.0 | 0.2 | 1.4 | 0.2 | 0 | 0.89 | 41.9 |
| 835 | 40.3 | 57.9 | 0.2 | 1.4 | 0.2 | 0 | 0.90 | 41.5 |
| 900 | 40.3 | 57.9 | 0.2 | 1.4 | 0.2 | 0 | 0.97 | 41.5 |
| 1800, 1900, 2000 | 55.2 | 0 | 0 | 0.3 | 0 | 44.5 | 1.40 | 40.0 |
| 2450 | 55.0 | 0 | 0 | 0 | 0 | 45.0 | 1.80 | 39.2 |
| 2600 | 54.8 | 0 | 0 | 0.1 | 0 | 45.1 | 1.96 | 39.0 |
| For Body | | | | | | | | |
| 750 | 51.7 | 47.2 | 0 | 0.9 | 0.1 | 0 | 0.96 | 55.5 |
| 835 | 50.8 | 48.2 | 0 | 0.9 | 0.1 | 0 | 0.97 | 55.2 |
| 900 | 50.8 | 48.2 | 0 | 0.9 | 0.1 | 0 | 1.05 | 55.0 |
| 1800, 1900, 2000 | 70.2 | 0 | 0 | 0.4 | 0 | 29.4 | 1.52 | 53.3 |
| 2450 | 68.6 | 0 | 0 | 0 | 0 | 31.4 | 1.95 | 52.7 |
| 2600 | 68.1 | 0 | 0 | 0.1 | 0 | 31.8 | 2.16 | 52.5 |

Simulating Liquid for 5GHz, Manufactured by SPEAG

| Ingredients | (% by weight) |
|---|---|
| Water | 64~78% |
| Mineral oil | 11~18% |
| Emulsifiers | 9~15% |
| Additives and Salt | 2~3% |

**<Tissue Dielectric Parameter Check Results>**

| Frequency (MHz) | Tissue Type | Liquid Temp. (℃) | Conductivity (σ) | Permittivity ($\varepsilon_r$) | Conductivity Target (σ) | Permittivity Target ($\varepsilon_r$) | Delta (σ) (%) | Delta ($\varepsilon_r$) (%) | Limit (%) | Date |
|---|---|---|---|---|---|---|---|---|---|---|
| 2450 | Body | 22.5 | 2.015 | 53.957 | 1.95 | 52.70 | 3.33 | 2.39 | ±5 | 2014/3/21 |
| 5200 | Body | 22.6 | 5.284 | 47.499 | 5.30 | 49.00 | -0.30 | -3.06 | ±5 | 2014/3/20 |
| 5800 | Body | 22.6 | 6.179 | 46.434 | 6.00 | 48.20 | 2.98 | -3.66 | ±5 | 2014/3/20 |

**Table 8.2.1 Measuring Results for Simulating Liquid**

## 10.2 System Performance Check Results

Comparing to the original SAR value provided by SPEAG, the verification data should be within its specification of 10 %. Table 8.3.1 shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion and the plots can be referred to Appendix A of this report.

| Date | Frequency (MHz) | Tissue Type | Input Power (mW) | Dipole S/N | Probe S/N | DAE S/N | Measured SAR (W/kg) | Targeted SAR (W/kg) | Normalized SAR (W/kg) | Deviation (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| 2014/3/21 | 2450 | Body | 250 | D2450V2-924 | 3954 | 1279 | 12.40 | 50.20 | 49.6 | -1.20 |
| 2014/3/20 | 5200 | Body | 100 | D5GHzV2-1128 | 3954 | 1279 | 7.47 | 73.40 | 74.7 | 1.77 |
| 2014/3/20 | 5800 | Body | 100 | D5GHzV2-1128 | 3954 | 1279 | 7.43 | 72.20 | 74.3 | 2.91 |

**Table 8.3.1 Target and Measurement SAR after Normalized**

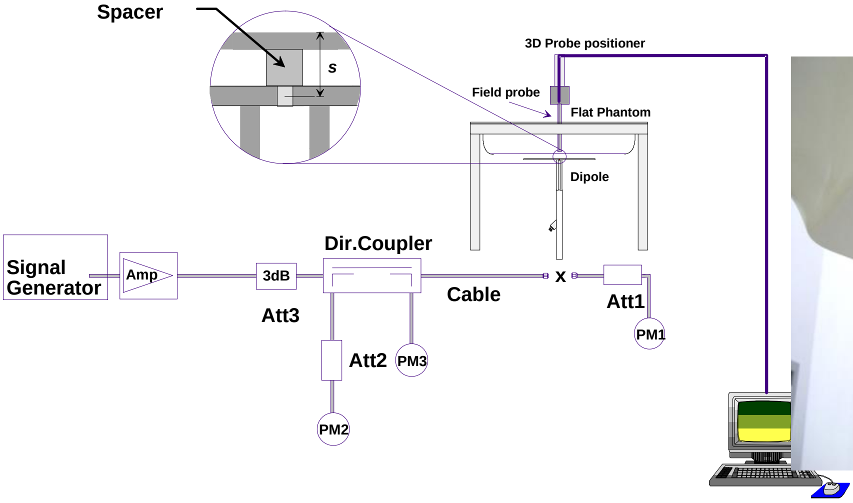



**Fig 8.3.1 System Performance Check Setup** **Fig 8.3.2 Setup Photo**

# 11. Conducted RF Output Power (Unit: dBm)

## <WLAN Conducted Power>

**General Note:**

1. Per April 2013 TCB Workshop notes, full SAR tests for SISO IEEE 802.11ac configurations were not required because the average output power was not more than 0.25 dB higher than IEEE 802.11a mode. IEEE 802.11ac was evaluated for the highest IEEE 802.11a position in each 5 GHz band and exposure condition.
2. For 2.4GHz WLAN SAR testing, highest average RF output power channel for the lowest data rate for 802.11b were selected for SAR evaluation. 802.11g/n HT20/HT40 were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of 802.11b mode.
3. For 5 GHz WLAN SAR testing, highest average RF output power channel for the lowest data rate for 802.11a 6Mbps were selected for SAR evaluation. 802.11n HT20/HT40 modes were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of 802.11a mode.

## <2.4GHz WLAN>

| WLAN 2.4GHz 802.11b Average Power (dBm) | | | | | |
|---|---|---|---|---|---|
| Power vs. Channel | | | Power vs. Data Rate | | |
| Channel | Frequency (MHz) | Data Rate 1Mbps | 2Mbps | 5.5Mbps | 11Mbps |
| CH 1 | 2412 | 17.95 | 17.96 | 17.95 | 17.93 |
| CH 6 | 2437 | 18.04 | | | |
| CH 11 | 2462 | 18.13 | | | |

| WLAN 2.4GHz 802.11g Average Power (dBm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Power vs. Channel | | | Power vs. Data Rate | | | | | | |
| Channel | Frequency (MHz) | Data Rate 6Mbps | 9Mbps | 12Mbps | 18Mbps | 24Mbps | 36Mbps | 48Mbps | 54Mbps |
| CH 1 | 2412 | 16.04 | 16.11 | 16.04 | 16.02 | 15.97 | 15.95 | 15.96 | 15.93 |
| CH 6 | 2437 | 16.17 | | | | | | | |
| CH 11 | 2462 | 16.22 | | | | | | | |

| WLAN 2.4GHz 802.11n-HT20 Average Power (dBm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Power vs. Channel | | | Power vs. MCS Index | | | | | | |
| Channel | Frequency (MHz) | MCS Index MCS0 | MCS1 | MCS2 | MCS3 | MCS4 | MCS5 | MCS6 | MCS7 |
| CH 1 | 2412 | 16.13 | 16.18 | 16.13 | 16.15 | 16.02 | 16.04 | 16.02 | 16.01 |
| CH 6 | 2437 | 16.21 | | | | | | | |
| CH 11 | 2462 | 16.19 | | | | | | | |

| WLAN 2.4GHz 802.11n-HT40 Average Power (dBm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Power vs. Channel | | | Power vs. MCS Index | | | | | | |
| Channel | Frequency (MHz) | MCS Index MCS0 | MCS1 | MCS2 | MCS3 | MCS4 | MCS5 | MCS6 | MCS7 |
| CH 3 | 2422 | 16.05 | 16.09 | 16.06 | 16.05 | 16.02 | 16.01 | 16.03 | 15.99 |
| CH 6 | 2437 | 16.12 | | | | | | | |
| CH 9 | 2452 | 16.04 | | | | | | | |

<5GHz WLAN>

| WLAN 5GHz 802.11a Average Power (dBm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Power vs. Channel | | | Power vs. Data Rate | | | | | | |
| Channel | Frequency (MHz) | Data Rate 6Mbps | 9Mbps | 12Mbps | 18Mbps | 24Mbps | 36Mbps | 48Mbps | 54Mbps |
| CH 36 | 5180 | 14.18 | 14.29 | 14.26 | 14.28 | 14.26 | 14.24 | 14.25 | 14.27 |
| CH 40 | 5200 | 14.27 | | | | | | | |
| CH 44 | 5220 | 14.21 | | | | | | | |
| CH 48 | 5240 | 14.31 | | | | | | | |
| CH 149 | 5745 | 14.37 | 14.38 | 14.36 | 14.35 | 14.39 | 14.37 | 14.40 | 14.38 |
| CH 153 | 5765 | 14.34 | | | | | | | |
| CH 157 | 5785 | 14.41 | | | | | | | |
| CH 161 | 5805 | 14.36 | | | | | | | |
| CH 165 | 5825 | 14.28 | | | | | | | |

| WLAN 5GHz 802.11n-HT20 Average Power (dBm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Power vs. Channel | | | Power vs. MCS Index | | | | | | |
| Channel | Frequency (MHz) | MCS Index MCS0 | MCS1 | MCS2 | MCS3 | MCS4 | MCS5 | MCS6 | MCS7 |
| CH 36 | 5180 | 14.11 | 14.26 | 14.24 | 14.20 | 14.21 | 14.18 | 14.19 | 14.21 |
| CH 40 | 5200 | 14.26 | | | | | | | |
| CH 44 | 5220 | 14.21 | | | | | | | |
| CH 48 | 5240 | 14.28 | | | | | | | |
| CH 149 | 5745 | 14.31 | 14.34 | 14.33 | 14.31 | 14.28 | 14.30 | 14.32 | 14.33 |
| CH 153 | 5765 | 14.29 | | | | | | | |
| CH 157 | 5785 | 14.36 | | | | | | | |
| CH 161 | 5805 | 14.25 | | | | | | | |
| CH 165 | 5825 | 14.12 | | | | | | | |

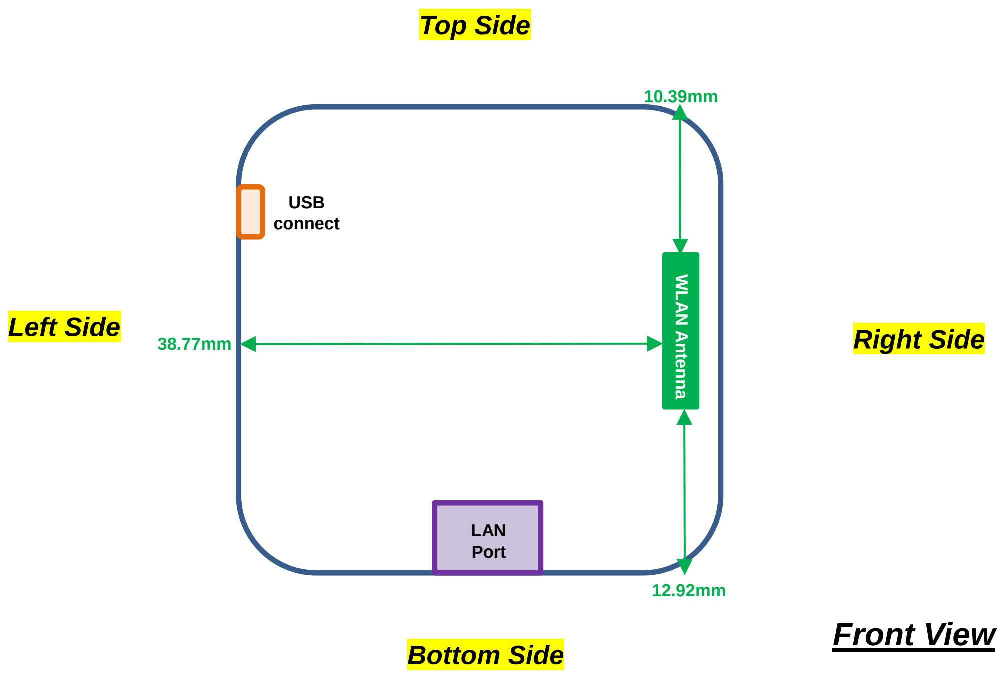
| WLAN 5GHz 802.11n-HT40 Average Power (dBm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Power vs. Channel | | | Power vs. MCS Index | | | | | | |
| Channel | Frequency (MHz) | MCS Index MCS0 | MCS1 | MCS2 | MCS3 | MCS4 | MCS5 | MCS6 | MCS7 |
| CH 38 | 5190 | 14.15 | 14.13 | 14.14 | 14.12 | 14.11 | 14.13 | 14.10 | 14.11 |
| CH 46 | 5230 | 14.12 | | | | | | | |
| CH 151 | 5755 | 14.29 | 14.34 | 14.33 | 14.35 | 14.33 | 14.31 | 14.32 | 14.34 |
| CH 159 | 5795 | 14.36 | | | | | | | |

| WLAN 5GHz 802.11ac-VHT20 Average Power (dBm) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Power vs. Channel | | | Power vs. MCS Index | | | | | | | | |
| Channel | Frequency (MHz) | MCS Index MCS0 | MCS1 | MCS2 | MCS3 | MCS4 | MCS5 | MCS6 | MCS7 | MCS8 | MCS9 |
| CH 36 | 5180 | 14.15 | 14.32 | 14.31 | 14.32 | 14.29 | 14.30 | 14.28 | 14.31 | 14.30 | 14.27 |
| CH 40 | 5200 | 14.32 | | | | | | | | | |
| CH 44 | 5220 | 14.27 | | | | | | | | | |
| CH 48 | 5240 | 14.33 | | | | | | | | | |
| CH 149 | 5745 | 14.35 | 14.38 | 14.36 | 14.34 | 14.37 | 14.35 | 14.33 | 14.36 | 14.32 | 14.33 |
| CH 153 | 5765 | 14.32 | | | | | | | | | |
| CH 157 | 5785 | 14.42 | | | | | | | | | |
| CH 161 | 5805 | 14.33 | | | | | | | | | |
| CH 165 | 5825 | 14.21 | | | | | | | | | |

| WLAN 5GHz 802.11ac-VHT40 Average Power (dBm) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Power vs. Channel | | | Power vs. MCS Index | | | | | | | | |
| Channel | Frequency (MHz) | MCS Index MCS0 | MCS1 | MCS2 | MCS3 | MCS4 | MCS5 | MCS6 | MCS7 | MCS8 | MCS9 |
| CH 38 | 5190 | 14.19 | 14.16 | 14.15 | 14.13 | 14.10 | 14.12 | 14.14 | 14.12 | 14.11 | 14.08 |
| CH 46 | 5230 | 14.16 | | | | | | | | | |
| CH 151 | 5755 | 14.36 | 14.38 | 14.36 | 14.37 | 14.36 | 14.34 | 14.35 | 14.34 | 14.33 | 14.35 |
| CH 159 | 5795 | 14.42 | | | | | | | | | |

| WLAN 5GHz 802.11ac-VHT80 Average Power (dBm) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Power vs. Channel | | | Power vs. MCS Index | | | | | | | | |
| Channel | Frequency (MHz) | MCS Index MCS0 | MCS1 | MCS2 | MCS3 | MCS4 | MCS5 | MCS6 | MCS7 | MCS8 | MCS9 |
| CH 42 | 5210 | 14.26 | 14.24 | 14.23 | 14.20 | 14.22 | 14.19 | 14.17 | 14.20 | 14.21 | 14.17 |
| CH 155 | 5775 | 14.02 | 13.98 | 13.97 | 14.00 | 13.95 | 13.93 | 14.01 | 13.99 | 13.95 | 13.97 |

## 12. Antenna Location




***Front View***

# 13. SAR Test Results

**General Note:**

1. Per KDB 447498 D01v05r02, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
   b. For WLAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
2. Per KDB 447498 D01v05r02, section5.2.3(3), When a peripheral transmitter, such as a USB dongle, must be connected to the host through an external cable or adapter, a test separation distance ≤ 15 mm should be applied to test the required device orientations when it can be demonstrated that smaller separation distances are not applicable for normal operations. The same consideration also applies when a cable, adapter or accessory antenna is available for a peripheral transmitter to offer alternative connection and use conditions.
3. When the WLAN transmission was verified using a spectrum analyzer.

## 13.1 Body SAR

**<DTS WLAN SAR>**

| Plot No. | Band | Mode | Test Position | Gap (cm) | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Tune-up Scaling Factor | Power Drift (dB) | Measured 1g SAR (W/kg) | Reported 1g SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | WLAN 2.4GHz | 802.11b 1Mbps | Front | 1.5cm | 11 | 2462 | 18.13 | 18.5 | 1.089 | -0.07 | 0.105 | 0.114 |
| | WLAN 2.4GHz | 802.11b 1Mbps | Back | 1.5cm | 11 | 2462 | 18.13 | 18.5 | 1.089 | 0.01 | 0.143 | 0.156 |
| | WLAN 2.4GHz | 802.11b 1Mbps | Back | 1.5cm | 1 | 2412 | 17.95 | 18.5 | 1.135 | -0.07 | 0.112 | 0.127 |
| 01 | WLAN 2.4GHz | 802.11b 1Mbps | Back | 1.5cm | 6 | 2437 | 18.04 | 18.5 | 1.112 | 0 | 0.149 | 0.166 |
| | WLAN 2.4GHz | 802.11b 1Mbps | Right Side | 1.5cm | 11 | 2462 | 18.13 | 18.5 | 1.089 | -0.02 | 0.094 | 0.102 |
| | WLAN 2.4GHz | 802.11b 1Mbps | Top Side | 1.5cm | 11 | 2462 | 18.13 | 18.5 | 1.089 | -0.02 | 0.037 | 0.040 |
| | WLAN 2.4GHz | 802.11b 1Mbps | Bottom Side | 1.5cm | 11 | 2462 | 18.13 | 18.5 | 1.089 | -0.03 | 0.116 | 0.126 |
| | WLAN 5GHz | 802.11a 6Mbps | Front | 1.5cm | 157 | 5785 | 14.41 | 14.5 | 1.021 | 0.09 | 0.090 | 0.092 |
| | WLAN 5GHz | 802.11a 6Mbps | Back | 1.5cm | 157 | 5785 | 14.41 | 14.5 | 1.021 | -0.19 | 0.349 | 0.356 |
| | WLAN 5GHz | 802.11a 6Mbps | Right Side | 1.5cm | 157 | 5785 | 14.41 | 14.5 | 1.021 | -0.16 | 0.364 | 0.372 |
| | WLAN 5GHz | 802.11a 6Mbps | Right Side | 1.5cm | 149 | 5745 | 14.31 | 14.5 | 1.045 | -0.19 | 0.361 | 0.377 |
| 02 | WLAN 5GHz | 802.11a 6Mbps | Right Side | 1.5cm | 161 | 5805 | 14.25 | 14.5 | 1.059 | -0.18 | 0.453 | 0.480 |
| | WLAN 5GHz | 802.11ac-HT80 MCS0 | Right Side | 1.5cm | 155 | 5775 | 14.02 | 14.5 | 1.117 | -0.18 | 0.412 | 0.460 |
| | WLAN 5GHz | 802.11a 6Mbps | Top Side | 1.5cm | 157 | 5785 | 14.41 | 14.5 | 1.021 | 0.12 | 0.072 | 0.074 |
| | WLAN 5GHz | 802.11a 6Mbps | Bottom Side | 1.5cm | 157 | 5785 | 14.41 | 14.5 | 1.021 | 0.08 | 0.060 | 0.061 |

**<NII WLAN SAR>**

| Plot No. | Band | Mode | Test Position | Gap (cm) | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Tune-up Scaling Factor | Power Drift (dB) | Measured 1g SAR (W/kg) | Reported 1g SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | WLAN 5GHz | 802.11a 6Mbps | Front | 1.5cm | 48 | 5240 | 14.31 | 14.5 | 1.045 | -0.08 | 0.101 | 0.106 |
| | WLAN 5GHz | 802.11a 6Mbps | Back | 1.5cm | 48 | 5240 | 14.31 | 14.5 | 1.045 | 0.02 | 0.476 | 0.497 |
| 03 | WLAN 5GHz | 802.11ac-HT80 MCS0 | Back | 1.5cm | 42 | 5210 | 14.26 | 14.5 | 1.057 | 0.05 | 0.505 | 0.534 |
| | WLAN 5GHz | 802.11a 6Mbps | Back | 1.5cm | 40 | 5200 | 14.27 | 14.5 | 1.054 | 0.02 | 0.468 | 0.493 |
| | WLAN 5GHz | 802.11a 6Mbps | Right Side | 1.5cm | 48 | 5240 | 14.31 | 14.5 | 1.045 | -0.06 | 0.444 | 0.464 |
| | WLAN 5GHz | 802.11a 6Mbps | Top Side | 1.5cm | 48 | 5240 | 14.31 | 14.5 | 1.045 | 0.05 | 0.155 | 0.162 |
| | WLAN 5GHz | 802.11a 6Mbps | Bottom Side | 1.5cm | 48 | 5240 | 14.31 | 14.5 | 1.045 | 0.16 | 0.066 | 0.069 |

**Test Engineer：** Jack Wu, Mood Huang, and Iran Wang

# 14. Uncertainty Assessment

The component of uncertainly may generally be categorized according to the methods used to evaluate them. The evaluation of uncertainly by the statistical analysis of a series of observations is termed a Type An evaluation of uncertainty. The evaluation of uncertainty by means other than the statistical analysis of a series of observation is termed a Type B evaluation of uncertainty. Each component of uncertainty, however evaluated, is represented by an estimated standard deviation, termed standard uncertainty, which is determined by the positive square root of the estimated variance.

A Type A evaluation of standard uncertainty may be based on any valid statistical method for treating data. This includes calculating the standard deviation of the mean of a series of independent observations; using the method of least squares to fit a curve to the data in order to estimate the parameter of the curve and their standard deviations; or carrying out an analysis of variance in order to identify and quantify random effects in certain kinds of measurement.

A type B evaluation of standard uncertainty is typically based on scientific judgment using all of the relevant information available. These may include previous measurement data, experience, and knowledge of the behavior and properties of relevant materials and instruments, manufacture's specification, data provided in calibration reports and uncertainties assigned to reference data taken from handbooks. Broadly speaking, the uncertainty is either obtained from an outdoor source or obtained from an assumed distribution, such as the normal distribution, rectangular or triangular distributions indicated in Table 14.1

| Uncertainty Distributions | Normal | Rectangular | Triangular | U-Shape |
|---|---|---|---|---|
| Multi-plying Factor[(a)] | 1/k[(b)] | 1/√3 | 1/√6 | 1/√2 |

(a) standard uncertainty is determined as the product of the multiplying factor and the estimated range of variations in the measured quantity

(b) *κ* is the coverage factor

**Table 14.1. Standard Uncertainty for Assumed Distribution**

The combined standard uncertainty of the measurement result represents the estimated standard deviation of the result. It is obtained by combining the individual standard uncertainties of both Type A and Type B evaluation using the usual "root-sum-squares" (RSS) methods of combining standard deviations by taking the positive square root of the estimated variances.

Expanded uncertainty is a measure of uncertainty that defines an interval about the measurement result within which the measured value is confidently believed to lie. It is obtained by multiplying the combined standard uncertainty by a coverage factor. Typically, the coverage factor ranges from 2 to 3. Using a coverage factor allows the true value of a measured quantity to be specified with a defined probability within the specified uncertainty range. For purpose of this document, a coverage factor two is used, which corresponds to confidence interval of about 95 %. The DASY uncertainty Budget is shown in the following tables.

| Error Description | Uncertainty Value (±%) | Probability Distribution | Divisor | Ci (1g) | Ci (10g) | Standard Uncertainty (1g) | Standard Uncertainty (10g) |
|---|---|---|---|---|---|---|---|
| **Measurement System** | | | | | | | |
| Probe Calibration | 6.0 | Normal | 1 | 1 | 1 | ± 6.0 % | ± 6.0 % |
| Axial Isotropy | 4.7 | Rectangular | √3 | 0.7 | 0.7 | ± 1.9 % | ± 1.9 % |
| Hemispherical Isotropy | 9.6 | Rectangular | √3 | 0.7 | 0.7 | ± 3.9 % | ± 3.9 % |
| Boundary Effects | 1.0 | Rectangular | √3 | 1 | 1 | ± 0.6 % | ± 0.6 % |
| Linearity | 4.7 | Rectangular | √3 | 1 | 1 | ± 2.7 % | ± 2.7 % |
| System Detection Limits | 1.0 | Rectangular | √3 | 1 | 1 | ± 0.6 % | ± 0.6 % |
| Readout Electronics | 0.3 | Normal | 1 | 1 | 1 | ± 0.3 % | ± 0.3 % |
| Response Time | 0.8 | Rectangular | √3 | 1 | 1 | ± 0.5 % | ± 0.5 % |
| Integration Time | 2.6 | Rectangular | √3 | 1 | 1 | ± 1.5 % | ± 1.5 % |
| RF Ambient Noise | 3.0 | Rectangular | √3 | 1 | 1 | ± 1.7 % | ± 1.7 % |
| RF Ambient Reflections | 3.0 | Rectangular | √3 | 1 | 1 | ± 1.7 % | ± 1.7 % |
| Probe Positioner | 0.4 | Rectangular | √3 | 1 | 1 | ± 0.2 % | ± 0.2 % |
| Probe Positioning | 2.9 | Rectangular | √3 | 1 | 1 | ± 1.7 % | ± 1.7 % |
| Max. SAR Eval. | 1.0 | Rectangular | √3 | 1 | 1 | ± 0.6 % | ± 0.6 % |
| **Test Sample Related** | | | | | | | |
| Device Positioning | 2.9 | Normal | 1 | 1 | 1 | ± 2.9 % | ± 2.9 % |
| Device Holder | 3.6 | Normal | 1 | 1 | 1 | ± 3.6 % | ± 3.6 % |
| Power Drift | 5.0 | Rectangular | √3 | 1 | 1 | ± 2.9 % | ± 2.9 % |
| **Phantom and Setup** | | | | | | | |
| Phantom Uncertainty | 4.0 | Rectangular | √3 | 1 | 1 | ± 2.3 % | ± 2.3 % |
| Liquid Conductivity (Target) | 5.0 | Rectangular | √3 | 0.64 | 0.43 | ± 1.8 % | ± 1.2 % |
| Liquid Conductivity (Meas.) | 2.5 | Normal | 1 | 0.64 | 0.43 | ± 1.6 % | ± 1.1 % |
| Liquid Permittivity (Target) | 5.0 | Rectangular | √3 | 0.6 | 0.49 | ± 1.7 % | ± 1.4 % |
| Liquid Permittivity (Meas.) | 2.5 | Normal | 1 | 0.6 | 0.49 | ± 1.5 % | ± 1.2 % |
| **Combined Standard Uncertainty** | | | | | | ± 11.0 % | ± 10.8 % |
| **Coverage Factor for 95 %** | | | | | | K=2 | |
| **Expanded Uncertainty** | | | | | | **± 22.0 %** | **± 21.5 %** |

**Table 14.2. Uncertainty Budget for frequency range 300 MHz to 3 GHz**

| Error Description | Uncertainty Value (±%) | Probability Distribution | Divisor | Ci (1g) | Ci (10g) | Standard Uncertainty (1g) | Standard Uncertainty (10g) |
|---|---|---|---|---|---|---|---|
| **Measurement System** | | | | | | | |
| Probe Calibration | 6.55 | Normal | 1 | 1 | 1 | ± 6.55 % | ± 6.55 % |
| Axial Isotropy | 4.7 | Rectangular | √3 | 0.7 | 0.7 | ± 1.9 % | ± 1.9 % |
| Hemispherical Isotropy | 9.6 | Rectangular | √3 | 0.7 | 0.7 | ± 3.9 % | ± 3.9 % |
| Boundary Effects | 2.0 | Rectangular | √3 | 1 | 1 | ± 1.2 % | ± 1.2 % |
| Linearity | 4.7 | Rectangular | √3 | 1 | 1 | ± 2.7 % | ± 2.7 % |
| System Detection Limits | 1.0 | Rectangular | √3 | 1 | 1 | ± 0.6 % | ± 0.6 % |
| Readout Electronics | 0.3 | Normal | 1 | 1 | 1 | ± 0.3 % | ± 0.3 % |
| Response Time | 0.8 | Rectangular | √3 | 1 | 1 | ± 0.5 % | ± 0.5 % |
| Integration Time | 2.6 | Rectangular | √3 | 1 | 1 | ± 1.5 % | ± 1.5 % |
| RF Ambient Noise | 3.0 | Rectangular | √3 | 1 | 1 | ± 1.7 % | ± 1.7 % |
| RF Ambient Reflections | 3.0 | Rectangular | √3 | 1 | 1 | ± 1.7 % | ± 1.7 % |
| Probe Positioner | 0.8 | Rectangular | √3 | 1 | 1 | ± 0.5 % | ± 0.5 % |
| Probe Positioning | 9.9 | Rectangular | √3 | 1 | 1 | ± 5.7 % | ± 5.7 % |
| Max. SAR Eval. | 4.0 | Rectangular | √3 | 1 | 1 | ± 2.3 % | ± 2.3 % |
| **Test Sample Related** | | | | | | | |
| Device Positioning | 2.9 | Normal | 1 | 1 | 1 | ± 2.9 % | ± 2.9 % |
| Device Holder | 3.6 | Normal | 1 | 1 | 1 | ± 3.6 % | ± 3.6 % |
| Power Drift | 5.0 | Rectangular | √3 | 1 | 1 | ± 2.9 % | ± 2.9 % |
| **Phantom and Setup** | | | | | | | |
| Phantom Uncertainty | 4.0 | Rectangular | √3 | 1 | 1 | ± 2.3 % | ± 2.3 % |
| Liquid Conductivity (Target) | 5.0 | Rectangular | √3 | 0.64 | 0.43 | ± 1.8 % | ± 1.2 % |
| Liquid Conductivity (Meas.) | 2.5 | Normal | 1 | 0.64 | 0.43 | ± 1.6 % | ± 1.1 % |
| Liquid Permittivity (Target) | 5.0 | Rectangular | √3 | 0.6 | 0.49 | ± 1.7 % | ± 1.4 % |
| Liquid Permittivity (Meas.) | 2.5 | Normal | 1 | 0.6 | 0.49 | ± 1.5 % | ± 1.2 % |
| **Combined Standard Uncertainty** | | | | | | ± 12.8 % | ± 12.6 % |
| **Coverage Factor for 95 %** | | | | | | K=2 | |
| **Expanded Uncertainty** | | | | | | **± 25.6 %** | **± 25.2 %** |

**Table 14.3. Uncertainty Budget for frequency range 3 GHz to 6 GHz**

# 15. References

[1] FCC 47 CFR Part 2 “Frequency Allocations and Radio Treaty Matters; General Rules and Regulations”

[2] ANSI/IEEE Std. C95.1-1992, “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”, September 1992

[3] IEEE Std. 1528-2003, “Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”, December 2003

[4] SPEAG DASY System Handbook

[5] FCC KDB 248227 D01 v01r02, “SAR Measurement Procedures for 802.11 a/b/g Transmitters”, May 2007

[6] FCC KDB 447498 D01 v05r02, “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”, Feb 2014

[7] FCC KDB 644545 D01 v01r02, "Guidance for IEEE 802.11ac and Pre-ac Device Emission Testing", Apr 2013

[8] FCC KDB 865664 D01 v01r03, "SAR Measurement Requirements for 100 MHz to 6 GHz", Feb 2014.

[9] FCC KDB 865664 D02 v01r01, “RF Exposure Compliance Reporting and Documentation Considerations” May 2013.