FCC SAR Test Report

Report No.	:	**KES-SR-22T0022-R2**
FCC ID	:	**2AJAC-C4HALO**
Applicant	:	**Snap One, LLC**
Address	:	**1800 Continental Blvd, Suite 300 Charlotte, NC 28273**
Manufacturer	:	**Remote Solution Co., Ltd.**
Address	:	**71, Gunpo cheom dan san eop 2-ro, Gunpo-si, Gyeonggi-do, 15580**
DUT Type	:	**Remote Controller**
Model Name	:	**C4-HALO-BL**
Multiple Model Name:	:	**N/A**
Serial Number	:	**N/A**
Date of Testing	:	**2022.07.20 ~ 2022.12.22**
Issued Date	:	**2022.12.23**

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 : Min-sup Kim / Engineer

Approved By : Wihan Jeong / Technical Manager

This test report is not related to KS Q ISO/IEC 17025 and KOLAS

Revision history

Report No.	Reason for Change	Date Issued
KES-SR-22T0022	Initial release	2022. 07. 28
KES-SR-22T0022-R1	2.4 GHz hotspot mode was added at the request of the applicant. Revised Page: 4, 6, 7, 11, 20, 21, 22, 24	2022. 12. 14
KES-SR-22T0022-R2	Front to mouth mode was added at the request of the applicant. Revised Page: 4, 11, 21, 22, 23	2022 12. 23

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1. General Information

Applicant:	**Snap One, LLC**
Applicant address:	**1800 Continental Blvd, Suite 300 Charlotte, NC 28273**
Test site:	**KES Co., Ltd.**
Test site address:	**3701, 40, Simin-daero 365beon-gil, Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea**
Test Facility:	**FCC Accreditation Designation No.: KR0100, Registration No.: 4796B**
FCC rule part(s):	**CFR §2.1093**
FCC ID:	**2AJAC-C4HALO**

1.1. Highest SAR Summary

EUT Type	Remote Controller
Brand Name(Applicant)	Snap One, LLC
Model Name	C4-HALO-BL
Additional Model Name	N/A
Antenna Type	Fixed Internal Antenna (Chip Antenna)
EUT Stage	Identical Prototype

Equipment Class	**Band & Mode**	**TX Frequency**	**1 g SAR (W/kg)**		**10 g SAR (W/kg)**
			Front to Mouth SAR	**Hotspot SAR**	**Hands SAR**
DTS	2.4 GHz W-LAN	2 412 ~ 2 462 MHz	0.48	**0.61**	0.54
NII	U-NII-1	5 180 ~ 5 240 MHz	N/A	N/A	N/A
NII	U-NII-2A	5 260 ~ 5 320 MHz	**0.58**	N/A	**0.67**
NII	U-NII-2C	5 500 ~ 5 720 MHz	0.47	N/A	0.62
NII	U-NII-3	5 745 ~ 5 825 MHz	0.30	N/A	0.31
Simultaneous SAR per 690783 D01v01r03			N/A	N/A	N/A

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 and has been tested in accordance with the measurement procedures specified in Section 7 of this report;

1.2. Device Overview

Band & Mode	Operating Modes	Tx Frequency
2.4 GHz WLAN	Data	2 412 ~ 2 462 MHz
U-NII-1	Data	5 180 ~ 5 240 MHz
U-NII-2A	Data	5 260 ~ 5 320 MHz
U-NII-2C	Data	5 500 ~ 5 720 MHz
U-NII-3	Data	5 745 ~ 5 825 MHz

1.3. Power Reduction for SAR

There is no power reduction used for any band/mode implemented in the device for SAR purposes.

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.

Band / Mode		Modulated Average – Single Tx Chain (dBm)		
	Channel	1	6	11
IEEE 802.11b (2.4 GHz)	Maximum	17.5	17.5	17.5
	Nominal	16.5	16.5	16.5
IEEE 802.11g (2.4 GHz)	Maximum	12.0	16.0	12.0
	Nominal	11.0	15.0	11.0
IEEE 802.11n (2.4 GHz)	Maximum	12.0	14.0	12.0
	Nominal	11.0	13.0	11.0

Band / Mode	Modulated Average (20 MHz) – Single Tx Chain (dBm)							
	Channel	36~40	44~48	52~56	60~64	100, 124~144	120	149~165
IEEE 802.11a (5 GHz)	Maximum	13.0	15.0	15.5	13.5	13.0	15.0	13.0
	Nominal	12.0	14.0	14.5	12.5	12.0	14.0	12.0
IEEE 802.11n (5 GHz)	Maximum	13.0	15.0	15.5	13.5	13.0	15.0	13.0
	Nominal	12.0	14.0	14.5	12.5	12.0	14.0	12.0
IEEE 802.11ac (5 GHz)	Maximum	13.0	15.0	15.5	13.5	13.0	15.0	13.0
	Nominal	12.0	14.0	14.5	12.5	12.0	14.0	12.0

Band / Mode	Modulated Average (40 MHz) – Single Tx Chain (dBm)							
	Channel	38	46	54	62	102, 134~142	118~126	151~159
IEEE 802.11n (5 GHz)	Maximum	10.0	14.0	14.0	10.5	10.0	14.0	10.0
	Nominal	9.0	13.0	13.0	9.5	9.0	13.0	9.0
IEEE 802.11ac (5 GHz)	Maximum	10.0	14.0	14.0	10.5	10.0	14.0	10.0
	Nominal	9.0	13.0	13.0	9.5	9.0	13.0	9.0

Band / Mode		Modulated Average (80 MHz) – Single Tx Chain (dBm)			
		Ch. 42	Ch. 58	Ch. 106 ~ 138	Ch. 155
IEEE 802.11ac (5 GHz)	Maximum	10.0	10.5	10.5	9.5
	Nominal	9.0	9.5	9.5	8.5

1.5. Simultaneous Transmission Capabilities

This device operates independently from two antennas and does not support simultaneous operation.
2.4 GHz WLAN and 5 GHz WLAN share the same antenna path and cannot transmit simultaneously on any antenna.

1.6. Miscellaneous SAR Test Considerations

This device is operating at hand-held use near hand. Since this DUT operates in AP (Hotspot) mode in 2.4 GHz WLAN only, Hotspot SAR has been applied according to FCC KDB Publication 941225 D06v02r01. For detailed operating conditions, refer to Operation Description.

Per FCC KDB Publication 447498 Section 4.2.3., Since the bottom side of the DUT can be used closest to the human body, the SAR test was considered through the 1g Body SAR Test Exclusion Thresholds as shown below.

Per FCC KDB Publication 447498 D01v06, the 1g Body SAR exclusion threshold for distance > 50 mm (for 100 MHz to 6 GHz) is defined by the following equation:

Band/Mode	Freq. [MHz]	Maximum Allowed Power		Separation Distance [mm]	Exclusion
		[dBm]	[mW]		
U-NII-1	5 220	15.00	32	98	546 mW EXEMPT
U-NII-2A	5 260	15.50	35	98	545mW EXEMPT
U-NII-2C	5 600	13.00	20	98	543mW EXEMPT
U-NII-3	5 785	13.00	20	98	542mW EXEMPT

1.7. DUT Antenna Locations

FCC KDB Publication 941225 D06v02r01 (for 2.4 GHz Hotspot Mode) and October 2016 TCBC Workshop (for 5 GHz WLAN) are applied to this condition. The overall dimensions of this device are < 9 X 5 cm. So 1 g SAR (Hotspot SAR) test is evaluated to some position (distance from to the edge/side is within 2.5 cm) at 5 mm and 10 g SAR (Hands SAR) test is evaluated to some position (distance from to the edge/side is within 2.5 cm) at 0 mm.

Table 1.7.1 Device Edges/Sides for SAR Testing

Mode	Top	Bottom	Front	Rear	Right	Left
WLAN Ant. 1	No	No	Yes	Yes	Yes	Yes
WLAN Ant. 2	No	No	Yes	Yes	Yes	Yes

Note: Particular DUT edges were not required to be evaluated for wireless router SAR or phablet SAR if the edges were greater than 2.5 cm from the transmitting antenna according to FCC KDB Publication 941225 D06v02r01 Section III (for 2.4 GHz WLAN Hotspot Mode) and October 2016 TCBC Workshop Note (for 5 GHz WLAN). The distances between the transmit antenna and the edges of the device are included in the filing.

1.8. Near Field Communications (NFC) Antenna

This DUT does not support NFC function.

1.9. Guidance Applied

- IEEE 1528-2013
- FCC KDB Publication 248227 D01v02r02 (Wi-Fi SAR)
- FCC KDB Publication 447498 D01v06 (General RF Exposure Guidance)
- FCC KDB Publication 865664 D01v01r04 (SAR Measurement 100 MHz to 6 GHz)
- FCC KDB Publication 865664 D02v01r02 (RF Exposure Reporting)
- FCC KDB Publication 690783 D01v01r03 (SAR Listings on Grants)
- FCC KDB Publication 941225 D06v02r01 (Hotspot Mode SAR)
- October 2016 TCBC Workshop Notes (SAR Testing for Generic Device)
- April 2019 TCBC workshop Notes (Tissue Simulating Liquids (TSL))
- CFR §2.1093: 2020

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 8.

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

Specific Absorption Rate is defined as 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). It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body (see Equation 2-1)

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

Equation 2-1 SAR Mathematical Equation

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

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

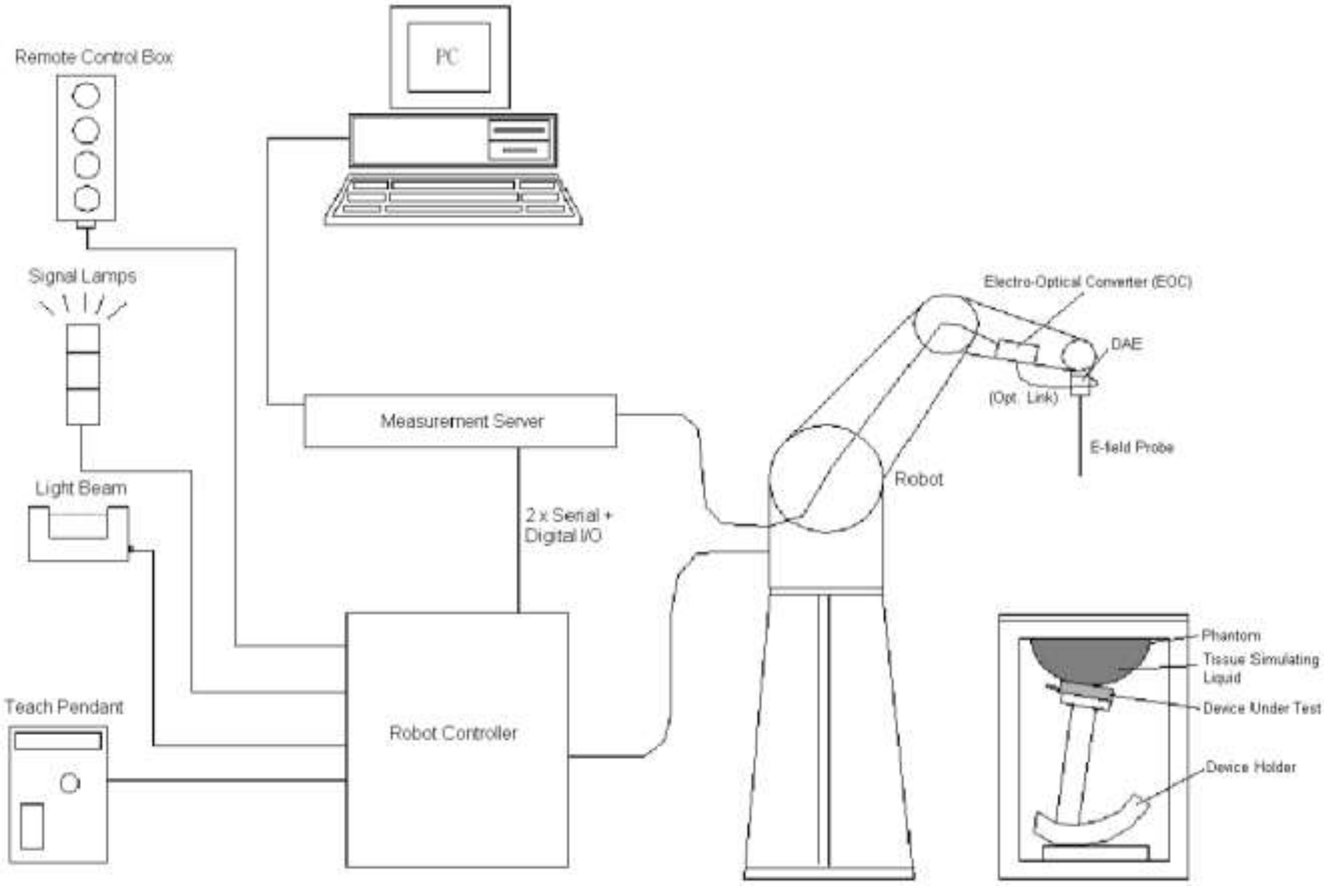
Where: σ = conductivity of the tissue (S/m)
ρ = mass density of the tissue (kg/m^3)
E = rms electrical field strength (V/m)

NOTE: The primary factors that control rate of energy absorption were found to be the wavelength of the incident field in 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. SAR Measurement Setup

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. 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, Win7 or Win10 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.



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 IEC/IEEE 1528-2013.

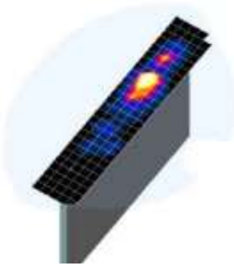


Figure 4-1 Sample SAR Area Scan

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

4. TEST CONFIGURATION POSITIONS

4.1. Device Holder

This 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. Positioning for Testing

Based on FCC guidance and expected exposure conditions, the device was positioned with the outside of the device touching the flat phantom and such that the location of maximum SAR was captured during SAR testing. The SAR test setup photograph is included in Appendix E.

4.3. Front to mouth Exposure Configurations

This DUT is a remote controller with a voice command function, where the microphone is located in the top side of the product, but the actual conditions of use the user's face (mouth) can be used close to the front side of the DUT. The Top side is also exempt from testing in accordance with FCC KDB Publication 941225 D06v02r01 and the October 2016 TCBC Workshop Note.

Therefore, the Front to mouth exposure conditions were tested using 5 mm separation from the Front Side, the worst conditions and actual conditions that were close to the body with Hotspot mode and voice function supported.

4.4. Extremity Exposure Configurations

Devices that are designed or intended for use on extremities or mainly operated in extremity only exposure conditions; i.e., hands, wrists, feet and ankles, may require extremity SAR evaluation. When the device also operates in close proximity to the user’s body, SAR compliance for the body is also required. The 1 g body and 10 g extremity SAR exclusion Thresholds found in KDB Publication 447498 D01v06 should be applied to determine SAR test requirements.

Per KDB Publication 447498 D01v06, remote controller are not normally designed to be used on body or operated in body only exposure conditions. The maximum output power levels of remote controller generally do not require body SAR testing to show compliance for 5 GHz WLAN. Therefore, body SAR was not evaluated for this device.

4.5. Wireless Router Configurations

Some battery-operated remote controllers have the capability to transmit and receive user data through simultaneous transmission of WIFI simultaneously with a separate licensed transmitter. The FCC has provided guidance in FCC KDB Publication 941225 D06v02r01 where SAR test considerations for remote controllers (L x W ≥ 9 cm x 5 cm) are based on a composite test separation distance of 10 mm from the front, back and edges of the device containing transmitting antennas within 2.5 cm of their edges, determined from general mixed use conditions for this type of devices. Since the hotspot SAR results may overlap with the body-worn accessory SAR requirements, the more conservative configurations can be considered, thus excluding some body-worn accessory SAR tests.

When the user enables the personal wireless router functions for the remote controller, actual operations include simultaneous transmission of both the WIFI transmitter and another licensed transmitter. Both transmitters often do not transmit at the same transmitting frequency and thus cannot be evaluated for SAR under actual use conditions due to the limitations of the SAR assessment probes. Therefore, SAR must be evaluated for each frequency transmission and mode separately and spatially summed with the WIFI transmitter according to FCC KDB Publication 447498 D01v06 procedures. The "Portable Hotspot" feature on the remote controller was NOT activated during SAR assessments, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal at a time.

5. RF Exposure Limits

In order for users to be aware of the body-worn operating requirements for meeting RF exposure compliance, Operating instruction and cautions statements are included in the user's manual.

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 5-1 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

Power measurements for licensed transmitters are performed using a base station simulator under digital average power.

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.

Per KDB Publication 447498 D01v06, testing of other required channels within the operating mode of a frequency band is not required when the reported 1g of 10g SAR for the mid-band or highest output power channel is:

- ≤ 0.8 W/kg or 2.0 W/kg, for 1g or 10g respectively, when the transmission band is ≤ 100 MHz
- ≤ 0.6 W/kg or 1.5 W/kg, for 1g or 10g respectively, when the transmission band is between 100 MHz and 200 MHz
- ≤ 0.4 W/kg or 1.0 W/kg, for 1g or 10g respectively, when the transmission band is ≥ 200 MHz

6.2. Procedures Used to Establish RF signal for SAR

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. Establishing connections in this manner ensure a consistent means for testing SAR and are recommended for evaluating SAR. Devices under test are evaluated prior to testing, with a fully charged battery and were configured to operate at maximum output power. In order to verify that the device is tested throughout the SAR test at maximum output power, the SAR measurement system measures a “point SAR” at an arbitrary reference point at the start and end of the 1 gram SAR evaluation, to assess for any power drifts during the evaluation. If the power drift deviates by more than 5%, the SAR test and drift measurements are repeated.

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.

6.3. SAR Testing with 802.11 Transmitters

Normal network operating configurations are not suitable for measuring the SAR of 802.11 b/g/n transmitters. Unpredictable fluctuations in network traffic and antenna diversity conditions can introduce undesirable variations in SAR results. The SAR for these devices should be measured using chipset based test mode software to ensure the results are consistent and reliable. See KDB Publication 248227D01v02r02 for more details.

6.3.1. U-NII-1 and U-NII-2A

For devices that operate in only one of the U-NII-1 and U-NII-2A bands, the normally required SAR procedures for OFDM configurations are applied. For devices that operate in both U-NII bands using the same transmitter and antenna(s), SAR test reduction is determined according to the following, with respect to the highest reported SAR and maximum output power specified for production units. The procedures are applied independently to each exposure configuration; for example, head, body, hotspot mode etc.

1) When the same maximum output power is specified for both bands, begin SAR measurement in U-NII-2A band by applying the OFDM SAR requirements. If the highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for U-NII-1 band for that configuration (802.11 mode and exposure condition); otherwise, each band is tested independently for SAR.

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

6.3.2. U-NII-2C and U-NII-3

The frequency range covered by U-NII-2C and U-NII-3 is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. When Terminal Doppler Weather Rader (TDWR) restriction applies, the channels at 5.60 – 5.65 GHz in U-NII-2C band must be disabled with acceptable mechanisms and documented in the equipment certification. Unless band gap channels are permanently disabled, SAR must be considered for these channels. When band gap channels are disabled, each band is tested independently according to the normally required OFDM SAR measurements and probe calibration frequency points requirements.

6.3.3. Initial Test Position Procedure

For exposure conditions with multiple test positions, such as handset operating next to the ear, devices with hotspot mode or UMPC mini-tablet, procedures for initial test position can be applied. Using the transmission mode determined by the DSSS procedure or initial test configuration, area scans are measured for all position in an exposure condition. The test position with the highest extrapolated (peak) SAR is used as the initial test position. When reported SAR for the initial test position is ≤ 0.4 W/kg, no additional testing for the remaining test positions is required. Otherwise, SAR is evaluated at the subsequent highest peak SAR position until the reported SAR result is ≤ 0.8 W/kg or all test position are measured.

6.3.4. 2.4 GHz SAR Test Requirements

SAR is measured for 2.4 GHz 802.11b DSSS using either a fixed test position or, when applicable, the initial test position procedure. SAR test reduction is determined according to the following:

1) When the reported SAR of the highest measured maximum output power channel for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.
2) When the reported SAR is > 0.8 W/kg, SAR is required for that exposure configuration using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.

2.4 GHz 802.11 g/n OFDM are additionally evaluated for SAR if the highest reported SAR for 802.11b, adjusted by the ratio of the OFDM to DSSS specified maximum output power is > 1.2 W/kg. When SAR is required for OFDM modes in 2.4 GHz band, the Initial Test Configuration Procedures should be followed.

6.3.5. OFDM Transmission Mode and SAR Test Channel Selection

For the 2.4 GHz and 5 GHz bands, when the same maximum output power was specified for multiple OFDM transmission mode configurations in a frequency band or aggregated band, SAR is measured using the configuration with the largest channel bandwidth, lowest order modulation and lowest data rate. When the maximum output power of a channel is the same for equivalent OFDM configurations; for example, 802.11a, 802.11n and 802.11ac or 802.11g and 802.11n with the same channel bandwidth, modulation and data rate etc., the lower order 802.11 mode i.e., 802.11a, then 80211n and 802.11ac or 802.11g then 802.11n is used for SAR measurement. When the maximum output power ware the same for multiple test channels, either according to the default or additional power measurement requirements, SAR is measured using the channel closest to the middle of the frequency band or aggregated band. When there are multiple channels with the same maximum output power, SAR is measured using the higher number channel.

6.3.6. Initial Test Configuration Procedure

For OFDM, in both 2.4 and 5 GHz bands, an initial test configuration is determined for each frequency band and aggregated band, according to the transmission mode with the highest maximum output power specified for SAR measurements. When the same maximum output is specified for multiple OFDM transmission mode configurations in a frequency band or aggregated band, SAR is measured using the configuration(s) with the largest channel bandwidth, lowest order modulation, and lowest data rate. The channel of the transmission mode with the highest average RF output conducted power will be the initial test configuration.
When the reported SAR ≤ 0.8 W/kg, no additional measurements on other test channels are required. Otherwise, SAR is evaluated using the subsequent highest average RF output channel until the reported SAR result is ≤ 1.2 W/kg or all channels are measured.

6.3.7. Subsequent Test Configuration Procedures

For OFDM configurations, in each frequency band and aggregated band, SAR is evaluated for initial test configuration using the fixed test position or the initial test position procedure, when applicable. When the highest reported SAR for the initial test configuration, adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power is ≤ 1.2 W/kg, no additional SAR testing for the subsequent test configurations is required.

6.3.8. MIMO SAR considerations

Per KDB Publication 248227 D01v02r02, the simultaneous SAR provision in KDB Publication 447498 D01v06 should be applied to determine simultaneous transmission SAR test exclusion for WIFI MIMO. If the sum of 1g single transmission chain SAR measurements is < 1.6 W/kg, no additional SAR measurements for MIMO are required. Alternatively, SAR for MIMO can be measured with all antennas transmitting simultaneously at the specified maximum output power of MIMO operation.

7. RF Conducted Powers

7.1. W-LAN Conducted Powers

Table 7-1_2.4 GHz W-LAN Conducted Powers Ant. 1

2.4 GHz Conducted Power Setting [dBm]				
Freq. [MHz]	Channel	IEEE Transmission Mode		
		802.11b	802.11g	802.11n
		Average	Average	Average
2 412	1	17.15	11.53	11.20
2 437	6	17.03	15.47	13.26
2 462	11	**17.29**	11.83	11.25

Note: The yellow entre channel above were tested for SAR.

Table 7-2_2.4 GHz W-LAN Conducted Powers Ant. 2

2.4 GHz Conducted Power Setting [dBm]				
Freq. [MHz]	Channel	IEEE Transmission Mode		
		802.11b	802.11g	802.11n
		Average	Average	Average
2 412	1	17.21	11.49	11.10
2 437	6	17.09	15.53	13.15
2 462	11	**17.25**	11.77	11.08

Note: The yellow entre channel above were tested for SAR.

Table 7-3_5 GHz W-LAN Conducted Powers Ant. 1

5 GHz (20 MHz) Conducted Power [dBm]				
Freq. [MHz]	Channel	IEEE Transmission Mode		
		802.11a	802.11n	802.11ac
		Average	Average	Average
5 180	36	11.98	11.53	11.30
5 200	40	11.91	11.49	11.25
5 220	44	14.56	14.13	14.21
5 240	48	14.32	14.14	13.98
5 260	52	**14.62**	14.19	14.25
5 280	56	14.53	14.05	14.00
5 300	60	11.78	11.65	11.58
5 320	64	12.01	11.76	11.79
5 500	100	11.71	11.27	11.31
5 600	120	**14.61**	14.17	14.28
5 620	124	12.05	11.85	11.74
5 720	144	11.83	11.32	11.43
5 745	149	11.34	11.28	11.14
5 785	157	**12.98**	12.95	12.88
5 825	165	11.28	11.04	11.11

5 GHz (40 MHz) Conducted Power [dBm]			
Freq. [MHz]	Channel	IEEE Transmission Mode	
		802.11n	802.11ac
		Average	Average
5 190	38	9.11	9.05
5 230	46	13.41	13.46
5 270	54	13.48	13.52
5 310	62	9.32	9.28
5 510	102	9.21	9.24
5 590	118	13.48	13.52
5 630	126	13.35	13.28
5 670	134	9.41	9.44
5 710	142	9.52	9.48
5 755	151	9.05	9.08
5 795	159	9.16	9.11

5 GHz (80 MHz) Conducted Power [dBm]		
Freq. [MHz]	Channel	IEEE Transmission Mode
		802.11ac
		Average
5 210	42	9.15
5 290	58	9.21
5 530	106	9.28
5 610	122	9.34
5 690	138	9.42
5 775	155	8.87

Note: The yellow entre channel above were tested for SAR.

Table 7-4_5 GHz W-LAN Conducted Powers Ant. 2

5 GHz (20 MHz) Conducted Power [dBm]				
Freq. [MHz]	Channel	IEEE Transmission Mode		
		802.11a	802.11n	802.11ac
		Average	Average	Average
5 180	36	11.81	11.45	11.15
5 200	40	11.79	11.47	11.14
5 220	44	14.39	14.11	14.05
5 240	48	14.21	14.05	13.98
5 260	52	**14.53**	14.17	14.13
5 280	56	14.47	14.03	13.96
5 300	60	11.69	11.61	11.50
5 320	64	12.03	11.77	11.75
5 500	100	11.65	11.13	11.19
5 600	120	**14.56**	14.11	14.23
5 620	124	11.93	11.74	11.63
5 720	144	11.74	11.41	11.32
5 745	149	11.22	11.13	11.06
5 785	157	**12.95**	12.80	12.80
5 825	165	11.17	10.93	10.97

5 GHz (40 MHz) Conducted Power [dBm]			
Freq. [MHz]	Channel	IEEE Transmission Mode	
		802.11n	802.11ac
		Average	Average
5 190	38	9.01	8.93
5 230	46	13.30	13.31
5 270	54	13.35	13.39
5 310	62	9.17	9.16
5 510	102	9.12	9.15
5 590	118	13.34	13.37
5 630	126	13.27	13.13
5 670	134	9.29	9.33
5 710	142	9.40	9.38
5 755	151	8.93	8.95
5 795	159	9.04	8.99

5 GHz (80 MHz) Conducted Power [dBm]		
Freq. [MHz]	Channel	IEEE Transmission Mode
		802.11ac
		Average
5 210	42	9.02
5 290	58	9.10
5 530	106	9.18
5 610	122	9.24
5 690	138	9.31
5 775	155	8.77

Note: The yellow entre channel above were tested for SAR.

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) The yellow data rate and channel above were tested for SAR.

8. System Verification

8.1. Tissue Verification

Table 8-1 Measured Tissue Properties

Tissue Type	Measured Frequency (MHz)	Tissue Temp (℃)	Measured Conductivity (σ)	Measured Permittivity (ε_r)	Target Conductivity (σ)	Target Permittivity (ε_r)	Conductivity Deviation (%)	Permittivity Deviation (%)	Test Date
HSL2450	2 450	21.3	1.779	39.047	1.80	39.2	- 1.17	- 0.39	2022.07.20
	2 462		1.812	38.844	1.83	39.2	- 1.00	- 0.96	
HSL5GHz	5 300	21.6	4.655	35.466	4.76	35.9	- 2.21	- 1.21	2022.07.21
	5 260		4.631	35.461	4.72	35.9	- 1.89	- 1.33	
HSL5GHz	5 600	21.5	5.011	34.972	5.07	35.5	- 1.16	- 1.49	2022.07.22
HSL5GHz	5 800	21.3	5.173	34.766	5.27	35.3	- 1.84	- 1.51	2022.07.25
	5 785		5.120	34.711	5.26	35.3	- 2.57	- 1.71	
HSL2450	2 450	21.2	1.798	39.443	1.80	39.2	- 0.11	0.62	2022.12.12
	2 462		1.810	39.388	1.83	39.2	- 1.11	0.43	
HSL5GHz	5 300	21.3	4.690	36.034	4.76	35.9	- 1.47	0.37	2022.12.22
	5 260		4.683	36.934	4.72	35.9	- 0.78	2.77	
HSL5GHz	5 600	21.3	5.045	35.637	5.07	35.5	- 0.49	0.39	2022.12.22
	5 600		5.045	35.637	5.07	35.5	- 0.49	0.39	
HSL5GHz	5 800	21.3	5.261	35.243	5.27	35.3	- 0.17	- 0.16	2022.12.22
	5 785		5.235	35.301	5.25	35.3	- 0.37	- 0.04	

Tissue Verification Notes:

1. 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.
2. Per April 2019 TCBC Workshop Notes, effective February 19, 2019, FCC has permitted the use of single head-tissue simulating liquid specified in IEC 62209-1 for all SAR tests.

8.2. Tissue Verification

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.

Table 8-2 System Verification Results – 1 g

SAR System #	Test Date	Tissue Frequency (MHz)	Amb. Temp (℃)	Liquid Temp (℃)	Input Power (mW)	Dipole 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 (%)
1	2022.12.12	2 450	22.3	21.2	100	896	3879	52.50	5.24	52.40	- 0.19
1	2022.12.22	5 300	22.4	21.3	50	1170	3879	81.50	4.08	81.60	0.12
1	2022.12.22	5 600	22.4	21.3	50	1170	3879	84.40	4.11	82.20	-2.61
1	2022.12.22	5 800	22.4	21.3	50	1170	3879	81.10	4.02	80.40	-0.86

Table 8-3 System Verification Results – 10 g

SAR System #	Test Date	Tissue Frequency (MHz)	Amb. Temp (℃)	Liquid Temp (℃)	Input Power (mW)	Dipole SN	Probe SN	1W Target SAR-10 g (W/kg)	Measured SAR-10 g (W/kg)	Normalized to 1W SAR-10 g (W/kg)	Deviation (%)
1	2022.07.20	2 450	22.4	21.3	100	896	3879	24.10	2.34	23.40	- 2.90
1	2022.07.21	5 300	22.7	21.6	100	1170	3879	23.10	2.40	24.00	3.90
1	2022.07.22	5 600	22.8	21.5	100	1170	3879	23.80	2.36	23.60	- 0.84
1	2022.07.25	5 800	22.5	21.3	100	1170	3879	22.70	2.30	23.00	1.32

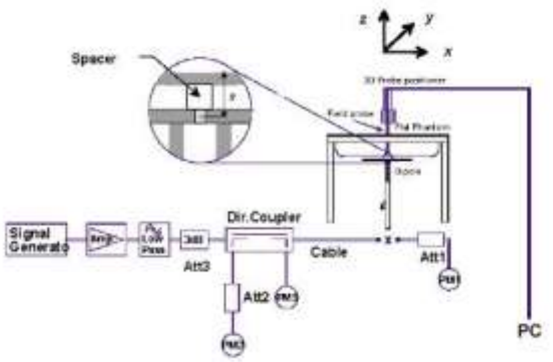


Figure 8-1 System Verification Setup Diagram

Figure 8-2 System Verification Setup Photo

9. SAR Data Summary

9.1. Front to Mouth SAR Results

Table 9-1 Front to Mouth SAR

Plot No.	Device Serial Number	Mode	Frequency		Service	Test Position	Spacing (cm)	Maximum Allowed Power [dBm]	Measured Conducted Power [dBm]	Scaling Factor (Duty Cycle)	Scaling Factor (Power)	Power Drift [dB]	Measured SAR 1 g (W/kg)	Reported SAR 1 g (W/kg)
			MHz	Ch.										
81	SAR1	802.11b (Ant. 1)	2 462	11	DSSS	Front to mouth	0.5	17.5	17.29	1.020	1.050	0.02	0.451	0.483
101	SAR1	802.11a (Ant. 1)	5 260	52	OFDM	Front to mouth	0.5	15.5	14.62	1.045	1.225	0.14	0.336	0.430
103	SAR1	802.11a (Ant. 1)	5 600	120	OFDM	Front to mouth	0.5	15.0	14.61	1.056	1.094	0.13	0.410	0.474
105	SAR1	802.11a (Ant. 1)	5 785	157	OFDM	Front to mouth	0.5	13.0	12.98	1.040	1.005	0.12	0.285	0.298
91	SAR1	802.11b (Ant. 2)	2 462	11	DSSS	Front to mouth	0.5	17.5	17.25	1.020	1.059	0.11	0.324	0.350
102	SAR1	802.11a (Ant. 2)	5 260	52	OFDM	Front to mouth	0.5	15.5	14.53	1.087	1.250	0.06	0.425	0.578
104	SAR1	802.11a (Ant. 2)	5 600	120	OFDM	Front to mouth	0.5	15.0	14.56	1.089	1.107	-0.03	0.304	0.366
106	SAR1	802.11a (Ant. 2)	5 785	157	OFDM	Front to mouth	0.5	13.0	12.95	1.041	1.012	0.01	0.152	0.160
ANSI / IEEE C95.1 1992 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General Population									Front to mouth (Head) 1.6 W/kg (W/kg) Averaged over 1 gram					

9.2. Hotspot SAR Results

Table 9-2 2.4 GHz WLAN Hotspot SAR

Plot No.	Device Serial Number	Mode	Frequency		Service	Test Position	Spacing (cm)	Maximum Allowed Power [dBm]	Measured Conducted Power [dBm]	Scaling Factor (Duty Cycle)	Scaling Factor (Power)	Power Drift [dB]	Measured SAR 1 g (W/kg)	Reported SAR 1 g (W/kg)
			MHz	Ch.										
	SAR1	802.11b (Ant. 1)	2 462	11	DSSS	Front Side	0.5	17.5	17.29	1.020	1.050	0.02	0.451	0.483
	SAR1	802.11b (Ant. 1)	2 462	11	DSSS	Rear Side	0.5	17.5	17.29	1.020	1.050	0.14	0.320	0.343
83	**SAR1**	**802.11b (Ant. 1)**	**2 462**	**11**	**DSSS**	**Right Side**	**0.5**	**17.5**	**17.29**	**1.020**	**1.050**	**0.09**	**0.568**	**0.608**
	SAR1	802.11b (Ant. 1)	2 462	11	DSSS	Left Side	0.5	17.5	17.29	1.020	1.050	0.07	0.045	0.048
	SAR1	802.11b (Ant. 2)	2 462	11	DSSS	Front Side	0.5	17.5	17.25	1.020	1.059	0.11	0.324	0.350
	SAR1	802.11b (Ant. 2)	2 462	11	DSSS	Rear Side	0.5	17.5	17.25	1.020	1.059	-0.12	0.266	0.288
	SAR1	802.11b (Ant. 2)	2 462	11	DSSS	Right Side	0.5	17.5	17.25	1.020	1.059	-0.10	0.033	0.036
94	**SAR1**	**802.11b (Ant. 2)**	**2 462**	**11**	**DSSS**	**Left Side**	**0.5**	**17.5**	**17.25**	**1.020**	**1.059**	**0.08**	**0.419**	**0.453**
ANSI / IEEE C95.1 1992 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General Population									Hotspot (Body) 1.6 W/kg (W/kg) Averaged over 1 gram					

9.3. Hands SAR Results

Table 9-3 2.4 GHz WLAN Hands SAR

Plot No.	Device Serial Number	Mode	Frequency		Service	Test Position	Spacing (cm)	Maximum Allowed Power [dBm]	Measured Conducted Power [dBm]	Scaling Factor (Duty Cycle)	Scaling Factor (Power)	Power Drift [dB]	Measured SAR 10 g (W/kg)	Reported SAR 10 g (W/kg)
			MHz	Ch.										
	SAR1	802.11b (Ant. 1)	2 462	11	DSSS	Front Side	0	17.5	17.29	1.020	1.050	0.05	0.393	0.421
	SAR1	802.11b (Ant. 1)	2 462	11	DSSS	Rear Side	0	17.5	17.29	1.020	1.050	- 0.03	0.324	0.347
3	**SAR1**	**802.11b (Ant. 1)**	**2 462**	**11**	**DSSS**	**Right Side**	**0**	**17.5**	**17.29**	**1.020**	**1.050**	**- 0.12**	**0.503**	**0.539**
	SAR1	802.11b (Ant. 1)	2 462	11	DSSS	Left Side	0	17.5	17.29	1.020	1.050	- 0.01	0.019	0.020
11	**SAR1**	**802.11b (Ant. 2)**	**2 462**	**11**	**DSSS**	**Front Side**	**0**	**17.5**	**17.25**	**1.020**	**1.059**	**- 0.03**	**0.360**	**0.389**
	SAR1	802.11b (Ant. 2)	2 462	11	DSSS	Rear Side	0	17.5	17.25	1.020	1.059	- 0.05	0.289	0.312
	SAR1	802.11b (Ant. 2)	2 462	11	DSSS	Right Side	0	17.5	17.25	1.020	1.059	0.17	0.027	0.029
	SAR1	802.11b (Ant. 2)	2 462	11	DSSS	Left Side	0	17.5	17.25	1.020	1.059	0.12	0.326	0.352
ANSI / IEEE C95.1 1992 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General Population									Hands 4.0 W/kg (W/kg) Averaged over 10 gram					

Table 9-4 5 GHz WLAN Hands SAR

Plot No.	Device Serial Number	Mode	Frequency		Service	Test Position	Spacing (cm)	Maximum Allowed Power [dBm]	Measured Conducted Power [dBm]	Scaling Factor (Duty Cycle)	Scaling Factor (Power)	Power Drift [dB]	Measured SAR 10 g (W/kg)	Reported SAR 10 g (W/kg)
			MHz	Ch.										
	SAR1	802.11a (Ant. 1)	5 260	52	OFDM	Front Side	0	15.5	14.62	1.045	1.225	- 0.08	0.349	0.447
	SAR1	802.11a (Ant. 1)	5 260	52	OFDM	Rear Side	0	15.5	14.62	1.045	1.225	- 0.01	0.246	0.315
23	**SAR1**	**802.11a (Ant. 1)**	**5 260**	**52**	**OFDM**	**Right Side**	**0**	**15.5**	**14.62**	**1.045**	**1.225**	**0.19**	**0.460**	**0.589**
	SAR1	802.11a (Ant. 1)	5 260	52	OFDM	Left Side	0	15.5	14.62	1.045	1.225	0.14	0.033	0.042
	SAR1	802.11a (Ant. 2)	5 260	52	OFDM	Front Side	0	15.5	14.53	1.087	1.250	- 0.14	0.341	0.463
	SAR1	802.11a (Ant. 2)	5 260	52	OFDM	Rear Side	0	15.5	14.53	1.087	1.250	0.03	0.246	0.334
	SAR1	802.11a (Ant. 2)	5 260	52	OFDM	Right Side	0	15.5	14.53	1.087	1.250	0.01	0.035	0.048
34	**SAR1**	**802.11a (Ant. 2)**	**5 260**	**52**	**OFDM**	**Left Side**	**0**	**15.5**	**14.53**	**1.087**	**1.250**	**0.17**	**0.490**	**0.666**
	SAR1	802.11a (Ant. 1)	5 600	120	OFDM	Front Side	0	15.0	14.61	1.056	1.094	0.10	0.411	0.475
	SAR1	802.11a (Ant. 1)	5 600	120	OFDM	Rear Side	0	15.0	14.61	1.056	1.094	- 0.01	0.237	0.274
43	**SAR1**	**802.11a (Ant. 1)**	**5 600**	**120**	**OFDM**	**Right Side**	**0**	**15.0**	**14.61**	**1.056**	**1.094**	**0.16**	**0.472**	**0.545**
	SAR1	802.11a (Ant. 1)	5 600	120	OFDM	Left Side	0	15.0	14.61	1.056	1.094	0.05	0.041	0.047
	SAR1	802.11a (Ant. 2)	5 600	120	OFDM	Front Side	0	15.0	14.56	1.089	1.107	- 0.18	0.421	0.508
	SAR1	802.11a (Ant. 2)	5 600	120	OFDM	Rear Side	0	15.0	14.56	1.089	1.107	0.17	0.231	0.278
	SAR1	802.11a (Ant. 2)	5 600	120	OFDM	Right Side	0	15.0	14.56	1.089	1.107	0.18	0.043	0.052
54	**SAR1**	**802.11a (Ant. 2)**	**5 600**	**120**	**OFDM**	**Left Side**	**0**	**15.0**	**14.56**	**1.089**	**1.107**	**0.10**	**0.517**	**0.623**
	SAR1	802.11a (Ant. 1)	5 785	157	OFDM	Front Side	0	13.0	12.98	1.040	1.005	0.07	0.229	0.239
	SAR1	802.11a (Ant. 1)	5 785	157	OFDM	Rear Side	0	13.0	12.98	1.040	1.005	- 0.01	0.133	0.139
63	**SAR1**	**802.11a (Ant. 1)**	**5 785**	**157**	**OFDM**	**Right Side**	**0**	**13.0**	**12.98**	**1.040**	**1.005**	**0.17**	**0.267**	**0.279**
	SAR1	802.11a (Ant. 1)	5 785	157	OFDM	Left Side	0	13.0	12.98	1.040	1.005	- 0.14	0.038	0.040
	SAR1	802.11a (Ant. 2)	5 785	157	OFDM	Front Side	0	13.0	12.95	1.041	1.012	- 0.11	0.237	0.249
	SAR1	802.11a (Ant. 2)	5 785	157	OFDM	Rear Side	0	13.0	12.95	1.041	1.012	0.06	0.140	0.147
	SAR1	802.11a (Ant. 2)	5 785	157	OFDM	Right Side	0	13.0	12.95	1.041	1.012	0.00	0.000	0.000
74	**SAR1**	**802.11a (Ant. 2)**	**5 785**	**157**	**OFDM**	**Left Side**	**0**	**13.0**	**12.95**	**1.041**	**1.012**	**0.16**	**0.298**	**0.314**
ANSI / IEEE C95.1 1992 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General Population									Hands 4.0 W/kg (W/kg) Averaged over 10 gram					

9.4. 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. Unless otherwise noted, when 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds below.
7. Per FCC KDB 865664 D01v01r04, variability SAR tests may be performed when the measured SAR results for a frequency band were greater than or equal to 2.0 W/kg for 10 g. Since the measured SAR results of this device were less than or equal to 2.0 W/kg, repeated SAR measurements are not required.
8. Since this DUT operates in AP (Hotspot) mode in 2.4 GHz WLAN, Hotspot SAR has been applied according to FCC KDB Publication 941225 D06v02r01. For detailed operating conditions, refer to Operation Description.

W-LAN Notes:

1. Justification for test configurations for W-LAN per KDB Publication 248227 D01v02r02 for 2.4 GHz WIFI single transmission chain operations, the highest measured maximum output power channel for DSSS was selected for SAR measurement. SAR for OFDM modes (2.4 GHz 802.11g/n) was not required duo to the maximum allowed powers and the highest reported DSSS SAR when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output and the adjust SAR is ≤ 3 W/kg. See Section 6.3.4 more information.
2. Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02 for 5 GHz WIFI single transmission chain operations, the initial test configuration was selected according to the transmission mode with the highest maximum allowed powers. Other transmission modes were not investigated since the highest reported SAR for initial test configuration adjusted by the ratio of maximum output powers is less than 3.0 W/kg for 10 g evaluations. See Section 6.3.5 more information.
3. When the maximum reported 10 g averaged SAR ≤ 2.0 W/kg, SAR testing on additional channels was not required. Otherwise, SAR for the next highest output power channel was required until the reported SAR result was ≤ 3.0 W/kg or all test channels were measured**.**
4. The device was configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor to determine compliance.
5. When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds below.

10. SAR Measurement Uncertainty

Table 10-1 Uncertainty of SAR equipment for measurement Body 0.3 GHz to 3 GHz

A	b	c	d	e=f(d, k)	f	g	h=c x f/e	I=c x g/e	k
Uncertainty component	**Reference**	**Tol. (± %)**	**Prob. dist.**	**Div.**	**Ci (1 g)**	**Ci (10 g)**	**1 g *ui* (± %)**	**10 g *ui* (± %)**	***vi***
Measurement system									
Probe calibration	4	6.65	N	1	1	1	6.65	6.65	∞
Axial isotropy	5	4.7	R	1.732	0.71	0.71	1.93	1.93	∞
Hemispherical isotropy	5	9.6	R	1.732	0.71	0.71	3.94	3.94	∞
Boundary effect	6	1	R	1.732	1	1	0.58	0.58	∞
Linearity	7	4.7	R	1.732	1	1	2.71	2.71	∞
System detection limits	9	0.25	R	1.732	1	1	0.14	0.14	∞
Modulation response	8	2.4	R	1.732	1	1	1.39	1.39	∞
Readout electronics	10	0.3	N	1	1	1	0.30	0.30	∞
Response time	11	0	R	1.732	1	1	0.00	0.00	∞
Integration time	12	2.6	R	1.732	1	1	1.50	1.50	∞
RF ambient conditions—noise	13	3	R	1.732	1	1	1.73	1.73	∞
RF ambient conditions—reflections	13	3	R	1.732	1	1	1.73	1.73	∞
Probe positioner mechanical tolerance	14	0.4	R	1.732	1	1	0.23	0.23	∞
Probe positioning with respect to phantom shell	15	2.9	R	1.732	1	1	1.67	1.67	∞
Extrapolation, interpolation, and integration algorithms for max. SAR evaluation	16	2	R	1.732	1	1	1.15	1.15	∞
Test sample related									
Test sample positioning	17	1 1	N	1	1	1	1	1	30
Device holder uncertainty	18	0.9 0.9	N	1	1	1	0.9	0.9	24
Output power variation—SAR drift measurement	20	5	R	1.732	1	1	2.89	2.89	∞
SAR scaling	19	0	R	1.732	1	1	0.00	0.00	∞
Phantom and tissue parameters									
Phantom shell uncertainty—shape, thickness and permittivity	21	6.1	R	1.732	1	1	3.52	3.52	∞
Uncertainty in SAR correction for deviations in permittivity and conductivity	22	1.9	N	1	1	0.84	1.90	1.60	∞
Liquid conductivity measurement	22	1.81	N	1	0.78	0.71	1.41	1.29	35
Liquid permittivity measurement	22	1.63	N	1	0.23	0.26	0.37	0.42	35
Liquid conductivity—temperature uncertainty	23	2.37	R	1.732	0.78	0.71	1.07	0.97	∞
Liquid permittivity—temperature uncertainty	23	2.03	R	1.732	0.23	0.26	0.27	0.30	∞
Combined standard uncertainty			RSS				10.80	10.70	v_{eff}
Expanded uncertainty (95% *confidence interval*)			*K* = 2				**21.60**	**21.40**	

Table 10-2 Uncertainty of SAR equipment for measurement Body 3 GHz to 6 GHz

A	b	c	d	e=f(d, k)	f	g	h=c x f/e	I=c x g/e	k
Uncertainty component	**Reference**	**Tol. (± %)**	**Prob. dist.**	**Div.**	**Ci (1 g)**	**Ci (10 g)**	**1 g *ui* (± %)**	**10 g *ui* (± %)**	***vi***
Measurement system									
Probe calibration	4	6.55	N	1	1	1	6.55	6.55	∞
Axial isotropy	5	4.7	R	1.732	0.71	0.71	1.93	1.93	∞
Hemispherical isotropy	5	9.6	R	1.732	0.71	0.71	3.94	3.94	∞
Boundary effect	6	2	R	1.732	1	1	1.15	1.15	∞
Linearity	7	4.7	R	1.732	1	1	2.71	2.71	∞
System detection limits	9	0.25	R	1.732	1	1	0.14	0.14	∞
Modulation response	8	2.4	R	1.732	1	1	1.39	1.39	∞
Readout electronics	10	0.3	N	1	1	1	0.30	0.30	∞
Response time	11	0	R	1.732	1	1	0.00	0.00	∞
Integration time	12	2.6	R	1.732	1	1	1.50	1.50	∞
RF ambient conditions—noise	13	3	R	1.732	1	1	1.73	1.73	∞
RF ambient conditions—reflections	13	3	R	1.732	1	1	1.73	1.73	∞
Probe positioner mechanical tolerance	14	0.4	R	1.732	1	1	0.23	0.23	∞
Probe positioning with respect to phantom shell	15	6.7	R	1.732	1	1	3.87	3.87	∞
Extrapolation, interpolation, and integration algorithms for max. SAR evaluation	16	4	R	1.732	1	1	2.31	2.31	∞
Test sample related									
Test sample positioning	17	0.7 0.5	N	1	1	1	0.7	0.5	12
Device holder uncertainty	18	1 1	N	1	1	1	1	1	24
Output power variation—SAR drift measurement	20	5	R	1.732	1	1	2.89	2.89	∞
SAR scaling	19	0	R	1.732	1	1	0.00	0.00	∞
Phantom and tissue parameters									
Phantom shell uncertainty—shape, thickness and permittivity	21	6.6	R	1.732	1	1	3.81	3.81	∞
Uncertainty in SAR correction for deviations in permittivity and conductivity	22	1.9	N	1	1	0.84	1.90	1.60	∞
Liquid conductivity measurement	22	1.35	N	1	0.78	0.71	1.05	0.96	15
Liquid permittivity measurement	22	0.97	N	1	0.23	0.26	0.22	0.25	15
Liquid conductivity—temperature uncertainty	23	2.01	R	1.732	0.78	0.71	0.91	0.82	∞
Liquid permittivity—temperature uncertainty	23	1.96	R	1.732	0.23	0.26	0.26	0.29	∞
Combined standard uncertainty			RSS				11.50	11.40	v_{eff}
Expanded uncertainty (95% *confidence interval*)			*K* = 2				**23.00**	**22.80**	

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 Upgrade	SD 000 H99 AA	N/A	N/A	N/A
Data Acquisition Electronics	SPEAG	DAE4	1460	2021-11-24	2022-11-24	1 Year
E-Field Probe	SPEAG	EX3DV4	3879	2022-01-27	2023-01-27	1 Year
Dipole Antenna	SPEAG	D2450V2	896	2022-02-11	2024-02-11	2 Years
Dipole Antenna	SPEAG	D5GHzV2	1170	2022-02-23	2024-02-23	2 Years
RF Signal Generator	ANRITSU	68369B	992113	2022-01-13	2023-01-13	1 Year
BROADBAND HIGH POWER AMPLIFIER	EMPOWER	1138	1030	2022-06-17	2023-06-17	1 Year
DUAL DIRECTIONAL COUPLER	HP	11692D	1212A03523	2022-06-17	2023-06-17	1 Year
EPM Series Power Meter	HP	E4419B	GB40202055	2022-01-13	2023-01-13	1 Year
E-Series AVG Power Sensor	Agilent	E9300H	MY41495967	2022-01-13	2023-01-13	1 Year
E-Series AVG Power Sensor	Agilent	E9300H	US39215405	2022-01-13	2023-01-13	1 Year
POWER METER	ANRITSU	ML2495A	1438001	2022-01-13	2023-01-13	1 Year
Pulse Power Sensor	ANRITSU	MA2411B	1339205	2022-01-13	2023-01-13	1 Year
Attenuator	HP	8491B	22234	2022-01-13	2023-01-13	1 Year
Attenuator	MINI-CIRCUITS	UNAT-10+	VUU38501715	2022-01-13	2023-01-13	1 Year
Low Pass Filter	FILTRON	F-LPCA-KOO1410	1408004S	2022-01-13	2023-01-13	1 Year
Low Pass Filter	FILTRON	F-LPCA-KOO1420	1408008S	2022-01-13	2023-01-13	1 Year
DIELECTRIC ASSESSMENT KIT	SPEAG	DAKS-3.5	1065	2022-01-26	2023-01-26	1 Year
Network Analyzer	HP	8720C	3124A01008	2022-06-17	2023-06-17	1 Year
HYGRO-THERMOMETER	DAEKWANG	811CE	NONE	2022-06-17	2023-06-17	1 Year
DIGITAL THERMOMETER	NONE	TP101	191105	2022-01-21	2023-01-21	1 Year
Spectrum Analyzer	R&S	FSQ 40	200045	2022-06-17	2023-06-17	1 Year

Note:
1. CBT (Calibration 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.
2. All equipment was used solely within its calibration period.

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.

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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: 2022-12-22

System Verification for 5300 MHz

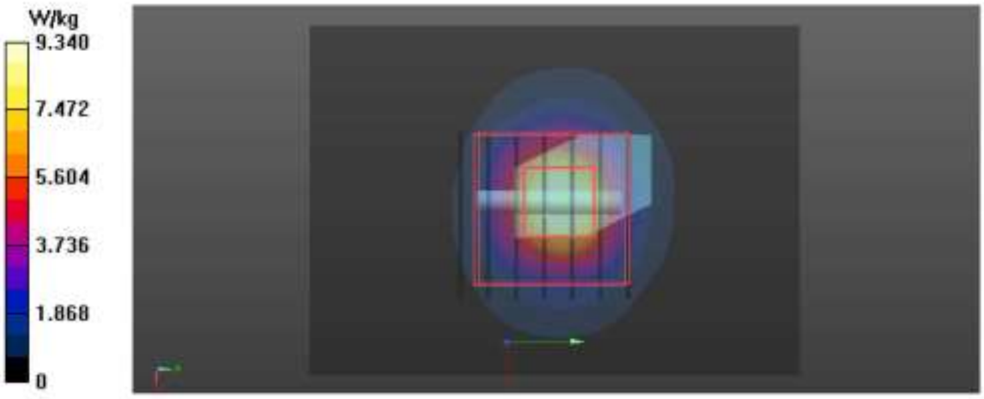
DUT: Dipole D5GHzV2-SN: 1170

Communication System: CW; Frequency: 5300 MHz;Duty Cycle: 1:1
Medium: HSL5GHz Medium parameters used: f = 5300 MHz; σ = 4.69 S/m; ε_r = 36.034; ρ = 1000 kg/m^3
Ambient Temperature 22.4 ℃; Liquid Temperature 21.3 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3879; ConvF(4.9, 4.9, 4.9) @ 5300 MHz; Calibrated: 2022-01-27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1344; Calibrated: 2022-01-21
- Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2036
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Pin=50 mW/Area Scan (51x71x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 10.8 W/kg

Pin=50 mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 51.44 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 15.9 W/kg
SAR(1 g) = 4.08 W/kg; SAR(10 g) = 1.16 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 66.3%
Maximum value of SAR (measured) = 9.34 W/kg



Test Laboratory: KES Co., Ltd. Date: 2022-12-22

System Verification for 5600 MHz

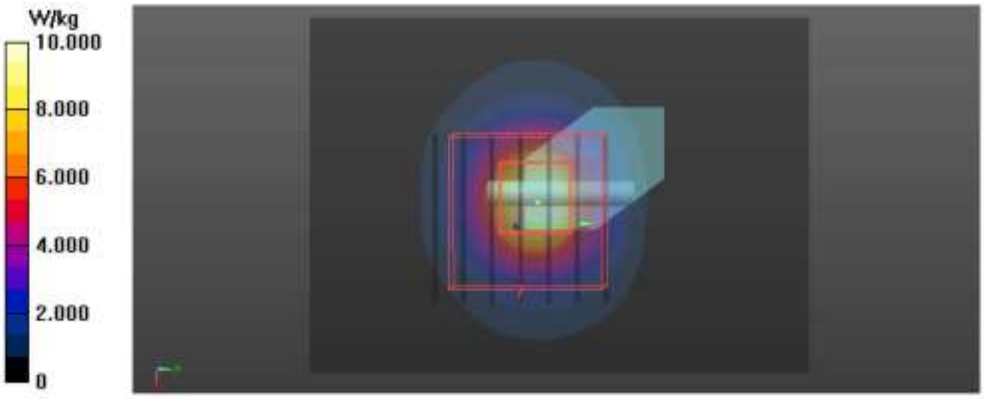
DUT: Dipole D5GHzV2-SN: 1170

Communication System: CW; Frequency: 5600 MHz;Duty Cycle: 1:1
Medium: HSL5GHz Medium parameters used: f = 5600 MHz; σ = 5.045 S/m; ε_r = 35.637; ρ = 1000 kg/m^3
Ambient Temperature 22.4 °C; Liquid Temperature 21.3 °C

DASY5 Configuration:
- Probe: EX3DV4 - SN3879; ConvF(4.61, 4.61, 4.61) @ 5600 MHz; Calibrated: 2022-01-27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1344; Calibrated: 2022-01-21
- Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2036
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Pin=50 mW/Area Scan (51x71x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 10.8 W/kg

Pin=50 mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 47.56 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 18.1 W/kg
SAR(1 g) = 4.11 W/kg; SAR(10 g) = 1.15 W/kg
Smallest distance from peaks to all points 3 dB below = 7.4 mm
Ratio of SAR at M2 to SAR at M1 = 62.7%
Maximum value of SAR (measured) = 10.0 W/kg



Test Laboratory: KES Co., Ltd. Date: 2022-12-22

System Verification for 5800 MHz

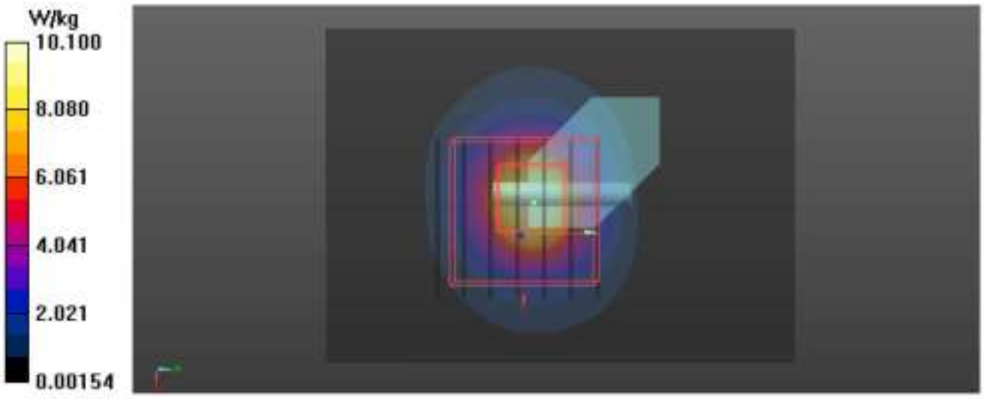
DUT: Dipole D5GHzV2-SN: 1170

Communication System: CW; Frequency: 5800 MHz;Duty Cycle: 1:1
Medium: HSL5GHz Medium parameters used: f = 5800 MHz; σ = 5.261 S/m; ε_r = 35.243; ρ = 1000 kg/m^3
Ambient Temperature 22.4 °C; Liquid Temperature 21.3 °C

DASY5 Configuration:
- Probe: EX3DV4 - SN3879; ConvF(4.65, 4.65, 4.65) @ 5800 MHz; Calibrated: 2022-01-27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1344; Calibrated: 2022-01-21
- Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2036
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Pin=50 mW/Area Scan (51x71x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 10.6 W/kg

Pin=50 mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 45.19 V/m; Power Drift = -0.13 dB
Peak SAR (extrapolated) = 19.2 W/kg
SAR(1 g) = 4.02 W/kg; SAR(10 g) = 1.12 W/kg
Smallest distance from peaks to all points 3 dB below = 7.4 mm
Ratio of SAR at M2 to SAR at M1 = 60.3%
Maximum value of SAR (measured) = 10.1 W/kg



Test Laboratory: KES Co., Ltd. Date: 2022-12-12

System Verification for 2450 MHz

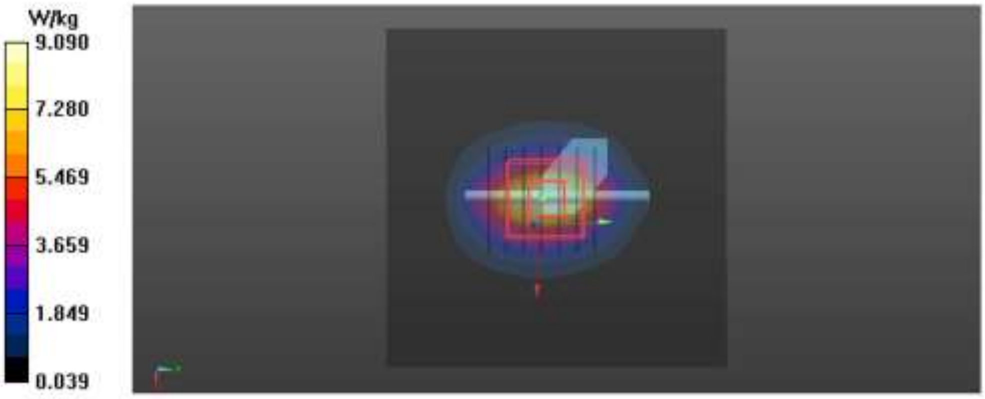
DUT: Dipole D2450V2-SN: 896

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: HSL2450 Medium parameters used: f = 2450 MHz; σ = 1.798 S/m; ε_r = 39.443; ρ = 1000 kg/m^3
Ambient Temperature 22.3 ℃; Liquid Temperature 21.2 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3879; ConvF(7.4, 7.4, 7.4) @ 2450 MHz; Calibrated: 2022-01-27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1344; Calibrated: 2022-01-21
- Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2036
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Pin=100 mW/Area Scan (81x81x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 9.30 W/kg

Pin=100 mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 73.81 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 11.5 W/kg
SAR(1 g) = 5.24 W/kg; SAR(10 g) = 2.37 W/kg
Smallest distance from peaks to all points 3 dB below = 9.8 mm
Ratio of SAR at M2 to SAR at M1 = 44.5%
Maximum value of SAR (measured) = 9.09 W/kg



Test Laboratory: KES Co., Ltd. Date: 2022-07-20

System Verification for 2450 MHz

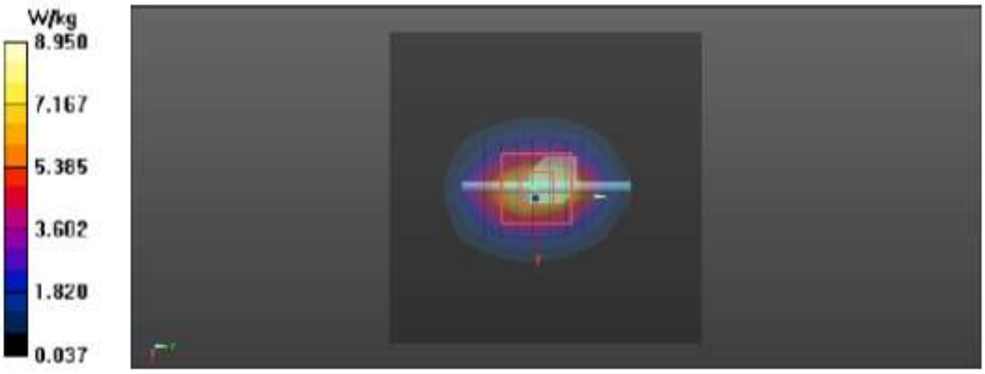
DUT: Dipole D2450V2-SN: 896

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: HSL2450 Medium parameters used: f = 2450 MHz; σ = 1.779 S/m; ε_r = 39.047; ρ = 1000 kg/m^3
Ambient Temperature 22.4°C; Liquid Temperature 21.3°C

DASY5 Configuration:
- Probe: EX3DV4 - SN3879; ConvF(7.4, 7.4, 7.4) @ 2450 MHz; Calibrated: 2022-01-27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1460; Calibrated: 2021-11-23
- Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2036
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Pin=100 mW/Area Scan (81x81x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 9.11 W/kg

Pin=100 mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 72.90 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 11.4 W/kg
SAR(1 g) = 5.16 W/kg; SAR(10 g) = 2.34 W/kg
Smallest distance from peaks to all points 3 dB below = 9.8 mm
Ratio of SAR at M2 to SAR at M1 = 44.6%
Maximum value of SAR (measured) = 8.95 W/kg



Test Laboratory: KES Co., Ltd. Date: 2022-07-21

System Verification for 5300 MHz

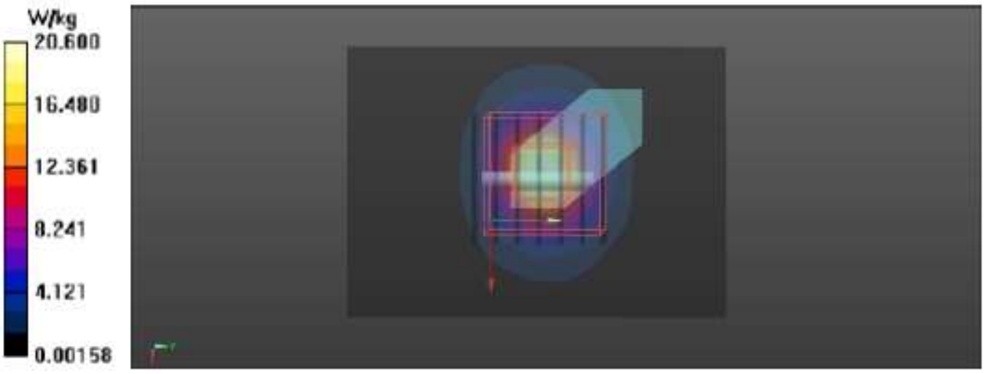
DUT: Dipole D5GHzV2-SN: 1170

Communication System: CW; Frequency: 5300 MHz;Duty Cycle: 1:1
Medium: HSL5GHz Medium parameters used: f = 5300 MHz; σ = 4.655 S/m; ε_r = 35.466; ρ = 1000 kg/m^3
Ambient Temperature 22.7°C; Liquid Temperature 21.6°C

DASY5 Configuration:
- Probe: EX3DV4 - SN3879; ConvF(4.9, 4.9, 4.9) @ 5300 MHz; Calibrated: 2022-01-27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1460; Calibrated: 2021-11-23
- Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2036
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Pin=100 mW/Area Scan (51x71x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 22.3 W/kg

Pin=100 mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 71.84 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 32.8 W/kg
SAR(1 g) = 8.2 W/kg; SAR(10 g) = 2.4 W/kg
Smallest distance from peaks to all points 3 dB below = 7.4 mm
Ratio of SAR at M2 to SAR at M1 = 54.1%
Maximum value of SAR (measured) = 20.6 W/kg



Test Laboratory: KES Co., Ltd. Date: 2022-07-22

System Verification for 5600 MHz

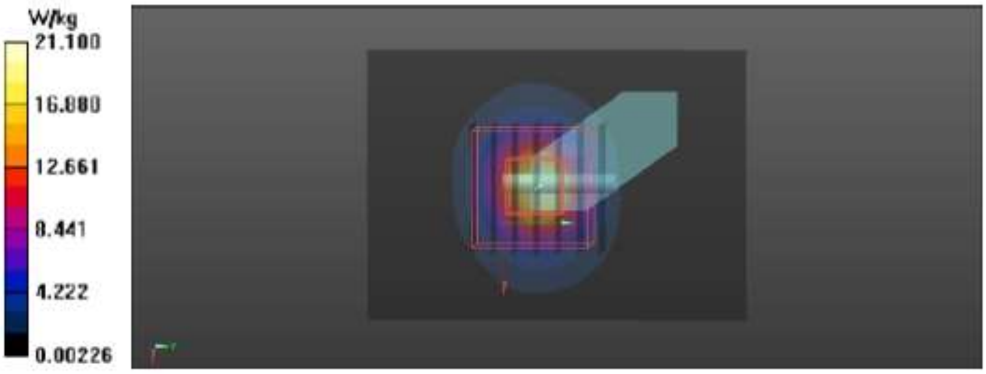
DUT: Dipole D5GHzV2-SN: 1170

Communication System: CW; Frequency: 5600 MHz;Duty Cycle: 1:1
Medium: HSL5GHz Medium parameters used: f = 5600 MHz; σ = 5.011 S/m; ε_r = 34.972; ρ = 1000 kg/m^3
Ambient Temperature 22.8°C; Liquid Temperature 21.5°C

DASY5 Configuration:
- Probe: EX3DV4 - SN3879; ConvF(4.61, 4.61, 4.61) @ 5600 MHz; Calibrated: 2022-01-27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1460; Calibrated: 2021-11-23
- Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2036
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Pin=100 mW/Area Scan (51x71x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 21.6 W/kg

Pin=100 mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 66.28 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 33.6 W/kg
SAR(1 g) = 8.26 W/kg; SAR(10 g) = 2.36 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 53.7%
Maximum value of SAR (measured) = 21.1 W/kg



Test Laboratory: KES Co., Ltd. Date: 2022-07-25

System Verification for 5800 MHz

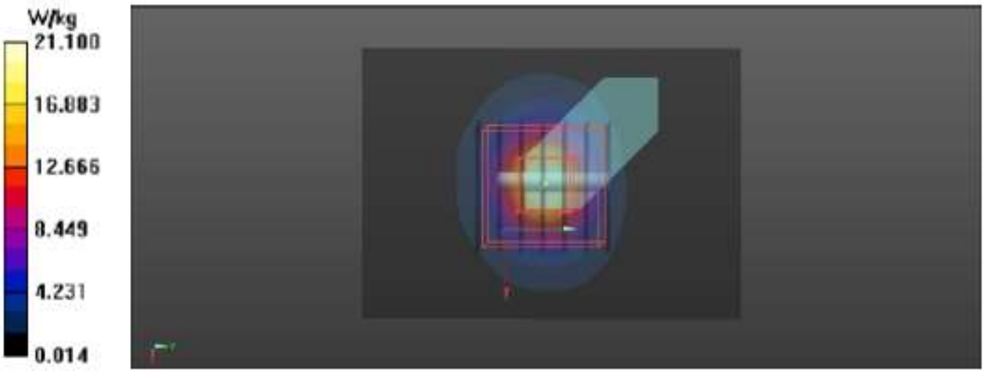
DUT: Dipole D5GHzV2-SN: 1170

Communication System: CW; Frequency: 5800 MHz;Duty Cycle: 1:1
Medium: HSL5GHz Medium parameters used: f = 5800 MHz; σ = 5.173 S/m; ε_r = 34.766; ρ = 1000 kg/m^3
Ambient Temperature 22.5°C; Liquid Temperature 21.3°C

DASY5 Configuration:
- Probe: EX3DV4 - SN3879; ConvF(4.65, 4.65, 4.65) @ 5800 MHz; Calibrated: 2022-01-27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1460; Calibrated: 2021-11-23
- Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2036
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Pin=100 mW/Area Scan (51x71x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 23.1 W/kg

Pin=100 mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 69.98 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 35.5 W/kg
SAR(1 g) = 7.99 W/kg; SAR(10 g) = 2.3 W/kg
Smallest distance from peaks to all points 3 dB below = 7.4 mm
Ratio of SAR at M2 to SAR at M1 = 50.3%
Maximum value of SAR (measured) = 21.1 W/kg



Appendix B. SAR Plots for SAR Measurement

The plots for SAR measurement are shown as follows.

Test Laboratory: KES Co., Ltd. Date: 2022-12-12

P81_2.4 GHz WLAN_802.11b_Front To Mouth_0.5cm_Ch.11_ANT.1

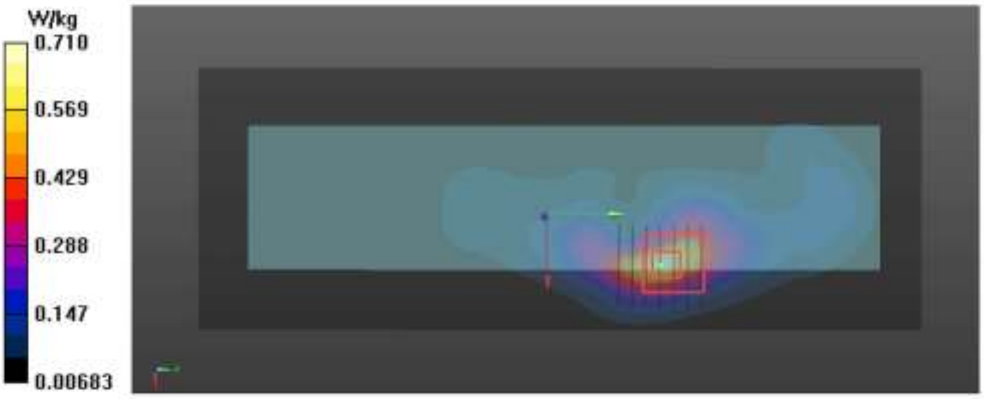
DUT: C4-HALO-BL

Communication System: UID 10415 - AAA, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle);
Frequency: 2462 MHz;Duty Cycle: 1:1.4243
Medium: HSL2450 Medium parameters used: f = 2462 MHz; σ = 1.81 S/m; ε_r = 39.388; ρ = 1000 kg/m^3
Ambient Temperature 22.3 °C; Liquid Temperature 21.2 °C

DASY5 Configuration:
- Probe: EX3DV4 - SN3879; ConvF(7.4, 7.4, 7.4) @ 2462 MHz; Calibrated: 2022-01-27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1344; Calibrated: 2022-01-21
- Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2036
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

- Area Scan (81x221x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.689 W/kg

- Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 6.436 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 1.03 W/kg
SAR(1 g) = 0.451 W/kg; SAR(10 g) = 0.206 W/kg
Smallest distance from peaks to all points 3 dB below = 7.6 mm
Ratio of SAR at M2 to SAR at M1 = 44.7%
Maximum value of SAR (measured) = 0.710 W/kg



Test Laboratory: KES Co., Ltd. Date: 2022-12-12

P91_2.4 GHz WLAN_802.11b_Front To Mouth_0.5cm_Ch.11_ANT.2

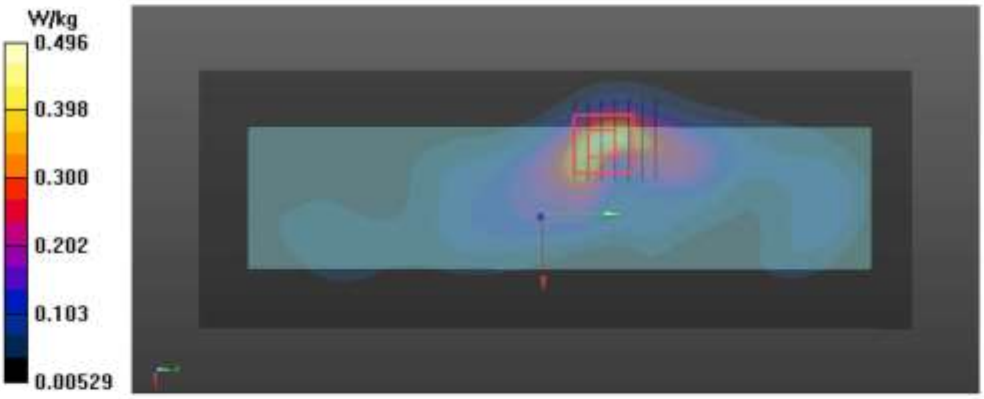
DUT: C4-HALO-BL

Communication System: UID 10415 - AAA, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle);
Frequency: 2462 MHz;Duty Cycle: 1:1.4243
Medium: HSL2450 Medium parameters used: f = 2462 MHz; σ = 1.81 S/m; ε_r = 39.388; ρ = 1000 kg/m^3
Ambient Temperature 22.3 °C; Liquid Temperature 21.2 °C

DASY5 Configuration:
- Probe: EX3DV4 - SN3879; ConvF(7.4, 7.4, 7.4) @ 2462 MHz; Calibrated: 2022-01-27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1344; Calibrated: 2022-01-21
- Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2036
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

- Area Scan (81x221x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.471 W/kg

- Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.855 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 0.734 W/kg
SAR(1 g) = 0.324 W/kg; SAR(10 g) = 0.147 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 47.1%
Maximum value of SAR (measured) = 0.496 W/kg



Test Laboratory: KES Co., Ltd. Date: 2022-12-22

P101_5.3 GHz WLAN_802.11a_Front To Mouth_0.5cm_Ch.52_ANT.1

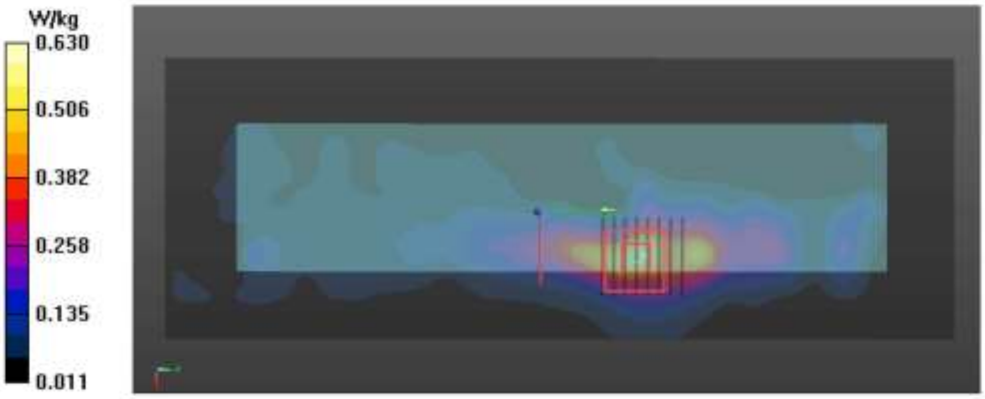
DUT: C4-HALO-BL

Communication System: UID 10417 - AAC, IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc duty cycle); Frequency: 5260 MHz;Duty Cycle: 1:6.64967
Medium: HSL5GHz Medium parameters used: f = 5260 MHz; σ = 4.683 S/m; ε_r = 35.934; ρ = 1000 kg/m^3
Ambient Temperature 22.4 °C; Liquid Temperature 21.3 °C

DASY5 Configuration:
- Probe: EX3DV4 - SN3879; ConvF(4.9, 4.9, 4.9) @ 5260 MHz; Calibrated: 2022-01-27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1344; Calibrated: 2022-01-21
- Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2036
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

- Area Scan (101x281x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.631 W/kg

- Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 11.62 V/m; Power Drift = 0.14 dB
Peak SAR (extrapolated) = 1.24 W/kg
SAR(1 g) = 0.336 W/kg; SAR(10 g) = 0.138 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 65.9%
Maximum value of SAR (measured) = 0.630 W/kg



Test Laboratory: KES Co., Ltd. Date: 2022-12-22

P102_5.3 GHz WLAN_802.11a_Front To Mouth_0.5cm_Ch.52_ANT.2

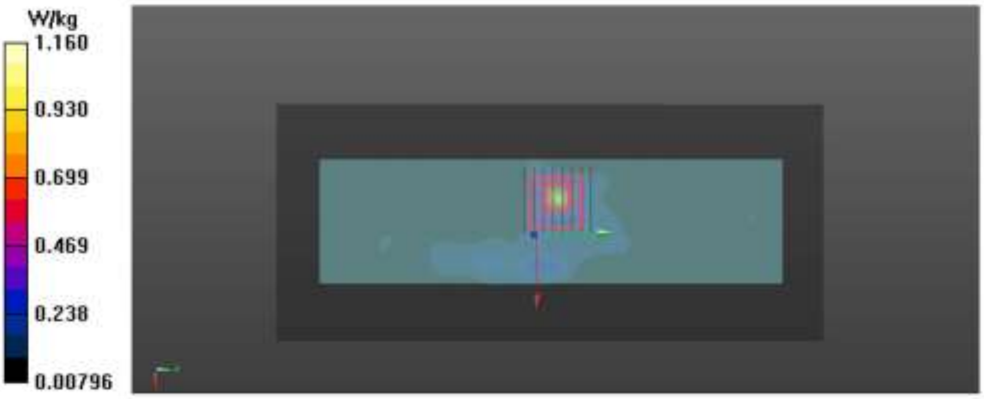
DUT: C4-HALO-BL

Communication System: UID 10417 - AAC, IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc duty cycle); Frequency: 5260 MHz;Duty Cycle: 1:6.64967
Medium: HSL5GHz Medium parameters used: f = 5260 MHz; σ = 4.683 S/m; ε_r = 35.934; ρ = 1000 kg/m³
Ambient Temperature 22.4 ℃; Liquid Temperature 21.3 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3879; ConvF(4.9, 4.9, 4.9) @ 5260 MHz; Calibrated: 2022-01-27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1344; Calibrated: 2022-01-21
- Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2036
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

- Area Scan (101x231x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.06 W/kg

- Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 4.899 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 2.05 W/kg
SAR(1 g) = 0.425 W/kg; SAR(10 g) = 0.125 W/kg
Smallest distance from peaks to all points 3 dB below = 4.2 mm
Ratio of SAR at M2 to SAR at M1 = 64.4%
Maximum value of SAR (measured) = 1.16 W/kg



Test Laboratory: KES Co., Ltd. Date: 2022-12-22

P103_5.6 GHz WLAN_802.11a_Front To Mouth_0.5cm_Ch.120_ANT.1

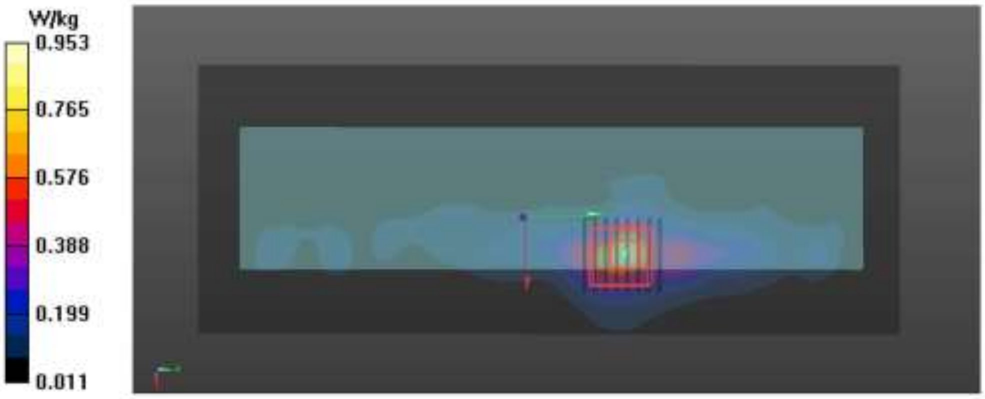
DUT: C4-HALO-BL

Communication System: UID 10417 - AAC, IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc duty cycle); Frequency: 5600 MHz;Duty Cycle: 1:6.64967
Medium: HSL5GHz Medium parameters used: f = 5600 MHz; σ = 5.045 S/m; ε_r = 35.637; ρ = 1000 kg/m^3
Ambient Temperature 22.4 °C; Liquid Temperature 21.3 °C

DASY5 Configuration:
- Probe: EX3DV4 - SN3879; ConvF(4.61, 4.61, 4.61) @ 5600 MHz; Calibrated: 2022-01-27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1344; Calibrated: 2022-01-21
- Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2036
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

- Area Scan (101x261x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.974 W/kg

- Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 2.739 V/m; Power Drift = 0.14 dB
Peak SAR (extrapolated) = 1.73 W/kg
SAR(1 g) = 0.410 W/kg; SAR(10 g) = 0.154 W/kg
Smallest distance from peaks to all points 3 dB below = 7.4 mm
Ratio of SAR at M2 to SAR at M1 = 61.9%
Maximum value of SAR (measured) = 0.953 W/kg



Test Laboratory: KES Co., Ltd. Date: 2022-12-22

P104_5.6 GHz WLAN_802.11a_Front To Mouth_0.5cm_Ch.120_ANT.2

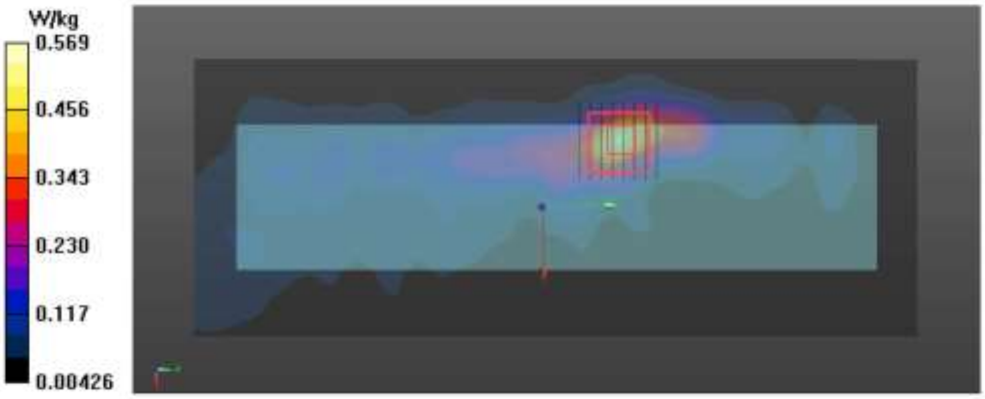
DUT: C4-HALO-BL

Communication System: UID 10417 - AAC, IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc duty cycle); Frequency: 5600 MHz;Duty Cycle: 1:6.64967
Medium: HSL5GHz Medium parameters used: f = 5600 MHz; σ = 5.045 S/m; ε_r = 35.637; ρ = 1000 kg/m^3
Ambient Temperature 22.4 °C; Liquid Temperature 21.3 °C

DASY5 Configuration:
- Probe: EX3DV4 - SN3879; ConvF(4.61, 4.61, 4.61) @ 5600 MHz; Calibrated: 2022-01-27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1344; Calibrated: 2022-01-21
- Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2036
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

- Area Scan (101x261x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.549 W/kg

- Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 11.13 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 1.18 W/kg
SAR(1 g) = 0.304 W/kg; SAR(10 g) = 0.113 W/kg
Smallest distance from peaks to all points 3 dB below = 7.9 mm
Ratio of SAR at M2 to SAR at M1 = 65.3%
Maximum value of SAR (measured) = 0.569 W/kg



Test Laboratory: KES Co., Ltd. Date: 2022-12-22

P105_5.8 GHz WLAN_802.11a_Front To Mouth_0.5cm_Ch.157_ANT.1

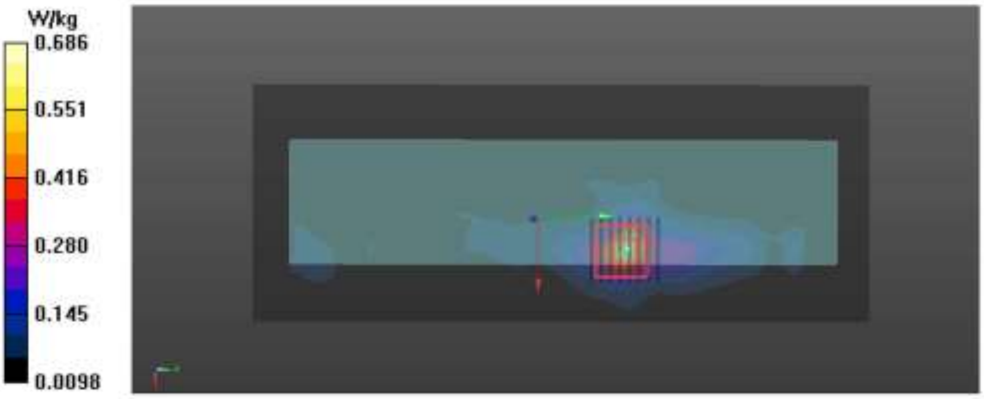
DUT: C4-HALO-BL

Communication System: UID 10417 - AAC, IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc duty cycle); Frequency: 5785 MHz;Duty Cycle: 1:6.64967
Medium: HSL5GHz Medium parameters used: f = 5785 MHz; σ = 5.235 S/m; ε_r = 35.301; ρ = 1000 kg/m^3
Ambient Temperature 22.4 ℃; Liquid Temperature 21.3 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3879; ConvF(4.65, 4.65, 4.65) @ 5785 MHz; Calibrated: 2022-01-27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1344; Calibrated: 2022-01-21
- Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2036
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

- Area Scan (101x261x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.648 W/kg

- Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 12.57 V/m; Power Drift = 0.12 dB
Peak SAR (extrapolated) = 1.31 W/kg
SAR(1 g) = 0.285 W/kg; SAR(10 g) = 0.112 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 58.8%
Maximum value of SAR (measured) = 0.686 W/kg



Test Laboratory: KES Co., Ltd. Date: 2022-12-22

P106_5.8 GHz WLAN_802.11a_Front To Mouth_0.5cm_Ch.157_ANT.2

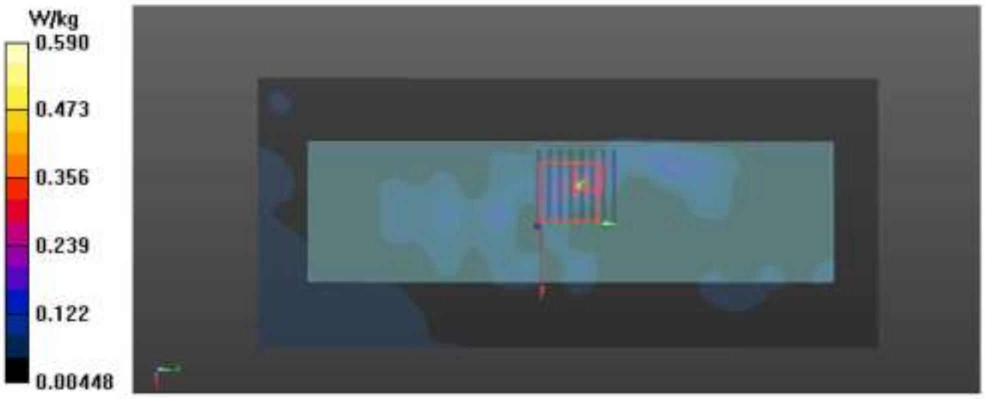
DUT: C4-HALO-BL

Communication System: UID 10417 - AAC, IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc duty cycle); Frequency: 5785 MHz;Duty Cycle: 1:6.64967
Medium: HSL5GHz Medium parameters used: f = 5785 MHz; σ = 5.235 S/m; ε_r = 35.301; ρ = 1000 kg/m^3
Ambient Temperature 22.4 ℃; Liquid Temperature 21.3 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3879; ConvF(4.65, 4.65, 4.65) @ 5785 MHz; Calibrated: 2022-01-27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1344; Calibrated: 2022-01-21
- Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2036
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

- Area Scan (101x231x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.373 W/kg

- Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 5.746 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 1.55 W/kg
SAR(1 g) = 0.152 W/kg; SAR(10 g) = 0.061 W/kg
Smallest distance from peaks to all points 3 dB below = 4.9 mm
Ratio of SAR at M2 to SAR at M1 = 55.8%
Maximum value of SAR (measured) = 0.590 W/kg



Test Laboratory: KES Co., Ltd. Date: 2022-12-12

P83_2.4 GHz WLAN_802.11b_Right Side_0.5cm_Ch.11_ANT.1

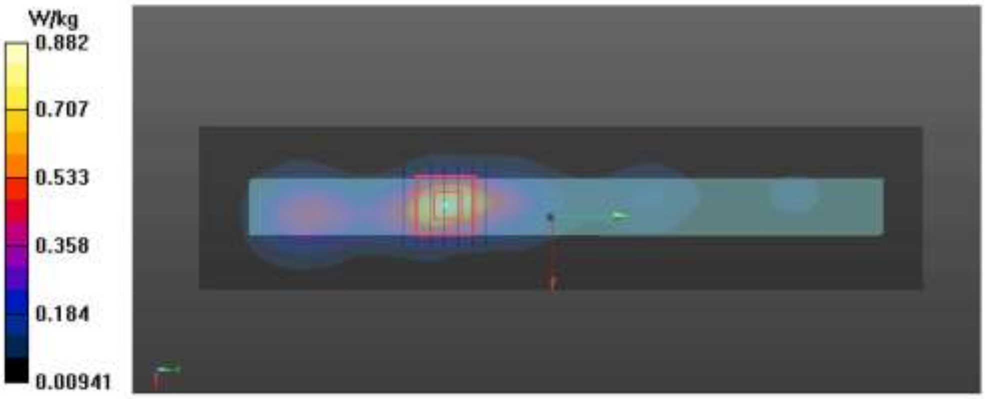
DUT: C4-HALO-BL

Communication System: UID 10415 - AAA, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle);
Frequency: 2462 MHz;Duty Cycle: 1:1.4243
Medium: HSL2450 Medium parameters used: f = 2462 MHz; σ = 1.81 S/m; ε_r = 39.388; ρ = 1000 kg/m^3
Ambient Temperature 22.3 ℃; Liquid Temperature 21.2 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3879; ConvF(7.4, 7.4, 7.4) @ 2462 MHz; Calibrated: 2022-01-27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1344; Calibrated: 2022-01-21
- Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2036
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

- Area Scan (51x221x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.902 W/kg

- Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 6.197 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 1.21 W/kg
SAR(1 g) = 0.568 W/kg; SAR(10 g) = 0.254 W/kg
Smallest distance from peaks to all points 3 dB below = 8.1 mm
Ratio of SAR at M2 to SAR at M1 = 48.6%
Maximum value of SAR (measured) = 0.882 W/kg



Test Laboratory: KES Co., Ltd. Date: 2022-12-12

P94_2.4 GHz WLAN_802.11b_Left Side_0.5cm_Ch.11_ANT.2

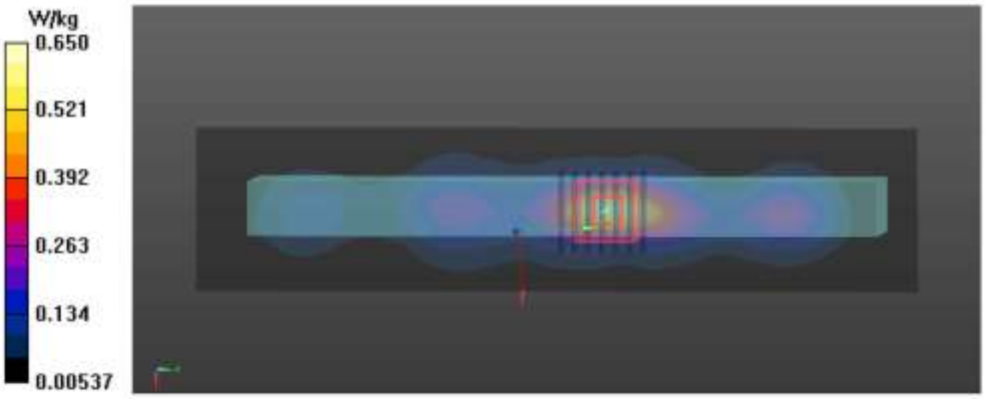
DUT: C4-HALO-BL

Communication System: UID 10415 - AAA, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle); Frequency: 2462 MHz;Duty Cycle: 1:1.4243
Medium: HSL2450 Medium parameters used: f = 2462 MHz; σ = 1.81 S/m; ε_r = 39.388; ρ = 1000 kg/m^3
Ambient Temperature 22.3 °C; Liquid Temperature 21.2 °C

DASY5 Configuration:
- Probe: EX3DV4 - SN3879; ConvF(7.4, 7.4, 7.4) @ 2462 MHz; Calibrated: 2022-01-27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1344; Calibrated: 2022-01-21
- Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2036
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

- Area Scan (51x221x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.638 W/kg

- Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.330 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 0.892 W/kg
SAR(1 g) = 0.419 W/kg; SAR(10 g) = 0.192 W/kg
Smallest distance from peaks to all points 3 dB below = 8.2 mm
Ratio of SAR at M2 to SAR at M1 = 48.3%
Maximum value of SAR (measured) = 0.650 W/kg



Test Laboratory: KES Co., Ltd. Date: 2022-07-20

P03_2.4 GHz WLAN_802.11b_Right Side_0cm_Ch.11_ANT.1

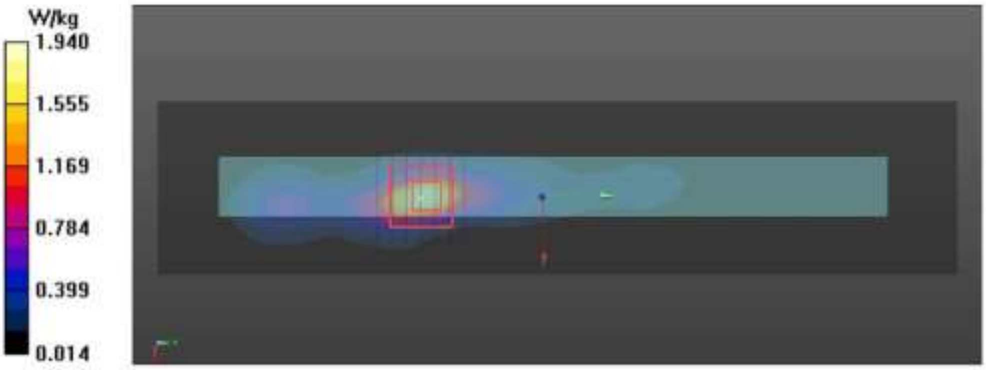
DUT: C4-HALO-BL

Communication System: UID 10415 - AAA, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle);
Frequency: 2462 MHz;Duty Cycle: 1:1.4243
Medium: HSL2450 Medium parameters used: f = 2462 MHz; σ = 1.812 S/m; ε_r = 38.844; ρ = 1000 kg/m^3
Ambient Temperature 22.4°C; Liquid Temperature 21.3°C

DASY5 Configuration:
- Probe: EX3DV4 - SN3879; ConvF(7.4, 7.4, 7.4) @ 2462 MHz; Calibrated: 2022-01-27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1460; Calibrated: 2021-11-23
- Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2036
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

- **Area Scan (51x231x1):** Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 2.00 W/kg

- **Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 34.03 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 2.78 W/kg
SAR(1 g) = 1.21 W/kg; SAR(10 g) = 0.503 W/kg
Smallest distance from peaks to all points 3 dB below = 7.1 mm
Ratio of SAR at M2 to SAR at M1 = 46.9%
Maximum value of SAR (measured) = 1.94 W/kg



Test Laboratory: KES Co., Ltd. Date: 2022-07-20

P11_2.4 GHz WLAN_802.11b_Front Side_0cm_Ch.11_ANT.2

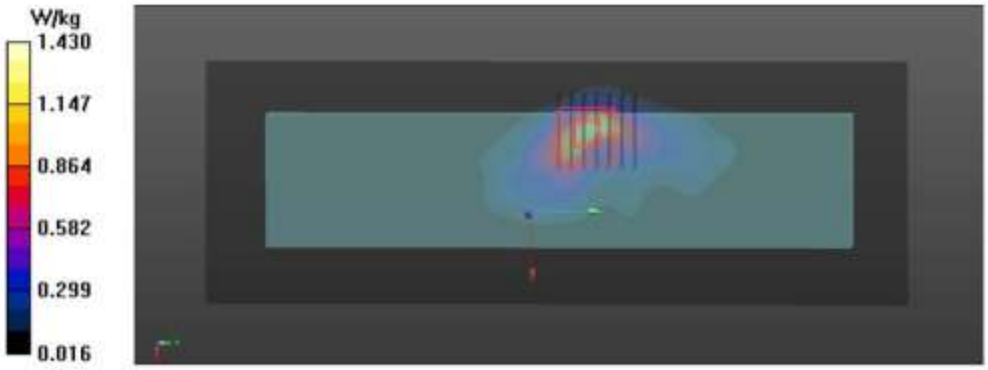
DUT: C4-HALO-BL

Communication System: UID 10415 - AAA, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle); Frequency: 2462 MHz;Duty Cycle: 1:1.4243
Medium: HSL2450 Medium parameters used: f = 2462 MHz; σ = 1.812 S/m; ε_r = 38.844; ρ = 1000 kg/m^3
Ambient Temperature 22.4℃; Liquid Temperature 21.3℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3879; ConvF(7.4, 7.4, 7.4) @ 2462 MHz; Calibrated: 2022-01-27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1460; Calibrated: 2021-11-23
- Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2036
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

- **Area Scan (81x231x1):** Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 1.34 W/kg

- **Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 28.68 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 2.23 W/kg
SAR(1 g) = 0.858 W/kg; SAR(10 g) = 0.360 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 38.3%
Maximum value of SAR (measured) = 1.43 W/kg



Test Laboratory: KES Co., Ltd. Date: 2022-07-21

P23_5.3 GHz WLAN_802.11a_Right Side_0cm_Ch.52_ANT.1

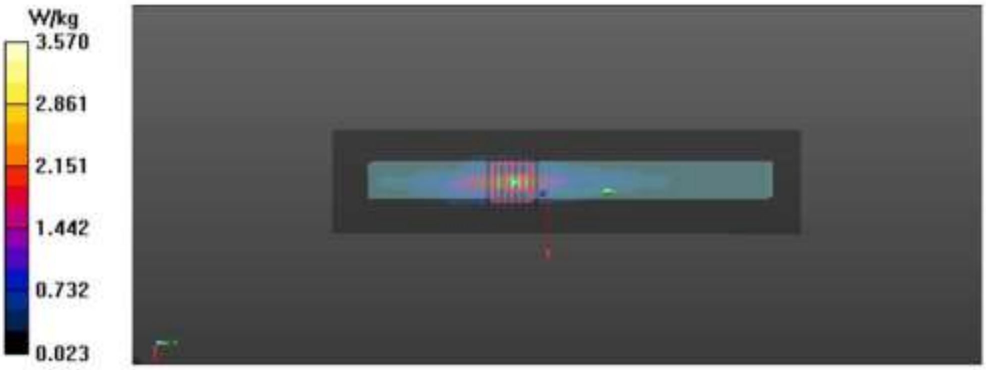
DUT: C4-HALO-BL

Communication System: UID 10417 - AAC, IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc duty cycle); Frequency: 5260 MHz;Duty Cycle: 1:6.64967
Medium: HSL5GHz Medium parameters used: f = 5260 MHz; σ = 4.631 S/m; ε_r = 35.461; ρ = 1000 kg/m^3
Ambient Temperature 22.7℃; Liquid Temperature 21.6℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3879; ConvF(4.9, 4.9, 4.9) @ 5260 MHz; Calibrated: 2022-01-27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1460; Calibrated: 2021-11-23
- Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2036
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

- **Area Scan (61x271x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 3.50 W/kg

- **Zoom Scan (8x8x8)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 30.28 V/m; Power Drift = 0.19 dB
Peak SAR (extrapolated) = 6.16 W/kg
SAR(1 g) = 1.49 W/kg; SAR(10 g) = 0.460 W/kg
Smallest distance from peaks to all points 3 dB below = 5.6 mm
Ratio of SAR at M2 to SAR at M1 = 45%
Maximum value of SAR (measured) = 3.57 W/kg



Test Laboratory: KES Co., Ltd. Date: 2022-07-21

P34_5.3 GHz WLAN_802.11a_Left Side_0cm_Ch.52_ANT.2

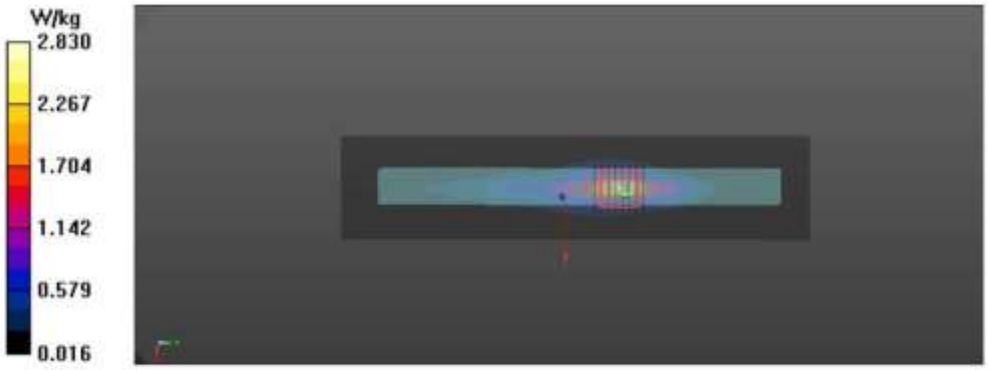
DUT: C4-HALO-BL

Communication System: UID 10417 - AAC, IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc duty cycle); Frequency: 5260 MHz;Duty Cycle: 1:6.64967
Medium: HSL5GHz Medium parameters used: f = 5260 MHz; σ = 4.631 S/m; ε_r = 35.461; ρ = 1000 kg/m^3
Ambient Temperature 22.7°C; Liquid Temperature 21.6°C

DASY5 Configuration:
- Probe: EX3DV4 - SN3879; ConvF(4.9, 4.9, 4.9) @ 5260 MHz; Calibrated: 2022-01-27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1460; Calibrated: 2021-11-23
- Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2036
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

- **Area Scan (61x271x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 3.07 W/kg

- **Zoom Scan (8x8x8)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 26.51 V/m; Power Drift = 0.17 dB
Peak SAR (extrapolated) = 5.76 W/kg
SAR(1 g) = 1.47 W/kg; SAR(10 g) = 0.490 W/kg
Smallest distance from peaks to all points 3 dB below = 5.8 mm
Ratio of SAR at M2 to SAR at M1 = 55.1%
Maximum value of SAR (measured) = 2.83 W/kg



Test Laboratory: KES Co., Ltd. Date: 2022-07-22

P43_5.6 GHz WLAN_802.11a_Right Side_0cm_Ch.120_ANT.1

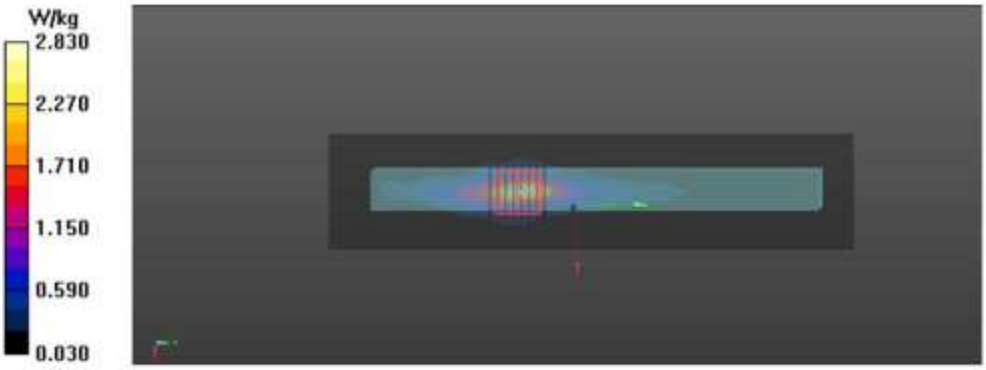
DUT: C4-HALO-BL

Communication System: UID 10417 - AAC, IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc duty cycle); Frequency: 5600 MHz;Duty Cycle: 1:6.64967
Medium: HSL5GHz Medium parameters used: f = 5600 MHz; $\sigma = 5.011$ S/m; $\varepsilon_r = 34.972$; $\rho = 1000$ kg/m^3
Ambient Temperature 22.8°C; Liquid Temperature 21.5°C

DASY5 Configuration:
- Probe: EX3DV4 - SN3879; ConvF(4.61, 4.61, 4.61) @ 5600 MHz; Calibrated: 2022-01-27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1460; Calibrated: 2021-11-23
- Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2036
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

- **Area Scan (61x271x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 2.77 W/kg

- **Zoom Scan (8x8x8)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 23.54 V/m; Power Drift = 0.16 dB
Peak SAR (extrapolated) = 5.76 W/kg
SAR(1 g) = 1.39 W/kg; SAR(10 g) = 0.472 W/kg
Smallest distance from peaks to all points 3 dB below = 5.8 mm
Ratio of SAR at M2 to SAR at M1 = 53.9%
Maximum value of SAR (measured) = 2.83 W/kg



Test Laboratory: KES Co., Ltd. Date: 2022-07-22

P54_5.6 GHz WLAN_802.11a_Right Side_0cm_Ch.120_ANT.2

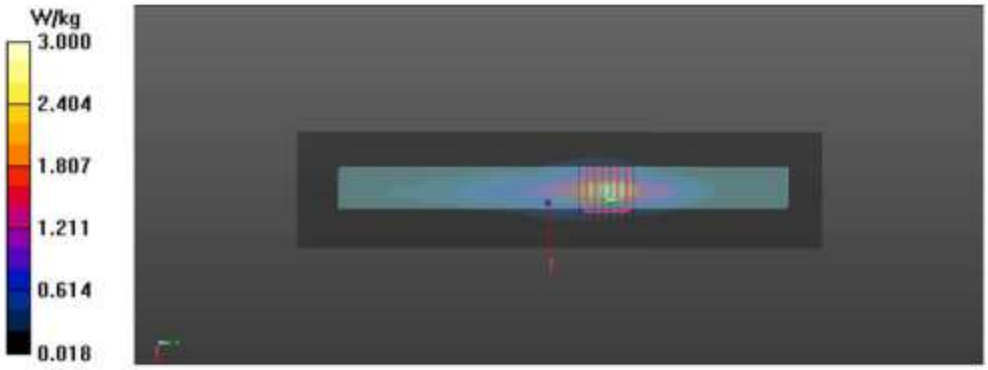
DUT: C4-HALO-BL

Communication System: UID 10417 - AAC, IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc duty cycle); Frequency: 5600 MHz;Duty Cycle: 1:6.64967
Medium: HSL5GHz Medium parameters used: f = 5600 MHz; $\sigma = 5.011$ S/m; $\varepsilon_r = 34.972$; $\rho = 1000$ kg/m^3
Ambient Temperature 22.8℃; Liquid Temperature 21.5℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3879; ConvF(4.61, 4.61, 4.61) @ 5600 MHz; Calibrated: 2022-01-27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1460; Calibrated: 2021-11-23
- Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2036
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

- **Area Scan (61x271x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 3.23 W/kg

- **Zoom Scan (8x8x8)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 25.43 V/m; Power Drift = 0.10 dB
Peak SAR (extrapolated) = 6.08 W/kg
SAR(1 g) = 1.57 W/kg; SAR(10 g) = 0.517 W/kg
Smallest distance from peaks to all points 3 dB below = 6.4 mm
Ratio of SAR at M2 to SAR at M1 = 55.7%
Maximum value of SAR (measured) = 3.00 W/kg



Test Laboratory: KES Co., Ltd. Date: 2022-07-25

P63_5.8 GHz WLAN_802.11a_Right Side_0cm_Ch.157_ANT.1

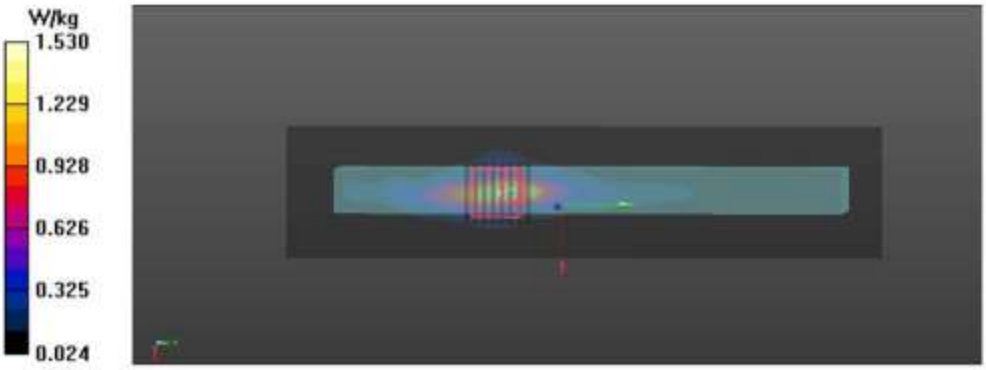
DUT: C4-HALO-BL

Communication System: UID 10417 - AAC, IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc duty cycle); Frequency: 5785 MHz;Duty Cycle: 1:6.64967
Medium: HSL5GHz Medium parameters used: f = 5785 MHz; σ = 5.12 S/m; ε_r = 34.711; ρ = 1000 kg/m^3
Ambient Temperature 22.5°C; Liquid Temperature 21.3°C

DASY5 Configuration:
- Probe: EX3DV4 - SN3879; ConvF(4.65, 4.65, 4.65) @ 5785 MHz; Calibrated: 2022-01-27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1460; Calibrated: 2021-11-23
- Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2036
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

- **Area Scan (61x271x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.47 W/kg

- **Zoom Scan (8x8x8)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 18.49 V/m; Power Drift = 0.17 dB
Peak SAR (extrapolated) = 3.33 W/kg
SAR(1 g) = 0.748 W/kg; SAR(10 g) = 0.267 W/kg
Smallest distance from peaks to all points 3 dB below = 5.6 mm
Ratio of SAR at M2 to SAR at M1 = 52.2%
Maximum value of SAR (measured) = 1.53 W/kg



Test Laboratory: KES Co., Ltd. Date: 2022-07-25

P74_5.8 GHz WLAN_802.11a_Left Side_0cm_Ch.157_ANT.2

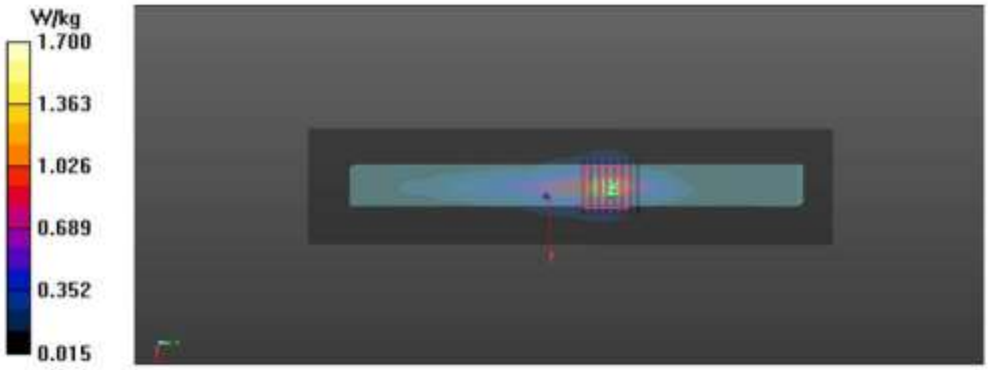
DUT: C4-HALO-BL

Communication System: UID 10417 - AAC, IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc duty cycle); Frequency: 5785 MHz;Duty Cycle: 1:6.64967
Medium: HSL5GHz Medium parameters used: f = 5785 MHz; σ = 5.12 S/m; ε_r = 34.711; ρ = 1000 kg/m^3
Ambient Temperature 22.5°C; Liquid Temperature 21.3°C

DASY5 Configuration:
- Probe: EX3DV4 - SN3879; ConvF(4.65, 4.65, 4.65) @ 5785 MHz; Calibrated: 2022-01-27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1460; Calibrated: 2021-11-23
- Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2036
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

- **Area Scan (61x271x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.86 W/kg

- **Zoom Scan (8x8x8)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 22.49 V/m; Power Drift = 0.16 dB
Peak SAR (extrapolated) = 3.64 W/kg
SAR(1 g) = 0.888 W/kg; SAR(10 g) = 0.298 W/kg
Smallest distance from peaks to all points 3 dB below = 6.6 mm
Ratio of SAR at M2 to SAR at M1 = 52.4%
Maximum value of SAR (measured) = 1.70 W/kg



Appendix C. Probe & Dipole Antenna Calibration Certificates

The SPEAG calibration certificates are shown as follows.

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

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

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

Accreditation No.: **SCS 0108**

Client **KES (Dymstec)**

Certificate No: **EX3-3879_Jan22**

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3879
Calibration procedure(s)	QA CAL-01.v9, QA CAL-12.v9, QA CAL-14.v6, QA CAL-23.v5, QA CAL-25.v7 Calibration procedure for dosimetric E-field probes
Calibration date:	January 27, 2022

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	09-Apr-21 (No. 217-03291/03292)	Apr-22
Power sensor NRP-Z91	SN: 103244	09-Apr-21 (No. 217-03291)	Apr-22
Power sensor NRP-Z91	SN: 103245	09-Apr-21 (No. 217-03292)	Apr-22
Reference 20 dB Attenuator	SN: CC2552 (20x)	09-Apr-21 (No. 217-03343)	Apr-22
DAE4	SN: 660	13-Oct-21 (No. DAE4-660_Oct21)	Oct-22
Reference Probe ES3DV2	SN: 3013	27-Dec-21 (No. ES3-3013_Dec21)	Dec-22
Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-20)	In house check: Jun-22
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-20)	In house check: Jun-22
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-20)	In house check: Jun-22
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-20)	In house check: Jun-22
Network Analyzer E8358A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-22

	Name	Function	Signature
Calibrated by:	Leif Klysner	Laboratory Technician	*Leif Klysner*
Approved by:	Sven Kühn	Deputy Manager	*S K*

Issued: February 1, 2022

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

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

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

Accreditation No.: **SCS 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEC/IEEE 62209-1528, "Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.

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

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z*: Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z*: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR*: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z*: *A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters*: Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3879

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.29	0.41	0.38	± 10.1 %
DCP (mV)[B]	103.9	99.9	101.9	

Calibration Results for Modulation Response

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Max dev.	Max Unc[E] (k=2)
0	CW	X	0.00	0.00	1.00	0.00	179.0	± 2.7 %	± 4.7 %
		Y	0.00	0.00	1.00		157.6		
		Z	0.00	0.00	1.00		161.9		
10352-AAA	Pulse Waveform (200Hz, 10%)	X	5.81	74.71	14.48	10.00	60.0	± 3.3 %	± 9.6 %
		Y	20.00	89.83	20.19		60.0		
		Z	86.00	112.00	27.00		60.0		
10353-AAA	Pulse Waveform (200Hz, 20%)	X	20.00	87.59	17.14	6.99	80.0	± 1.9 %	± 9.6 %
		Y	20.00	90.27	19.04		80.0		
		Z	20.00	95.97	22.43		80.0		
10354-AAA	Pulse Waveform (200Hz, 40%)	X	20.00	88.25	15.98	3.98	95.0	± 1.2 %	± 9.6 %
		Y	20.00	90.81	17.68		95.0		
		Z	20.00	100.93	23.44		95.0		
10355-AAA	Pulse Waveform (200Hz, 60%)	X	20.00	88.18	14.74	2.22	120.0	± 1.1 %	± 9.6 %
		Y	20.00	87.27	14.63		120.0		
		Z	20.00	107.33	24.97		120.0		
10387-AAA	QPSK Waveform, 1 MHz	X	1.74	68.50	15.96	1.00	150.0	± 3.0 %	± 9.6 %
		Y	1.48	65.01	14.12		150.0		
		Z	1.67	65.65	14.86		150.0		
10388-AAA	QPSK Waveform, 10 MHz	X	2.30	69.56	16.59	0.00	150.0	± 0.8 %	± 9.6 %
		Y	2.17	67.91	15.46		150.0		
		Z	2.22	67.77	15.57		150.0		
10396-AAA	64-QAM Waveform, 100 kHz	X	2.85	71.07	19.04	3.01	150.0	± 1.0 %	± 9.6 %
		Y	2.62	68.20	17.66		150.0		
		Z	3.24	71.61	19.22		150.0		
10399-AAA	64-QAM Waveform, 40 MHz	X	3.52	67.76	16.16	0.00	150.0	± 2.2 %	± 9.6 %
		Y	3.48	67.17	15.72		150.0		
		Z	3.50	66.99	15.69		150.0		
10414-AAA	WLAN CCDF, 64-QAM, 40MHz	X	4.81	66.05	15.78	0.00	150.0	± 4.0 %	± 9.6 %
		Y	4.89	65.87	15.64		150.0		
		Z	4.88	65.53	15.46		150.0		

Note: For details on UID parameters see Appendix

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

[A] The uncertainties of Norm X,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3879

Sensor Model Parameters

	C1 fF	C2 fF	α V^{-1}	T1 $ms.V^{-2}$	T2 $ms.V^{-1}$	T3 ms	T4 V^{-2}	T5 V^{-1}	T6
X	38.5	283.92	34.85	8.43	0.32	5.03	1.03	0.22	1.01
Y	45.0	340.84	36.43	11.24	0.53	5.07	0.00	0.50	1.01
Z	50.1	373.04	35.34	16.57	0.24	5.10	1.35	0.31	1.01

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	166
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	1.4 mm

Note: Measurement distance from surface can be increased to 3-4 mm for an *Area Scan* job.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3879

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
450	43.5	0.87	10.16	10.16	10.16	0.16	1.30	± 13.3 %
600	42.7	0.88	10.09	10.09	10.09	0.10	1.25	± 13.3 %
750	41.9	0.89	9.85	9.85	9.85	0.46	0.88	± 12.0 %
835	41.5	0.90	9.49	9.49	9.49	0.34	1.04	± 12.0 %
900	41.5	0.97	9.48	9.48	9.48	0.35	0.94	± 12.0 %
1750	40.1	1.37	8.50	8.50	8.50	0.30	0.86	± 12.0 %
1900	40.0	1.40	8.11	8.11	8.11	0.29	0.86	± 12.0 %
1950	40.0	1.40	7.81	7.81	7.81	0.28	0.86	± 12.0 %
2450	39.2	1.80	7.40	7.40	7.40	0.32	0.90	± 12.0 %
2600	39.0	1.96	7.24	7.24	7.24	0.35	0.90	± 12.0 %
5200	36.0	4.66	5.00	5.00	5.00	0.40	1.80	± 13.1 %
5300	35.9	4.76	4.90	4.90	4.90	0.40	1.80	± 13.1 %
5500	35.6	4.96	4.75	4.75	4.75	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.61	4.61	4.61	0.40	1.80	± 13.1 %
5800	35.3	5.27	4.65	4.65	4.65	0.40	1.80	± 13.1 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Validity of ConvF assessed at 6 MHz is 4-9 MHz, and ConvF assessed at 13 MHz is 9-19 MHz. Above 5 GHz frequency validity can be extended to ± 110 MHz.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3879

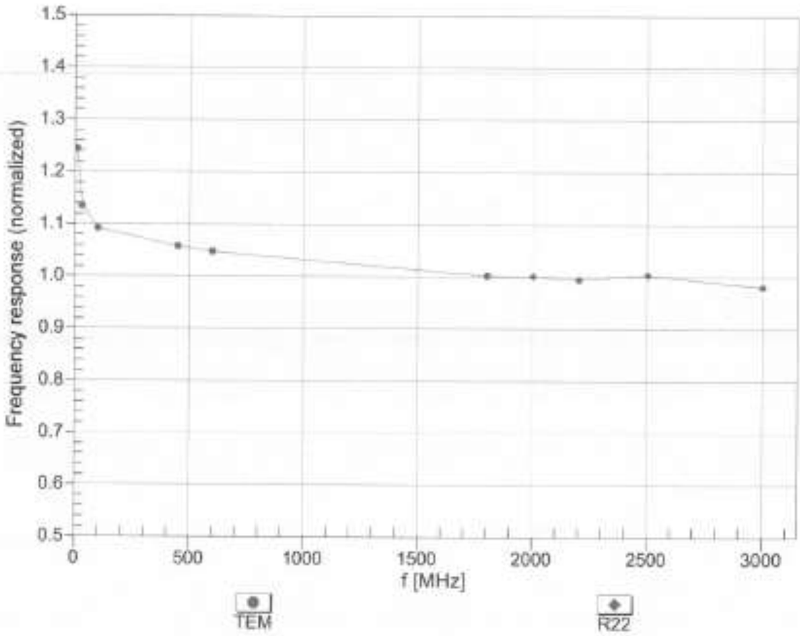
Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
6500	34.5	6.07	5.15	5.15	5.15	0.20	2.50	± 18.6 %

[C] Frequency validity above 6GHz is ± 700 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies 6-10 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz; below ± 2% for frequencies between 3-6 GHz; and below ± 4% for frequencies between 6-10 GHz at any distance larger than half the probe tip diameter from the boundary.

Frequency Response of E-Field

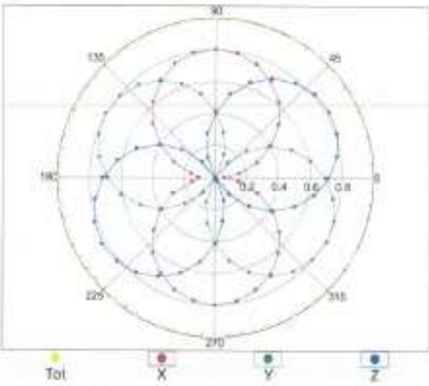
(TEM-Cell:ifi110 EXX, Waveguide: R22)



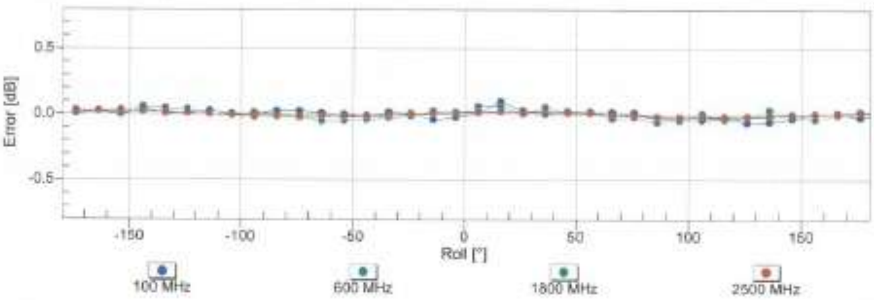
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), $\vartheta = 0°$

f=600 MHz,TEM



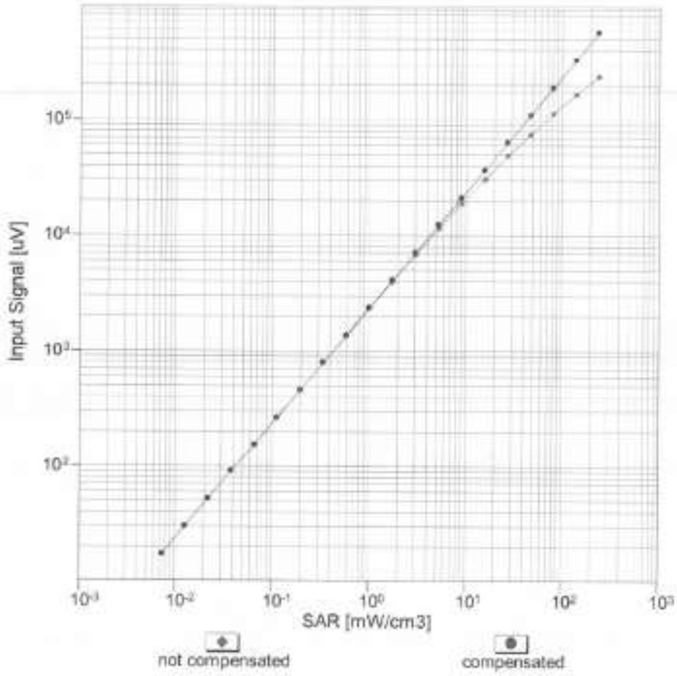
f=1800 MHz,R22

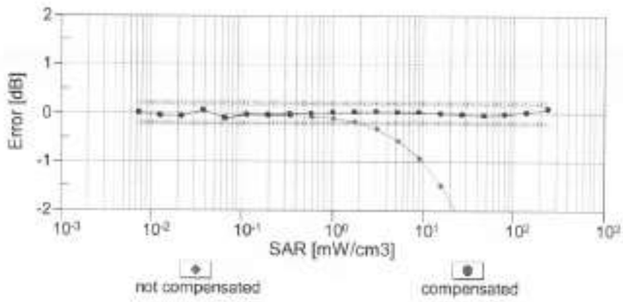


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})

(TEM cell , f_{eval}= 1900 MHz)





Uncertainty of Linearity Assessment: ± 0.6% (k=2)

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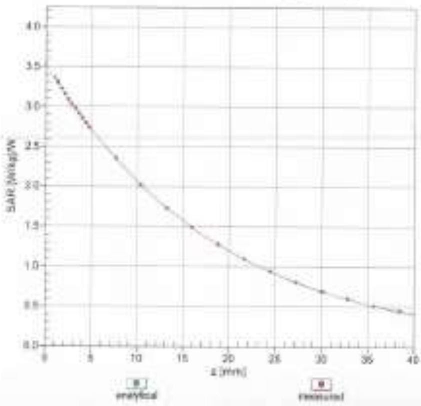
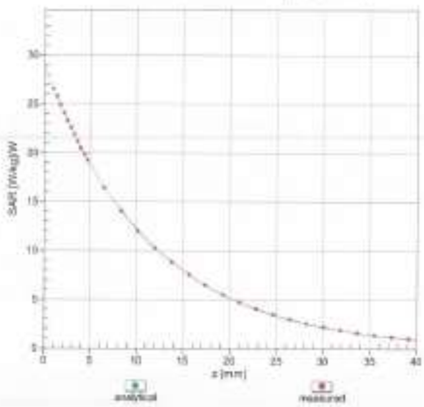
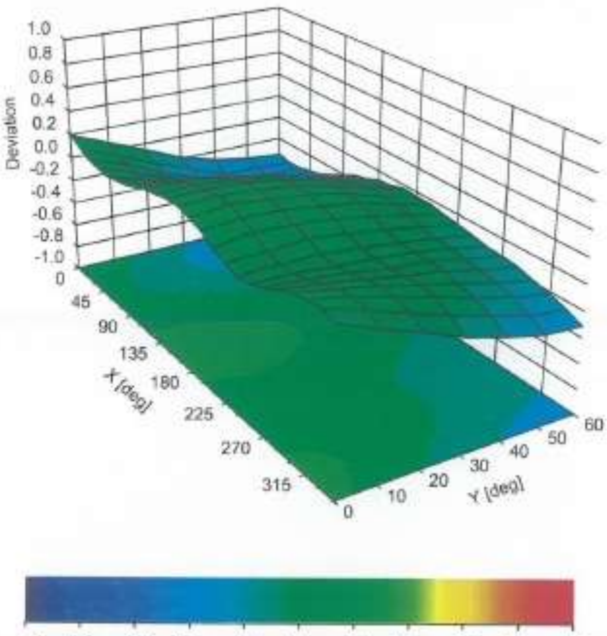
Conversion Factor Assessment





Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

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Appendix: Modulation Calibration Parameters

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

10100	CAE	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	LTE-FDD	5.67	± 9.6 %
10101	CAE	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM)	LTE-FDD	6.42	± 9.6 %
10102	CAE	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM)	LTE-FDD	6.60	± 9.6 %
10103	CAG	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	LTE-TDD	9.29	± 9.6 %
10104	CAG	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM)	LTE-TDD	9.97	± 9.6 %
10105	CAG	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM)	LTE-TDD	10.01	± 9.6 %
10108	CAG	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	LTE-FDD	5.80	± 9.6 %
10109	CAG	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM)	LTE-FDD	6.43	± 9.6 %
10110	CAG	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	LTE-FDD	5.75	± 9.6 %
10111	CAG	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM)	LTE-FDD	6.44	± 9.6 %
10112	CAG	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM)	LTE-FDD	6.59	± 9.6 %
10113	CAG	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM)	LTE-FDD	6.62	± 9.6 %
10114	CAD	IEEE 802.11n (HT Greenfield, 13.5 Mbps, BPSK)	WLAN	8.10	± 9.6 %
10115	CAD	IEEE 802.11n (HT Greenfield, 81 Mbps, 16-QAM)	WLAN	8.46	± 9.6 %
10116	CAD	IEEE 802.11n (HT Greenfield, 135 Mbps, 64-QAM)	WLAN	8.15	± 9.6 %
10117	CAD	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	WLAN	8.07	± 9.6 %
10118	CAD	IEEE 802.11n (HT Mixed, 81 Mbps, 16-QAM)	WLAN	8.59	± 9.6 %
10119	CAD	IEEE 802.11n (HT Mixed, 135 Mbps, 64-QAM)	WLAN	8.13	± 9.6 %
10140	CAE	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM)	LTE-FDD	6.49	± 9.6 %
10141	CAE	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM)	LTE-FDD	6.53	± 9.6 %
10142	CAE	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, QPSK)	LTE-FDD	5.73	± 9.6 %
10143	CAE	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM)	LTE-FDD	6.35	± 9.6 %
10144	CAE	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM)	LTE-FDD	6.65	± 9.6 %
10145	CAF	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK)	LTE-FDD	5.76	± 9.6 %
10146	CAF	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM)	LTE-FDD	6.41	± 9.6 %
10147	CAF	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM)	LTE-FDD	6.72	± 9.6 %
10149	CAE	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM)	LTE-FDD	6.42	± 9.6 %
10150	CAE	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM)	LTE-FDD	6.60	± 9.6 %
10151	CAG	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	LTE-TDD	9.28	± 9.6 %
10152	CAG	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM)	LTE-TDD	9.92	± 9.6 %
10153	CAG	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM)	LTE-TDD	10.05	± 9.6 %
10154	CAG	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	LTE-FDD	5.75	± 9.6 %
10155	CAG	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM)	LTE-FDD	6.43	± 9.6 %
10156	CAG	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, QPSK)	LTE-FDD	5.79	± 9.6 %
10157	CAG	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM)	LTE-FDD	6.49	± 9.6 %
10158	CAG	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM)	LTE-FDD	6.62	± 9.6 %
10159	CAG	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM)	LTE-FDD	6.56	± 9.6 %
10160	CAE	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	LTE-FDD	5.82	± 9.6 %
10161	CAE	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM)	LTE-FDD	6.43	± 9.6 %
10162	CAE	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM)	LTE-FDD	6.58	± 9.6 %
10166	CAF	LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK)	LTE-FDD	5.46	± 9.6 %
10167	CAF	LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM)	LTE-FDD	6.21	± 9.6 %
10168	CAF	LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM)	LTE-FDD	6.79	± 9.6 %
10169	CAE	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	LTE-FDD	5.73	± 9.6 %
10170	CAE	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM)	LTE-FDD	6.52	± 9.6 %
10171	AAE	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM)	LTE-FDD	6.49	± 9.6 %
10172	CAG	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	LTE-TDD	9.21	± 9.6 %
10173	CAG	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM)	LTE-TDD	9.48	± 9.6 %
10174	CAG	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM)	LTE-TDD	10.25	± 9.6 %
10175	CAG	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	LTE-FDD	5.72	± 9.6 %
10176	CAG	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM)	LTE-FDD	6.52	± 9.6 %
10177	CAI	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, QPSK)	LTE-FDD	5.73	± 9.6 %
10178	CAG	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM)	LTE-FDD	6.52	± 9.6 %
10179	CAG	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM)	LTE-FDD	6.50	± 9.6 %
10180	CAG	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM)	LTE-FDD	6.50	± 9.6 %
10181	CAE	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	LTE-FDD	5.73	± 9.6 %

10182	CAE	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM)	LTE-FDD	6.52	± 9.6 %
10183	AAD	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM)	LTE-FDD	6.50	± 9.6 %
10184	CAE	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, QPSK)	LTE-FDD	5.73	± 9.6 %
10185	CAE	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM)	LTE-FDD	6.51	± 9.6 %
10186	AAE	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM)	LTE-FDD	6.50	± 9.6 %
10187	CAF	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK)	LTE-FDD	5.73	± 9.6 %
10188	CAF	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM)	LTE-FDD	6.52	± 9.6 %
10189	AAF	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM)	LTE-FDD	6.50	± 9.6 %
10193	CAD	IEEE 802.11n (HT Greenfield, 6.5 Mbps, BPSK)	WLAN	8.09	± 9.6 %
10194	CAD	IEEE 802.11n (HT Greenfield, 39 Mbps, 16-QAM)	WLAN	8.12	± 9.6 %
10195	CAD	IEEE 802.11n (HT Greenfield, 65 Mbps, 64-QAM)	WLAN	8.21	± 9.6 %
10196	CAD	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	WLAN	8.10	± 9.6 %
10197	CAD	IEEE 802.11n (HT Mixed, 39 Mbps, 16-QAM)	WLAN	8.13	± 9.6 %
10198	CAD	IEEE 802.11n (HT Mixed, 65 Mbps, 64-QAM)	WLAN	8.27	± 9.6 %
10219	CAD	IEEE 802.11n (HT Mixed, 7.2 Mbps, BPSK)	WLAN	8.03	± 9.6 %
10220	CAD	IEEE 802.11n (HT Mixed, 43.3 Mbps, 16-QAM)	WLAN	8.13	± 9.6 %
10221	CAD	IEEE 802.11n (HT Mixed, 72.2 Mbps, 64-QAM)	WLAN	8.27	± 9.6 %
10222	CAD	IEEE 802.11n (HT Mixed, 15 Mbps, BPSK)	WLAN	8.06	± 9.6 %
10223	CAD	IEEE 802.11n (HT Mixed, 90 Mbps, 16-QAM)	WLAN	8.48	± 9.6 %
10224	CAD	IEEE 802.11n (HT Mixed, 150 Mbps, 64-QAM)	WLAN	8.08	± 9.6 %
10225	CAB	UMTS-FDD (HSPA+)	WCDMA	5.97	± 9.6 %
10226	CAB	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM)	LTE-TDD	9.49	± 9.6 %
10227	CAB	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM)	LTE-TDD	10.26	± 9.6 %
10228	CAB	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK)	LTE-TDD	9.22	± 9.6 %
10229	CAD	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM)	LTE-TDD	9.48	± 9.6 %
10230	CAD	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM)	LTE-TDD	10.25	± 9.6 %
10231	CAD	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, QPSK)	LTE-TDD	9.19	± 9.6 %
10232	CAG	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM)	LTE-TDD	9.48	± 9.6 %
10233	CAG	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM)	LTE-TDD	10.25	± 9.6 %
10234	CAG	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK)	LTE-TDD	9.21	± 9.6 %
10235	CAG	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM)	LTE-TDD	9.48	± 9.6 %
10236	CAG	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM)	LTE-TDD	10.25	± 9.6 %
10237	CAG	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	LTE-TDD	9.21	± 9.6 %
10238	CAF	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM)	LTE-TDD	9.48	± 9.6 %
10239	CAF	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM)	LTE-TDD	10.25	± 9.6 %
10240	CAF	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	LTE-TDD	9.21	± 9.6 %
10241	CAB	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM)	LTE-TDD	9.82	± 9.6 %
10242	CAB	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM)	LTE-TDD	9.86	± 9.6 %
10243	CAB	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK)	LTE-TDD	9.46	± 9.6 %
10244	CAD	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM)	LTE-TDD	10.06	± 9.6 %
10245	CAD	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM)	LTE-TDD	10.06	± 9.6 %
10246	CAD	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, QPSK)	LTE-TDD	9.30	± 9.6 %
10247	CAG	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM)	LTE-TDD	9.91	± 9.6 %
10248	CAG	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM)	LTE-TDD	10.09	± 9.6 %
10249	CAG	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, QPSK)	LTE-TDD	9.29	± 9.6 %
10250	CAG	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM)	LTE-TDD	9.81	± 9.6 %
10251	CAG	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM)	LTE-TDD	10.17	± 9.6 %
10252	CAG	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	LTE-TDD	9.24	± 9.6 %
10253	CAF	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM)	LTE-TDD	9.90	± 9.6 %
10254	CAF	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM)	LTE-TDD	10.14	± 9.6 %
10255	CAF	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	LTE-TDD	9.20	± 9.6 %
10256	CAB	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM)	LTE-TDD	9.96	± 9.6 %
10257	CAB	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM)	LTE-TDD	10.08	± 9.6 %
10258	CAB	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK)	LTE-TDD	9.34	± 9.6 %
10259	CAD	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM)	LTE-TDD	9.98	± 9.6 %
10260	CAD	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM)	LTE-TDD	9.97	± 9.6 %

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10261	CAD	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, QPSK)	LTE-TDD	9.24	± 9.6 %
10262	CAG	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM)	LTE-TDD	9.83	± 9.6 %
10263	CAG	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM)	LTE-TDD	10.16	± 9.6 %
10264	CAG	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	LTE-TDD	9.23	± 9.6 %
10265	CAG	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM)	LTE-TDD	9.92	± 9.6 %
10266	CAG	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM)	LTE-TDD	10.07	± 9.6 %
10267	CAG	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	LTE-TDD	9.30	± 9.6 %
10268	CAF	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM)	LTE-TDD	10.06	± 9.6 %
10269	CAF	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM)	LTE-TDD	10.13	± 9.6 %
10270	CAF	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	LTE-TDD	9.58	± 9.6 %
10274	CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.10)	WCDMA	4.87	± 9.6 %
10275	CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	WCDMA	3.96	± 9.6 %
10277	CAA	PHS (QPSK)	PHS	11.81	± 9.6 %
10278	CAA	PHS (QPSK, BW 884MHz, Rolloff 0.5)	PHS	11.81	± 9.6 %
10279	CAA	PHS (QPSK, BW 884MHz, Rolloff 0.38)	PHS	12.18	± 9.6 %
10290	AAB	CDMA2000, RC1, SO55, Full Rate	CDMA2000	3.91	± 9.6 %
10291	AAB	CDMA2000, RC3, SO55, Full Rate	CDMA2000	3.46	± 9.6 %
10292	AAB	CDMA2000, RC3, SO32, Full Rate	CDMA2000	3.39	± 9.6 %
10293	AAB	CDMA2000, RC3, SO3, Full Rate	CDMA2000	3.50	± 9.6 %
10295	AAB	CDMA2000, RC1, SO3, 1/8th Rate 25 fr.	CDMA2000	12.49	± 9.6 %
10297	AAD	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	LTE-FDD	5.81	± 9.6 %
10298	AAD	LTE-FDD (SC-FDMA, 50% RB, 3 MHz, QPSK)	LTE-FDD	5.72	± 9.6 %
10299	AAD	LTE-FDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM)	LTE-FDD	6.39	± 9.6 %
10300	AAD	LTE-FDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM)	LTE-FDD	6.60	± 9.6 %
10301	AAA	IEEE 802.16e WiMAX (29:18, 5ms, 10MHz, QPSK, PUSC)	WiMAX	12.03	± 9.6 %
10302	AAA	IEEE 802.16e WiMAX (29:18, 5ms, 10MHz, QPSK, PUSC, 3CTRL)	WiMAX	12.57	± 9.6 %
10303	AAA	IEEE 802.16e WiMAX (31:15, 5ms, 10MHz, 64QAM, PUSC)	WiMAX	12.52	± 9.6 %
10304	AAA	IEEE 802.16e WiMAX (29:18, 5ms, 10MHz, 64QAM, PUSC)	WiMAX	11.86	± 9.6 %
10305	AAA	IEEE 802.16e WiMAX (31:15, 10ms, 10MHz, 64QAM, PUSC)	WiMAX	15.24	± 9.6 %
10306	AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, 64QAM, PUSC)	WiMAX	14.67	± 9.6 %
10307	AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, QPSK, PUSC)	WiMAX	14.49	± 9.6 %
10308	AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, 16QAM, PUSC)	WiMAX	14.46	± 9.6 %
10309	AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, 16QAM,AMC 2x3)	WiMAX	14.58	± 9.6 %
10310	AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, QPSK, AMC 2x3	WiMAX	14.57	± 9.6 %
10311	AAD	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	LTE-FDD	6.06	± 9.6 %
10313	AAA	iDEN 1:3	iDEN	10.51	± 9.6 %
10314	AAA	iDEN 1:6	iDEN	13.48	± 9.6 %
10315	AAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 96pc dc)	WLAN	1.71	± 9.6 %
10316	AAB	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 96pc dc)	WLAN	8.36	± 9.6 %
10317	AAD	IEEE 802.11a WiFi 5 GHz (OFDM, 6 Mbps, 96pc dc)	WLAN	8.36	± 9.6 %
10352	AAA	Pulse Waveform (200Hz, 10%)	Generic	10.00	± 9.6 %
10353	AAA	Pulse Waveform (200Hz, 20%)	Generic	6.99	± 9.6 %
10354	AAA	Pulse Waveform (200Hz, 40%)	Generic	3.98	± 9.6 %
10355	AAA	Pulse Waveform (200Hz, 60%)	Generic	2.22	± 9.6 %
10356	AAA	Pulse Waveform (200Hz, 80%)	Generic	0.97	± 9.6 %
10387	AAA	QPSK Waveform, 1 MHz	Generic	5.10	± 9.6 %
10388	AAA	QPSK Waveform, 10 MHz	Generic	5.22	± 9.6 %
10396	AAA	64-QAM Waveform, 100 kHz	Generic	6.27	± 9.6 %
10399	AAA	64-QAM Waveform, 40 MHz	Generic	6.27	± 9.6 %
10400	AAE	IEEE 802.11ac WiFi (20MHz, 64-QAM, 99pc dc)	WLAN	8.37	± 9.6 %
10401	AAE	IEEE 802.11ac WiFi (40MHz, 64-QAM, 99pc dc)	WLAN	8.60	± 9.6 %
10402	AAE	IEEE 802.11ac WiFi (80MHz, 64-QAM, 99pc dc)	WLAN	8.53	± 9.6 %
10403	AAB	CDMA2000 (1xEV-DO, Rev. 0)	CDMA2000	3.76	± 9.6 %
10404	AAB	CDMA2000 (1xEV-DO, Rev. A)	CDMA2000	3.77	± 9.6 %
10406	AAB	CDMA2000, RC3, SO32, SCH0, Full Rate	CDMA2000	5.22	± 9.6 %
10410	AAG	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK, UL Sub=2,3,4,7,8,9)	LTE-TDD	7.82	± 9.6 %

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10414	AAA	WLAN CCDF, 64-QAM, 40MHz	Generic	8.54	± 9.6 %
10415	AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc dc)	WLAN	1.54	± 9.6 %
10416	AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc dc)	WLAN	8.23	± 9.6 %
10417	AAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc dc)	WLAN	8.23	± 9.6 %
10418	AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc, Long)	WLAN	8.14	± 9.6 %
10419	AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc, Short)	WLAN	8.19	± 9.6 %
10422	AAC	IEEE 802.11n (HT Greenfield, 7.2 Mbps, BPSK)	WLAN	8.32	± 9.6 %
10423	AAC	IEEE 802.11n (HT Greenfield, 43.3 Mbps, 16-QAM)	WLAN	8.47	± 9.6 %
10424	AAC	IEEE 802.11n (HT Greenfield, 72.2 Mbps, 64-QAM)	WLAN	8.40	± 9.6 %
10425	AAC	IEEE 802.11n (HT Greenfield, 15 Mbps, BPSK)	WLAN	8.41	± 9.6 %
10426	AAC	IEEE 802.11n (HT Greenfield, 90 Mbps, 16-QAM)	WLAN	8.45	± 9.6 %
10427	AAC	IEEE 802.11n (HT Greenfield, 150 Mbps, 64-QAM)	WLAN	8.41	± 9.6 %
10430	AAD	LTE-FDD (OFDMA, 5 MHz, E-TM 3.1)	LTE-FDD	8.28	± 9.6 %
10431	AAD	LTE-FDD (OFDMA, 10 MHz, E-TM 3.1)	LTE-FDD	8.38	± 9.6 %
10432	AAC	LTE-FDD (OFDMA, 15 MHz, E-TM 3.1)	LTE-FDD	8.34	± 9.6 %
10433	AAC	LTE-FDD (OFDMA, 20 MHz, E-TM 3.1)	LTE-FDD	8.34	± 9.6 %
10434	AAA	W-CDMA (BS Test Model 1, 64 DPCH)	WCDMA	8.60	± 9.6 %
10435	AAF	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL Sub)	LTE-TDD	7.82	± 9.6 %
10447	AAD	LTE-FDD (OFDMA, 5 MHz, E-TM 3.1, Clipping 44%)	LTE-FDD	7.56	± 9.6 %
10448	AAD	LTE-FDD (OFDMA, 10 MHz, E-TM 3.1, Clippin 44%)	LTE-FDD	7.53	± 9.6 %
10449	AAC	LTE-FDD (OFDMA, 15 MHz, E-TM 3.1, Cliping 44%)	LTE-FDD	7.51	± 9.6 %
10450	AAC	LTE-FDD (OFDMA, 20 MHz, E-TM 3.1, Clipping 44%)	LTE-FDD	7.48	± 9.6 %
10451	AAA	W-CDMA (BS Test Model 1, 64 DPCH, Clipping 44%)	WCDMA	7.59	± 9.6 %
10453	AAD	Validation (Square, 10ms, 1ms)	Test	10.00	± 9.6 %
10456	AAC	IEEE 802.11ac WiFi (160MHz, 64-QAM, 99pc dc)	WLAN	8.63	± 9.6 %
10457	AAA	UMTS-FDD (DC-HSDPA)	WCDMA	6.62	± 9.6 %
10458	AAA	CDMA2000 (1xEV-DO, Rev. B, 2 carriers)	CDMA2000	6.55	± 9.6 %
10459	AAA	CDMA2000 (1xEV-DO, Rev. B, 3 carriers)	CDMA2000	8.25	± 9.6 %
10460	AAA	UMTS-FDD (WCDMA, AMR)	WCDMA	2.39	± 9.6 %
10461	AAB	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK, UL Sub)	LTE-TDD	7.82	± 9.6 %
10462	AAB	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM, UL Sub)	LTE-TDD	8.30	± 9.6 %
10463	AAB	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM, UL Sub)	LTE-TDD	8.56	± 9.6 %
10464	AAC	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, QPSK, UL Sub)	LTE-TDD	7.82	± 9.6 %
10465	AAC	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM, UL Sub)	LTE-TDD	8.32	± 9.6 %
10466	AAC	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM, UL Sub)	LTE-TDD	8.57	± 9.6 %
10467	AAF	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK, UL Sub)	LTE-TDD	7.82	± 9.6 %
10468	AAF	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM, UL Sub)	LTE-TDD	8.32	± 9.6 %
10469	AAF	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM, UL Sub)	LTE-TDD	8.56	± 9.6 %
10470	AAF	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK, UL Sub)	LTE-TDD	7.82	± 9.6 %
10471	AAF	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM, UL Sub)	LTE-TDD	8.32	± 9.6 %
10472	AAF	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM, UL Sub)	LTE-TDD	8.57	± 9.6 %
10473	AAE	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, QPSK, UL Sub)	LTE-TDD	7.82	± 9.6 %
10474	AAE	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM, UL Sub)	LTE-TDD	8.32	± 9.6 %
10475	AAE	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM, UL Sub)	LTE-TDD	8.57	± 9.6 %
10477	AAF	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM, UL Sub)	LTE-TDD	8.32	± 9.6 %
10478	AAF	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM, UL Sub)	LTE-TDD	8.57	± 9.6 %
10479	AAB	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK, UL Sub)	LTE-TDD	7.74	± 9.6 %
10480	AAB	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM, UL Sub)	LTE-TDD	8.18	± 9.6 %
10481	AAB	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM, UL Sub)	LTE-TDD	8.45	± 9.6 %
10482	AAC	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, QPSK, UL Sub)	LTE-TDD	7.71	± 9.6 %
10483	AAC	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM, Sub)	LTE-TDD	8.39	± 9.6 %
10484	AAC	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM, UL Sub)	LTE-TDD	8.47	± 9.6 %
10485	AAF	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, QPSK, UL Sub)	LTE-TDD	7.59	± 9.6 %
10486	AAF	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM, UL Sub)	LTE-TDD	8.38	± 9.6 %
10487	AAF	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM, UL Sub)	LTE-TDD	8.60	± 9.6 %
10488	AAF	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK, UL Sub)	LTE-TDD	7.70	± 9.6 %

10489	AAF	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM, UL Sub)	LTE-TDD	8.31	± 9.6 %
10490	AAF	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM, UL Sub)	LTE-TDD	8.54	± 9.6 %
10491	AAE	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, QPSK, UL Sub)	LTE-TDD	7.74	± 9.6 %
10492	AAE	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM, UL Sub)	LTE-TDD	8.41	± 9.6 %
10493	AAE	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM, UL Sub)	LTE-TDD	8.55	± 9.6 %
10494	AAF	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK, UL Sub)	LTE-TDD	7.74	± 9.6 %
10495	AAF	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM, UL Sub)	LTE-TDD	8.37	± 9.6 %
10496	AAF	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM, UL Sub)	LTE-TDD	8.54	± 9.6 %
10497	AAB	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK, UL Sub)	LTE-TDD	7.67	± 9.6 %
10498	AAB	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM, UL Sub)	LTE-TDD	8.40	± 9.6 %
10499	AAB	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM, UL Sub)	LTE-TDD	8.68	± 9.6 %
10500	AAC	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, QPSK, UL Sub)	LTE-TDD	7.67	± 9.6 %
10501	AAC	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM, UL Sub)	LTE-TDD	8.44	± 9.6 %
10502	AAC	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM, UL Sub)	LTE-TDD	8.52	± 9.6 %
10503	AAF	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, QPSK, UL Sub)	LTE-TDD	7.72	± 9.6 %
10504	AAF	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM, UL Sub)	LTE-TDD	8.31	± 9.6 %
10505	AAF	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM, UL Sub)	LTE-TDD	8.54	± 9.6 %
10506	AAF	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK, UL Sub)	LTE-TDD	7.74	± 9.6 %
10507	AAF	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM, UL Sub)	LTE-TDD	8.36	± 9.6 %
10508	AAF	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM, UL Sub)	LTE-TDD	8.55	± 9.6 %
10509	AAE	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, QPSK, UL Sub)	LTE-TDD	7.99	± 9.6 %
10510	AAE	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM, UL Sub)	LTE-TDD	8.49	± 9.6 %
10511	AAE	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM, UL Sub)	LTE-TDD	8.51	± 9.6 %
10512	AAF	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK, UL Sub)	LTE-TDD	7.74	± 9.6 %
10513	AAF	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM, UL Sub)	LTE-TDD	8.42	± 9.6 %
10514	AAF	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM, UL Sub)	LTE-TDD	8.45	± 9.6 %
10515	AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 99pc dc)	WLAN	1.58	± 9.6 %
10516	AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 99pc dc)	WLAN	1.57	± 9.6 %
10517	AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps, 99pc dc)	WLAN	1.58	± 9.6 %
10518	AAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 99pc dc)	WLAN	8.23	± 9.6 %
10519	AAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 99pc dc)	WLAN	8.39	± 9.6 %
10520	AAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps, 99pc dc)	WLAN	8.12	± 9.6 %
10521	AAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps, 99pc dc)	WLAN	7.97	± 9.6 %
10522	AAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps, 99pc dc)	WLAN	8.45	± 9.6 %
10523	AAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 99pc dc)	WLAN	8.08	± 9.6 %
10524	AAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 99pc dc)	WLAN	8.27	± 9.6 %
10525	AAC	IEEE 802.11ac WiFi (20MHz, MCS0, 99pc dc)	WLAN	8.36	± 9.6 %
10526	AAC	IEEE 802.11ac WiFi (20MHz, MCS1, 99pc dc)	WLAN	8.42	± 9.6 %
10527	AAC	IEEE 802.11ac WiFi (20MHz, MCS2, 99pc dc)	WLAN	8.21	± 9.6 %
10528	AAC	IEEE 802.11ac WiFi (20MHz, MCS3, 99pc dc)	WLAN	8.36	± 9.6 %
10529	AAC	IEEE 802.11ac WiFi (20MHz, MCS4, 99pc dc)	WLAN	8.36	± 9.6 %
10531	AAC	IEEE 802.11ac WiFi (20MHz, MCS6, 99pc dc)	WLAN	8.43	± 9.6 %
10532	AAC	IEEE 802.11ac WiFi (20MHz, MCS7, 99pc dc)	WLAN	8.29	± 9.6 %
10533	AAC	IEEE 802.11ac WiFi (20MHz, MCS8, 99pc dc)	WLAN	8.38	± 9.6 %
10534	AAC	IEEE 802.11ac WiFi (40MHz, MCS0, 99pc dc)	WLAN	8.45	± 9.6 %
10535	AAC	IEEE 802.11ac WiFi (40MHz, MCS1, 99pc dc)	WLAN	8.45	± 9.6 %
10536	AAC	IEEE 802.11ac WiFi (40MHz, MCS2, 99pc dc)	WLAN	8.32	± 9.6 %
10537	AAC	IEEE 802.11ac WiFi (40MHz, MCS3, 99pc dc)	WLAN	8.44	± 9.6 %
10538	AAC	IEEE 802.11ac WiFi (40MHz, MCS4, 99pc dc)	WLAN	8.54	± 9.6 %
10540	AAC	IEEE 802.11ac WiFi (40MHz, MCS6, 99pc dc)	WLAN	8.39	± 9.6 %
10541	AAC	IEEE 802.11ac WiFi (40MHz, MCS7, 99pc dc)	WLAN	8.46	± 9.6 %
10542	AAC	IEEE 802.11ac WiFi (40MHz, MCS8, 99pc dc)	WLAN	8.65	± 9.6 %
10543	AAC	IEEE 802.11ac WiFi (40MHz, MCS9, 99pc dc)	WLAN	8.65	± 9.6 %
10544	AAC	IEEE 802.11ac WiFi (80MHz, MCS0, 99pc dc)	WLAN	8.47	± 9.6 %
10545	AAC	IEEE 802.11ac WiFi (80MHz, MCS1, 99pc dc)	WLAN	8.55	± 9.6 %
10546	AAC	IEEE 802.11ac WiFi (80MHz, MCS2, 99pc dc)	WLAN	8.35	± 9.6 %

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10547	AAC	IEEE 802.11ac WiFi (80MHz, MCS3, 99pc dc)	WLAN	8.49	± 9.6 %
10548	AAC	IEEE 802.11ac WiFi (80MHz, MCS4, 99pc dc)	WLAN	8.37	± 9.6 %
10550	AAC	IEEE 802.11ac WiFi (80MHz, MCS6, 99pc dc)	WLAN	8.39	± 9.6 %
10551	AAC	IEEE 802.11ac WiFi (80MHz, MCS7, 99pc dc)	WLAN	8.50	± 9.6 %
10552	AAC	IEEE 802.11ac WiFi (80MHz, MCS8, 99pc dc)	WLAN	8.42	± 9.6 %
10553	AAC	IEEE 802.11ac WiFi (80MHz, MCS9, 99pc dc)	WLAN	8.45	± 9.6 %
10554	AAD	IEEE 802.11ac WiFi (160MHz, MCS0, 99pc dc)	WLAN	8.48	± 9.6 %
10555	AAD	IEEE 802.11ac WiFi (160MHz, MCS1, 99pc dc)	WLAN	8.47	± 9.6 %
10556	AAD	IEEE 802.11ac WiFi (160MHz, MCS2, 99pc dc)	WLAN	8.50	± 9.6 %
10557	AAD	IEEE 802.11ac WiFi (160MHz, MCS3, 99pc dc)	WLAN	8.52	± 9.6 %
10558	AAD	IEEE 802.11ac WiFi (160MHz, MCS4, 99pc dc)	WLAN	8.61	± 9.6 %
10560	AAD	IEEE 802.11ac WiFi (160MHz, MCS6, 99pc dc)	WLAN	8.73	± 9.6 %
10561	AAD	IEEE 802.11ac WiFi (160MHz, MCS7, 99pc dc)	WLAN	8.56	± 9.6 %
10562	AAD	IEEE 802.11ac WiFi (160MHz, MCS8, 99pc dc)	WLAN	8.69	± 9.6 %
10563	AAD	IEEE 802.11ac WiFi (160MHz, MCS9, 99pc dc)	WLAN	8.77	± 9.6 %
10564	AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 99pc dc)	WLAN	8.25	± 9.6 %
10565	AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 12 Mbps, 99pc dc)	WLAN	8.45	± 9.6 %
10566	AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 18 Mbps, 99pc dc)	WLAN	8.13	± 9.6 %
10567	AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 99pc dc)	WLAN	8.00	± 9.6 %
10568	AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 99pc dc)	WLAN	8.37	± 9.6 %
10569	AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 99pc dc)	WLAN	8.10	± 9.6 %
10570	AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 99pc dc)	WLAN	8.30	± 9.6 %
10571	AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 90pc dc)	WLAN	1.99	± 9.6 %
10572	AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 90pc dc)	WLAN	1.99	± 9.6 %
10573	AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 90pc dc)	WLAN	1.98	± 9.6 %
10574	AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps, 90pc dc)	WLAN	1.98	± 9.6 %
10575	AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 90pc dc)	WLAN	8.59	± 9.6 %
10576	AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 90pc dc)	WLAN	8.60	± 9.6 %
10577	AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 12 Mbps, 90pc dc)	WLAN	8.70	± 9.6 %
10578	AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 18 Mbps, 90pc dc)	WLAN	8.49	± 9.6 %
10579	AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 90pc dc)	WLAN	8.36	± 9.6 %
10580	AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 90pc dc)	WLAN	8.76	± 9.6 %
10581	AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 90pc dc)	WLAN	8.35	± 9.6 %
10582	AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 90pc dc)	WLAN	8.67	± 9.6 %
10583	AAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 90pc dc)	WLAN	8.59	± 9.6 %
10584	AAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 90pc dc)	WLAN	8.60	± 9.6 %
10585	AAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 90pc dc)	WLAN	8.70	± 9.6 %
10586	AAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps, 90pc dc)	WLAN	8.49	± 9.6 %
10587	AAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps, 90pc dc)	WLAN	8.36	± 9.6 %
10588	AAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps, 90pc dc)	WLAN	8.76	± 9.6 %
10589	AAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 90pc dc)	WLAN	8.35	± 9.6 %
10590	AAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 90pc dc)	WLAN	8.67	± 9.6 %
10591	AAC	IEEE 802.11n (HT Mixed, 20MHz, MCS0, 90pc dc)	WLAN	8.63	± 9.6 %
10592	AAC	IEEE 802.11n (HT Mixed, 20MHz, MCS1, 90pc dc)	WLAN	8.79	± 9.6 %
10593	AAC	IEEE 802.11n (HT Mixed, 20MHz, MCS2, 90pc dc)	WLAN	8.64	± 9.6 %
10594	AAC	IEEE 802.11n (HT Mixed, 20MHz, MCS3, 90pc dc)	WLAN	8.74	± 9.6 %
10595	AAC	IEEE 802.11n (HT Mixed, 20MHz, MCS4, 90pc dc)	WLAN	8.74	± 9.6 %
10596	AAC	IEEE 802.11n (HT Mixed, 20MHz, MCS5, 90pc dc)	WLAN	8.71	± 9.6 %
10597	AAC	IEEE 802.11n (HT Mixed, 20MHz, MCS6, 90pc dc)	WLAN	8.72	± 9.6 %
10598	AAC	IEEE 802.11n (HT Mixed, 20MHz, MCS7, 90pc dc)	WLAN	8.50	± 9.6 %
10599	AAC	IEEE 802.11n (HT Mixed, 40MHz, MCS0, 90pc dc)	WLAN	8.79	± 9.6 %
10600	AAC	IEEE 802.11n (HT Mixed, 40MHz, MCS1, 90pc dc)	WLAN	8.88	± 9.6 %
10601	AAC	IEEE 802.11n (HT Mixed, 40MHz, MCS2, 90pc dc)	WLAN	8.82	± 9.6 %
10602	AAC	IEEE 802.11n (HT Mixed, 40MHz, MCS3, 90pc dc)	WLAN	8.94	± 9.6 %
10603	AAC	IEEE 802.11n (HT Mixed, 40MHz, MCS4, 90pc dc)	WLAN	9.03	± 9.6 %
10604	AAC	IEEE 802.11n (HT Mixed, 40MHz, MCS5, 90pc dc)	WLAN	8.76	± 9.6 %

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10605	AAC	IEEE 802.11n (HT Mixed, 40MHz, MCS6, 90pc dc)	WLAN	8.97	± 9.6 %
10606	AAC	IEEE 802.11n (HT Mixed, 40MHz, MCS7, 90pc dc)	WLAN	8.82	± 9.6 %
10607	AAC	IEEE 802.11ac WiFi (20MHz, MCS0, 90pc dc)	WLAN	8.64	± 9.6 %
10608	AAC	IEEE 802.11ac WiFi (20MHz, MCS1, 90pc dc)	WLAN	8.77	± 9.6 %
10609	AAC	IEEE 802.11ac WiFi (20MHz, MCS2, 90pc dc)	WLAN	8.57	± 9.6 %
10610	AAC	IEEE 802.11ac WiFi (20MHz, MCS3, 90pc dc)	WLAN	8.78	± 9.6 %
10611	AAC	IEEE 802.11ac WiFi (20MHz, MCS4, 90pc dc)	WLAN	8.70	± 9.6 %
10612	AAC	IEEE 802.11ac WiFi (20MHz, MCS5, 90pc dc)	WLAN	8.77	± 9.6 %
10613	AAC	IEEE 802.11ac WiFi (20MHz, MCS6, 90pc dc)	WLAN	8.94	± 9.6 %
10614	AAC	IEEE 802.11ac WiFi (20MHz, MCS7, 90pc dc)	WLAN	8.59	± 9.6 %
10615	AAC	IEEE 802.11ac WiFi (20MHz, MCS8, 90pc dc)	WLAN	8.82	± 9.6 %
10616	AAC	IEEE 802.11ac WiFi (40MHz, MCS0, 90pc dc)	WLAN	8.82	± 9.6 %
10617	AAC	IEEE 802.11ac WiFi (40MHz, MCS1, 90pc dc)	WLAN	8.81	± 9.6 %
10618	AAC	IEEE 802.11ac WiFi (40MHz, MCS2, 90pc dc)	WLAN	8.58	± 9.6 %
10619	AAC	IEEE 802.11ac WiFi (40MHz, MCS3, 90pc dc)	WLAN	8.86	± 9.6 %
10620	AAC	IEEE 802.11ac WiFi (40MHz, MCS4, 90pc dc)	WLAN	8.87	± 9.6 %
10621	AAC	IEEE 802.11ac WiFi (40MHz, MCS5, 90pc dc)	WLAN	8.77	± 9.6 %
10622	AAC	IEEE 802.11ac WiFi (40MHz, MCS6, 90pc dc)	WLAN	8.68	± 9.6 %
10623	AAC	IEEE 802.11ac WiFi (40MHz, MCS7, 90pc dc)	WLAN	8.82	± 9.6 %
10624	AAC	IEEE 802.11ac WiFi (40MHz, MCS8, 90pc dc)	WLAN	8.96	± 9.6 %
10625	AAC	IEEE 802.11ac WiFi (40MHz, MCS9, 90pc dc)	WLAN	8.96	± 9.6 %
10626	AAC	IEEE 802.11ac WiFi (80MHz, MCS0, 90pc dc)	WLAN	8.83	± 9.6 %
10627	AAC	IEEE 802.11ac WiFi (80MHz, MCS1, 90pc dc)	WLAN	8.88	± 9.6 %
10628	AAC	IEEE 802.11ac WiFi (80MHz, MCS2, 90pc dc)	WLAN	8.71	± 9.6 %
10629	AAC	IEEE 802.11ac WiFi (80MHz, MCS3, 90pc dc)	WLAN	8.85	± 9.6 %
10630	AAC	IEEE 802.11ac WiFi (80MHz, MCS4, 90pc dc)	WLAN	8.72	± 9.6 %
10631	AAC	IEEE 802.11ac WiFi (80MHz, MCS5, 90pc dc)	WLAN	8.81	± 9.6 %
10632	AAC	IEEE 802.11ac WiFi (80MHz, MCS6, 90pc dc)	WLAN	8.74	± 9.6 %
10633	AAC	IEEE 802.11ac WiFi (80MHz, MCS7, 90pc dc)	WLAN	8.83	± 9.6 %
10634	AAC	IEEE 802.11ac WiFi (80MHz, MCS8, 90pc dc)	WLAN	8.80	± 9.6 %
10635	AAC	IEEE 802.11ac WiFi (80MHz, MCS9, 90pc dc)	WLAN	8.81	± 9.6 %
10636	AAD	IEEE 802.11ac WiFi (160MHz, MCS0, 90pc dc)	WLAN	8.83	± 9.6 %
10637	AAD	IEEE 802.11ac WiFi (160MHz, MCS1, 90pc dc)	WLAN	8.79	± 9.6 %
10638	AAD	IEEE 802.11ac WiFi (160MHz, MCS2, 90pc dc)	WLAN	8.86	± 9.6 %
10639	AAD	IEEE 802.11ac WiFi (160MHz, MCS3, 90pc dc)	WLAN	8.85	± 9.6 %
10640	AAD	IEEE 802.11ac WiFi (160MHz, MCS4, 90pc dc)	WLAN	8.98	± 9.6 %
10641	AAD	IEEE 802.11ac WiFi (160MHz, MCS5, 90pc dc)	WLAN	9.06	± 9.6 %
10642	AAD	IEEE 802.11ac WiFi (160MHz, MCS6, 90pc dc)	WLAN	9.06	± 9.6 %
10643	AAD	IEEE 802.11ac WiFi (160MHz, MCS7, 90pc dc)	WLAN	8.89	± 9.6 %
10644	AAD	IEEE 802.11ac WiFi (160MHz, MCS8, 90pc dc)	WLAN	9.05	± 9.6 %
10645	AAD	IEEE 802.11ac WiFi (160MHz, MCS9, 90pc dc)	WLAN	9.11	± 9.6 %
10646	AAG	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK, UL Sub=2,7)	LTE-TDD	11.96	± 9.6 %
10647	AAF	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL Sub=2,7)	LTE-TDD	11.96	± 9.6 %
10648	AAA	CDMA2000 (1x Advanced)	CDMA2000	3.45	± 9.6 %
10652	AAE	LTE-TDD (OFDMA, 5 MHz, E-TM 3.1, Clipping 44%)	LTE-TDD	6.91	± 9.6 %
10653	AAE	LTE-TDD (OFDMA, 10 MHz, E-TM 3.1, Clipping 44%)	LTE-TDD	7.42	± 9.6 %
10654	AAD	LTE-TDD (OFDMA, 15 MHz, E-TM 3.1, Clipping 44%)	LTE-TDD	6.96	± 9.6 %
10655	AAE	LTE-TDD (OFDMA, 20 MHz, E-TM 3.1, Clipping 44%)	LTE-TDD	7.21	± 9.6 %
10658	AAA	Pulse Waveform (200Hz, 10%)	Test	10.00	± 9.6 %
10659	AAA	Pulse Waveform (200Hz, 20%)	Test	6.99	± 9.6 %
10660	AAA	Pulse Waveform (200Hz, 40%)	Test	3.98	± 9.6 %
10661	AAA	Pulse Waveform (200Hz, 60%)	Test	2.22	± 9.6 %
10662	AAA	Pulse Waveform (200Hz, 80%)	Test	0.97	± 9.6 %
10670	AAA	Bluetooth Low Energy	Bluetooth	2.19	± 9.6 %
10671	AAC	IEEE 802.11ax (20MHz, MCS0, 90pc dc)	WLAN	9.09	± 9.6 %
10672	AAC	IEEE 802.11ax (20MHz, MCS1, 90pc dc)	WLAN	8.57	± 9.6 %

10673	AAC	IEEE 802.11ax (20MHz, MCS2, 90pc dc)	WLAN	8.78	± 9.6 %
10674	AAC	IEEE 802.11ax (20MHz, MCS3, 90pc dc)	WLAN	8.74	± 9.6 %
10675	AAC	IEEE 802.11ax (20MHz, MCS4, 90pc dc)	WLAN	8.90	± 9.6 %
10676	AAC	IEEE 802.11ax (20MHz, MCS5, 90pc dc)	WLAN	8.77	± 9.6 %
10677	AAC	IEEE 802.11ax (20MHz, MCS6, 90pc dc)	WLAN	8.73	± 9.6 %
10678	AAC	IEEE 802.11ax (20MHz, MCS7, 90pc dc)	WLAN	8.78	± 9.6 %
10679	AAC	IEEE 802.11ax (20MHz, MCS8, 90pc dc)	WLAN	8.89	± 9.6 %
10680	AAC	IEEE 802.11ax (20MHz, MCS9, 90pc dc)	WLAN	8.80	± 9.6 %
10681	AAC	IEEE 802.11ax (20MHz, MCS10, 90pc dc)	WLAN	8.62	± 9.6 %
10682	AAC	IEEE 802.11ax (20MHz, MCS11, 90pc dc)	WLAN	8.83	± 9.6 %
10683	AAC	IEEE 802.11ax (20MHz, MCS0, 99pc dc)	WLAN	8.42	± 9.6 %
10684	AAC	IEEE 802.11ax (20MHz, MCS1, 99pc dc)	WLAN	8.26	± 9.6 %
10685	AAC	IEEE 802.11ax (20MHz, MCS2, 99pc dc)	WLAN	8.33	± 9.6 %
10686	AAC	IEEE 802.11ax (20MHz, MCS3, 99pc dc)	WLAN	8.28	± 9.6 %
10687	AAC	IEEE 802.11ax (20MHz, MCS4, 99pc dc)	WLAN	8.45	± 9.6 %
10688	AAC	IEEE 802.11ax (20MHz, MCS5, 99pc dc)	WLAN	8.29	± 9.6 %
10689	AAC	IEEE 802.11ax (20MHz, MCS6, 99pc dc)	WLAN	8.55	± 9.6 %
10690	AAC	IEEE 802.11ax (20MHz, MCS7, 99pc dc)	WLAN	8.29	± 9.6 %
10691	AAC	IEEE 802.11ax (20MHz, MCS8, 99pc dc)	WLAN	8.25	± 9.6 %
10692	AAC	IEEE 802.11ax (20MHz, MCS9, 99pc dc)	WLAN	8.29	± 9.6 %
10693	AAC	IEEE 802.11ax (20MHz, MCS10, 99pc dc)	WLAN	8.25	± 9.6 %
10694	AAC	IEEE 802.11ax (20MHz, MCS11, 99pc dc)	WLAN	8.57	± 9.6 %
10695	AAC	IEEE 802.11ax (40MHz, MCS0, 90pc dc)	WLAN	8.78	± 9.6 %
10696	AAC	IEEE 802.11ax (40MHz, MCS1, 90pc dc)	WLAN	8.91	± 9.6 %
10697	AAC	IEEE 802.11ax (40MHz, MCS2, 90pc dc)	WLAN	8.61	± 9.6 %
10698	AAC	IEEE 802.11ax (40MHz, MCS3, 90pc dc)	WLAN	8.89	± 9.6 %
10699	AAC	IEEE 802.11ax (40MHz, MCS4, 90pc dc)	WLAN	8.82	± 9.6 %
10700	AAC	IEEE 802.11ax (40MHz, MCS5, 90pc dc)	WLAN	8.73	± 9.6 %
10701	AAC	IEEE 802.11ax (40MHz, MCS6, 90pc dc)	WLAN	8.86	± 9.6 %
10702	AAC	IEEE 802.11ax (40MHz, MCS7, 90pc dc)	WLAN	8.70	± 9.6 %
10703	AAC	IEEE 802.11ax (40MHz, MCS8, 90pc dc)	WLAN	8.82	± 9.6 %
10704	AAC	IEEE 802.11ax (40MHz, MCS9, 90pc dc)	WLAN	8.56	± 9.6 %
10705	AAC	IEEE 802.11ax (40MHz, MCS10, 90pc dc)	WLAN	8.69	± 9.6 %
10706	AAC	IEEE 802.11ax (40MHz, MCS11, 90pc dc)	WLAN	8.66	± 9.6 %
10707	AAC	IEEE 802.11ax (40MHz, MCS0, 99pc dc)	WLAN	8.32	± 9.6 %
10708	AAC	IEEE 802.11ax (40MHz, MCS1, 99pc dc)	WLAN	8.55	± 9.6 %
10709	AAC	IEEE 802.11ax (40MHz, MCS2, 99pc dc)	WLAN	8.33	± 9.6 %
10710	AAC	IEEE 802.11ax (40MHz, MCS3, 99pc dc)	WLAN	8.29	± 9.6 %
10711	AAC	IEEE 802.11ax (40MHz, MCS4, 99pc dc)	WLAN	8.39	± 9.6 %
10712	AAC	IEEE 802.11ax (40MHz, MCS5, 99pc dc)	WLAN	8.67	± 9.6 %
10713	AAC	IEEE 802.11ax (40MHz, MCS6, 99pc dc)	WLAN	8.33	± 9.6 %
10714	AAC	IEEE 802.11ax (40MHz, MCS7, 99pc dc)	WLAN	8.26	± 9.6 %
10715	AAC	IEEE 802.11ax (40MHz, MCS8, 99pc dc)	WLAN	8.45	± 9.6 %
10716	AAC	IEEE 802.11ax (40MHz, MCS9, 99pc dc)	WLAN	8.30	± 9.6 %
10717	AAC	IEEE 802.11ax (40MHz, MCS10, 99pc dc)	WLAN	8.48	± 9.6 %
10718	AAC	IEEE 802.11ax (40MHz, MCS11, 99pc dc)	WLAN	8.24	± 9.6 %
10719	AAC	IEEE 802.11ax (80MHz, MCS0, 90pc dc)	WLAN	8.81	± 9.6 %
10720	AAC	IEEE 802.11ax (80MHz, MCS1, 90pc dc)	WLAN	8.87	± 9.6 %
10721	AAC	IEEE 802.11ax (80MHz, MCS2, 90pc dc)	WLAN	8.76	± 9.6 %
10722	AAC	IEEE 802.11ax (80MHz, MCS3, 90pc dc)	WLAN	8.55	± 9.6 %
10723	AAC	IEEE 802.11ax (80MHz, MCS4, 90pc dc)	WLAN	8.70	± 9.6 %
10724	AAC	IEEE 802.11ax (80MHz, MCS5, 90pc dc)	WLAN	8.90	± 9.6 %
10725	AAC	IEEE 802.11ax (80MHz, MCS6, 90pc dc)	WLAN	8.74	± 9.6 %
10726	AAC	IEEE 802.11ax (80MHz, MCS7, 90pc dc)	WLAN	8.72	± 9.6 %
10727	AAC	IEEE 802.11ax (80MHz, MCS8, 90pc dc)	WLAN	8.66	± 9.6 %
10728	AAC	IEEE 802.11ax (80MHz, MCS9, 90pc dc)	WLAN	8.65	± 9.6 %

10729	AAC	IEEE 802.11ax (80MHz, MCS10, 90pc dc)	WLAN	8.64	± 9.6 %
10730	AAC	IEEE 802.11ax (80MHz, MCS11, 90pc dc)	WLAN	8.67	± 9.6 %
10731	AAC	IEEE 802.11ax (80MHz, MCS0, 99pc dc)	WLAN	8.42	± 9.6 %
10732	AAC	IEEE 802.11ax (80MHz, MCS1, 99pc dc)	WLAN	8.46	± 9.6 %
10733	AAC	IEEE 802.11ax (80MHz, MCS2, 99pc dc)	WLAN	8.40	± 9.6 %
10734	AAC	IEEE 802.11ax (80MHz, MCS3, 99pc dc)	WLAN	8.25	± 9.6 %
10735	AAC	IEEE 802.11ax (80MHz, MCS4, 99pc dc)	WLAN	8.33	± 9.6 %
10736	AAC	IEEE 802.11ax (80MHz, MCS5, 99pc dc)	WLAN	8.27	± 9.6 %
10737	AAC	IEEE 802.11ax (80MHz, MCS6, 99pc dc)	WLAN	8.36	± 9.6 %
10738	AAC	IEEE 802.11ax (80MHz, MCS7, 99pc dc)	WLAN	8.42	± 9.6 %
10739	AAC	IEEE 802.11ax (80MHz, MCS8, 99pc dc)	WLAN	8.29	± 9.6 %
10740	AAC	IEEE 802.11ax (80MHz, MCS9, 99pc dc)	WLAN	8.48	± 9.6 %
10741	AAC	IEEE 802.11ax (80MHz, MCS10, 99pc dc)	WLAN	8.40	± 9.6 %
10742	AAC	IEEE 802.11ax (80MHz, MCS11, 99pc dc)	WLAN	8.43	± 9.6 %
10743	AAC	IEEE 802.11ax (160MHz, MCS0, 90pc dc)	WLAN	8.94	± 9.6 %
10744	AAC	IEEE 802.11ax (160MHz, MCS1, 90pc dc)	WLAN	9.16	± 9.6 %
10745	AAC	IEEE 802.11ax (160MHz, MCS2, 90pc dc)	WLAN	8.93	± 9.6 %
10746	AAC	IEEE 802.11ax (160MHz, MCS3, 90pc dc)	WLAN	9.11	± 9.6 %
10747	AAC	IEEE 802.11ax (160MHz, MCS4, 90pc dc)	WLAN	9.04	± 9.6 %
10748	AAC	IEEE 802.11ax (160MHz, MCS5, 90pc dc)	WLAN	8.93	± 9.6 %
10749	AAC	IEEE 802.11ax (160MHz, MCS6, 90pc dc)	WLAN	8.90	± 9.6 %
10750	AAC	IEEE 802.11ax (160MHz, MCS7, 90pc dc)	WLAN	8.79	± 9.6 %
10751	AAC	IEEE 802.11ax (160MHz, MCS8, 90pc dc)	WLAN	8.82	± 9.6 %
10752	AAC	IEEE 802.11ax (160MHz, MCS9, 90pc dc)	WLAN	8.81	± 9.6 %
10753	AAC	IEEE 802.11ax (160MHz, MCS10, 90pc dc)	WLAN	9.00	± 9.6 %
10754	AAC	IEEE 802.11ax (160MHz, MCS11, 90pc dc)	WLAN	8.94	± 9.6 %
10755	AAC	IEEE 802.11ax (160MHz, MCS0, 99pc dc)	WLAN	8.64	± 9.6 %
10756	AAC	IEEE 802.11ax (160MHz, MCS1, 99pc dc)	WLAN	8.77	± 9.6 %
10757	AAC	IEEE 802.11ax (160MHz, MCS2, 99pc dc)	WLAN	8.77	± 9.6 %
10758	AAC	IEEE 802.11ax (160MHz, MCS3, 99pc dc)	WLAN	8.69	± 9.6 %
10759	AAC	IEEE 802.11ax (160MHz, MCS4, 99pc dc)	WLAN	8.58	± 9.6 %
10760	AAC	IEEE 802.11ax (160MHz, MCS5, 99pc dc)	WLAN	8.49	± 9.6 %
10761	AAC	IEEE 802.11ax (160MHz, MCS6, 99pc dc)	WLAN	8.58	± 9.6 %
10762	AAC	IEEE 802.11ax (160MHz, MCS7, 99pc dc)	WLAN	8.49	± 9.6 %
10763	AAC	IEEE 802.11ax (160MHz, MCS8, 99pc dc)	WLAN	8.53	± 9.6 %
10764	AAC	IEEE 802.11ax (160MHz, MCS9, 99pc dc)	WLAN	8.54	± 9.6 %
10765	AAC	IEEE 802.11ax (160MHz, MCS10, 99pc dc)	WLAN	8.54	± 9.6 %
10766	AAC	IEEE 802.11ax (160MHz, MCS11, 99pc dc)	WLAN	8.51	± 9.6 %
10767	AAE	5G NR (CP-OFDM, 1 RB, 5 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	7.99	± 9.6 %
10768	AAD	5G NR (CP-OFDM, 1 RB, 10 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.01	± 9.6 %
10769	AAD	5G NR (CP-OFDM, 1 RB, 15 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.01	± 9.6 %
10770	AAD	5G NR (CP-OFDM, 1 RB, 20 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.02	± 9.6 %
10771	AAD	5G NR (CP-OFDM, 1 RB, 25 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.02	± 9.6 %
10772	AAD	5G NR (CP-OFDM, 1 RB, 30 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.23	± 9.6 %
10773	AAD	5G NR (CP-OFDM, 1 RB, 40 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.03	± 9.6 %
10774	AAD	5G NR (CP-OFDM, 1 RB, 50 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.02	± 9.6 %
10775	AAD	5G NR (CP-OFDM, 50% RB, 5 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.31	± 9.6 %
10776	AAD	5G NR (CP-OFDM, 50% RB, 10 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.30	± 9.6 %
10777	AAC	5G NR (CP-OFDM, 50% RB, 15 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.30	± 9.6 %
10778	AAD	5G NR (CP-OFDM, 50% RB, 20 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.34	± 9.6 %
10779	AAC	5G NR (CP-OFDM, 50% RB, 25 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.42	± 9.6 %
10780	AAD	5G NR (CP-OFDM, 50% RB, 30 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.38	± 9.6 %
10781	AAD	5G NR (CP-OFDM, 50% RB, 40 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.38	± 9.6 %
10782	AAD	5G NR (CP-OFDM, 50% RB, 50 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.43	± 9.6 %
10783	AAE	5G NR (CP-OFDM, 100% RB, 5 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.31	± 9.6 %
10784	AAD	5G NR (CP-OFDM, 100% RB, 10 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.29	± 9.6 %

10785	AAD	5G NR (CP-OFDM, 100% RB, 15 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.40	± 9.6 %
10786	AAD	5G NR (CP-OFDM, 100% RB, 20 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.35	± 9.6 %
10787	AAD	5G NR (CP-OFDM, 100% RB, 25 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.44	± 9.6 %
10788	AAD	5G NR (CP-OFDM, 100% RB, 30 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.39	± 9.6 %
10789	AAD	5G NR (CP-OFDM, 100% RB, 40 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.37	± 9.6 %
10790	AAD	5G NR (CP-OFDM, 100% RB, 50 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	8.39	± 9.6 %
10791	AAE	5G NR (CP-OFDM, 1 RB, 5 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	7.83	± 9.6 %
10792	AAD	5G NR (CP-OFDM, 1 RB, 10 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	7.92	± 9.6 %
10793	AAD	5G NR (CP-OFDM, 1 RB, 15 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	7.95	± 9.6 %
10794	AAD	5G NR (CP-OFDM, 1 RB, 20 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	7.82	± 9.6 %
10795	AAD	5G NR (CP-OFDM, 1 RB, 25 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	7.84	± 9.6 %
10796	AAD	5G NR (CP-OFDM, 1 RB, 30 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	7.82	± 9.6 %
10797	AAD	5G NR (CP-OFDM, 1 RB, 40 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	8.01	± 9.6 %
10798	AAD	5G NR (CP-OFDM, 1 RB, 50 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	7.89	± 9.6 %
10799	AAD	5G NR (CP-OFDM, 1 RB, 60 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	7.93	± 9.6 %
10801	AAD	5G NR (CP-OFDM, 1 RB, 80 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	7.89	± 9.6 %
10802	AAD	5G NR (CP-OFDM, 1 RB, 90 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	7.87	± 9.6 %
10803	AAD	5G NR (CP-OFDM, 1 RB, 100 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	7.93	± 9.6 %
10805	AAD	5G NR (CP-OFDM, 50% RB, 10 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	8.34	± 9.6 %
10806	AAD	5G NR (CP-OFDM, 50% RB, 15 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	8.37	± 9.6 %
10809	AAD	5G NR (CP-OFDM, 50% RB, 30 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	8.34	± 9.6 %
10810	AAD	5G NR (CP-OFDM, 50% RB, 40 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	8.34	± 9.6 %
10812	AAD	5G NR (CP-OFDM, 50% RB, 60 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	8.35	± 9.6 %
10817	AAE	5G NR (CP-OFDM, 100% RB, 5 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	8.35	± 9.6 %
10818	AAD	5G NR (CP-OFDM, 100% RB, 10 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	8.34	± 9.6 %
10819	AAD	5G NR (CP-OFDM, 100% RB, 15 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	8.33	± 9.6 %
10820	AAD	5G NR (CP-OFDM, 100% RB, 20 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	8.30	± 9.6 %
10821	AAD	5G NR (CP-OFDM, 100% RB, 25 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	8.41	± 9.6 %
10822	AAD	5G NR (CP-OFDM, 100% RB, 30 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	8.41	± 9.6 %
10823	AAD	5G NR (CP-OFDM, 100% RB, 40 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	8.36	± 9.6 %
10824	AAD	5G NR (CP-OFDM, 100% RB, 50 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	8.39	± 9.6 %
10825	AAD	5G NR (CP-OFDM, 100% RB, 60 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	8.41	± 9.6 %
10827	AAD	5G NR (CP-OFDM, 100% RB, 80 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	8.42	± 9.6 %
10828	AAD	5G NR (CP-OFDM, 100% RB, 90 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	8.43	± 9.6 %
10829	AAD	5G NR (CP-OFDM, 100% RB, 100 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	8.40	± 9.6 %
10830	AAD	5G NR (CP-OFDM, 1 RB, 10 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	7.63	± 9.6 %
10831	AAD	5G NR (CP-OFDM, 1 RB, 15 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	7.73	± 9.6 %
10832	AAD	5G NR (CP-OFDM, 1 RB, 20 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	7.74	± 9.6 %
10833	AAD	5G NR (CP-OFDM, 1 RB, 25 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	7.70	± 9.6 %
10834	AAD	5G NR (CP-OFDM, 1 RB, 30 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	7.75	± 9.6 %
10835	AAD	5G NR (CP-OFDM, 1 RB, 40 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	7.70	± 9.6 %
10836	AAD	5G NR (CP-OFDM, 1 RB, 50 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	7.66	± 9.6 %
10837	AAD	5G NR (CP-OFDM, 1 RB, 60 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	7.68	± 9.6 %
10839	AAD	5G NR (CP-OFDM, 1 RB, 80 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	7.70	± 9.6 %
10840	AAD	5G NR (CP-OFDM, 1 RB, 90 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	7.67	± 9.6 %
10841	AAD	5G NR (CP-OFDM, 1 RB, 100 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	7.71	± 9.6 %
10843	AAD	5G NR (CP-OFDM, 50% RB, 15 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	8.49	± 9.6 %
10844	AAD	5G NR (CP-OFDM, 50% RB, 20 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	8.34	± 9.6 %
10846	AAD	5G NR (CP-OFDM, 50% RB, 30 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	8.41	± 9.6 %
10854	AAD	5G NR (CP-OFDM, 100% RB, 10 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	8.34	± 9.6 %
10855	AAD	5G NR (CP-OFDM, 100% RB, 15 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	8.36	± 9.6 %
10856	AAD	5G NR (CP-OFDM, 100% RB, 20 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	8.37	± 9.6 %
10857	AAD	5G NR (CP-OFDM, 100% RB, 25 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	8.35	± 9.6 %
10858	AAD	5G NR (CP-OFDM, 100% RB, 30 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	8.36	± 9.6 %
10859	AAD	5G NR (CP-OFDM, 100% RB, 40 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	8.34	± 9.6 %
10860	AAD	5G NR (CP-OFDM, 100% RB, 50 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	8.41	± 9.6 %

10861	AAD	5G NR (CP-OFDM, 100% RB, 60 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	8.40	± 9.6 %
10863	AAD	5G NR (CP-OFDM, 100% RB, 80 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	8.41	± 9.6 %
10864	AAD	5G NR (CP-OFDM, 100% RB, 90 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	8.37	± 9.6 %
10865	AAD	5G NR (CP-OFDM, 100% RB, 100 MHz, QPSK, 60 kHz)	5G NR FR1 TDD	8.41	± 9.6 %
10866	AAD	5G NR (DFT-s-OFDM, 1 RB, 100 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.68	± 9.6 %
10868	AAD	5G NR (DFT-s-OFDM, 100% RB, 100 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.89	± 9.6 %
10869	AAD	5G NR (DFT-s-OFDM, 1 RB, 100 MHz, QPSK, 120 kHz)	5G NR FR2 TDD	5.75	± 9.6 %
10870	AAD	5G NR (DFT-s-OFDM, 100% RB, 100 MHz, QPSK, 120 kHz)	5G NR FR2 TDD	5.86	± 9.6 %
10871	AAD	5G NR (DFT-s-OFDM, 1 RB, 100 MHz, 16QAM, 120 kHz)	5G NR FR2 TDD	5.75	± 9.6 %
10872	AAD	5G NR (DFT-s-OFDM, 100% RB, 100 MHz, 16QAM, 120 kHz)	5G NR FR2 TDD	6.52	± 9.6 %
10873	AAD	5G NR (DFT-s-OFDM, 1 RB, 100 MHz, 64QAM, 120 kHz)	5G NR FR2 TDD	6.61	± 9.6 %
10874	AAD	5G NR (DFT-s-OFDM, 100% RB, 100 MHz, 64QAM, 120 kHz)	5G NR FR2 TDD	6.65	± 9.6 %
10875	AAD	5G NR (CP-OFDM, 1 RB, 100 MHz, QPSK, 120 kHz)	5G NR FR2 TDD	7.78	± 9.6 %
10876	AAD	5G NR (CP-OFDM, 100% RB, 100 MHz, QPSK, 120 kHz)	5G NR FR2 TDD	8.39	± 9.6 %
10877	AAD	5G NR (CP-OFDM, 1 RB, 100 MHz, 16QAM, 120 kHz)	5G NR FR2 TDD	7.95	± 9.6 %
10878	AAD	5G NR (CP-OFDM, 100% RB, 100 MHz, 16QAM, 120 kHz)	5G NR FR2 TDD	8.41	± 9.6 %
10879	AAD	5G NR (CP-OFDM, 1 RB, 100 MHz, 64QAM, 120 kHz)	5G NR FR2 TDD	8.12	± 9.6 %
10880	AAD	5G NR (CP-OFDM, 100% RB, 100 MHz, 64QAM, 120 kHz)	5G NR FR2 TDD	8.38	± 9.6 %
10881	AAD	5G NR (DFT-s-OFDM, 1 RB, 50 MHz, QPSK, 120 kHz)	5G NR FR2 TDD	5.75	± 9.6 %
10882	AAD	5G NR (DFT-s-OFDM, 100% RB, 50 MHz, QPSK, 120 kHz)	5G NR FR2 TDD	5.96	± 9.6 %
10883	AAD	5G NR (DFT-s-OFDM, 1 RB, 50 MHz, 16QAM, 120 kHz)	5G NR FR2 TDD	6.57	± 9.6 %
10884	AAD	5G NR (DFT-s-OFDM, 100% RB, 50 MHz, 16QAM, 120 kHz)	5G NR FR2 TDD	6.53	± 9.6 %
10885	AAD	5G NR (DFT-s-OFDM, 1 RB, 50 MHz, 64QAM, 120 kHz)	5G NR FR2 TDD	6.61	± 9.6 %
10886	AAD	5G NR (DFT-s-OFDM, 100% RB, 50 MHz, 64QAM, 120 kHz)	5G NR FR2 TDD	6.65	± 9.6 %
10887	AAD	5G NR (CP-OFDM, 1 RB, 50 MHz, QPSK, 120 kHz)	5G NR FR2 TDD	7.78	± 9.6 %
10888	AAD	5G NR (CP-OFDM, 100% RB, 50 MHz, QPSK, 120 kHz)	5G NR FR2 TDD	8.35	± 9.6 %
10889	AAD	5G NR (CP-OFDM, 1 RB, 50 MHz, 16QAM, 120 kHz)	5G NR FR2 TDD	8.02	± 9.6 %
10890	AAD	5G NR (CP-OFDM, 100% RB, 50 MHz, 16QAM, 120 kHz)	5G NR FR2 TDD	8.40	± 9.6 %
10891	AAD	5G NR (CP-OFDM, 1 RB, 50 MHz, 64QAM, 120 kHz)	5G NR FR2 TDD	8.13	± 9.6 %
10892	AAD	5G NR (CP-OFDM, 100% RB, 50 MHz, 64QAM, 120 kHz)	5G NR FR2 TDD	8.41	± 9.6 %
10897	AAC	5G NR (DFT-s-OFDM, 1 RB, 5 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.66	± 9.6 %
10898	AAB	5G NR (DFT-s-OFDM, 1 RB, 10 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.67	± 9.6 %
10899	AAB	5G NR (DFT-s-OFDM, 1 RB, 15 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.67	± 9.6 %
10900	AAB	5G NR (DFT-s-OFDM, 1 RB, 20 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.68	± 9.6 %
10901	AAB	5G NR (DFT-s-OFDM, 1 RB, 25 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.68	± 9.6 %
10902	AAB	5G NR (DFT-s-OFDM, 1 RB, 30 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.68	± 9.6 %
10903	AAB	5G NR (DFT-s-OFDM, 1 RB, 40 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.68	± 9.6 %
10904	AAB	5G NR (DFT-s-OFDM, 1 RB, 50 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.68	± 9.6 %
10905	AAB	5G NR (DFT-s-OFDM, 1 RB, 60 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.68	± 9.6 %
10906	AAB	5G NR (DFT-s-OFDM, 1 RB, 80 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.68	± 9.6 %
10907	AAC	5G NR (DFT-s-OFDM, 50% RB, 5 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.78	± 9.6 %
10908	AAB	5G NR (DFT-s-OFDM, 50% RB, 10 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.93	± 9.6 %
10909	AAB	5G NR (DFT-s-OFDM, 50% RB, 15 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.96	± 9.6 %
10910	AAB	5G NR (DFT-s-OFDM, 50% RB, 20 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.83	± 9.6 %
10911	AAB	5G NR (DFT-s-OFDM, 50% RB, 25 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.93	± 9.6 %
10912	AAB	5G NR (DFT-s-OFDM, 50% RB, 30 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.84	± 9.6 %
10913	AAB	5G NR (DFT-s-OFDM, 50% RB, 40 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.84	± 9.6 %
10914	AAB	5G NR (DFT-s-OFDM, 50% RB, 50 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.85	± 9.6 %
10915	AAB	5G NR (DFT-s-OFDM, 50% RB, 60 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.83	± 9.6 %
10916	AAB	5G NR (DFT-s-OFDM, 50% RB, 80 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.87	± 9.6 %
10917	AAB	5G NR (DFT-s-OFDM, 50% RB, 100 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.94	± 9.6 %
10918	AAC	5G NR (DFT-s-OFDM, 100% RB, 5 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.86	± 9.6 %
10919	AAB	5G NR (DFT-s-OFDM, 100% RB, 10 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.86	± 9.6 %
10920	AAB	5G NR (DFT-s-OFDM, 100% RB, 15 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.87	± 9.6 %
10921	AAB	5G NR (DFT-s-OFDM, 100% RB, 20 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.84	± 9.6 %
10922	AAB	5G NR (DFT-s-OFDM, 100% RB, 25 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.82	± 9.6 %

10923	AAB	5G NR (DFT-s-OFDM, 100% RB, 30 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.84	± 9.6 %
10924	AAB	5G NR (DFT-s-OFDM, 100% RB, 40 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.84	± 9.6 %
10925	AAB	5G NR (DFT-s-OFDM, 100% RB, 50 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.95	± 9.6 %
10926	AAB	5G NR (DFT-s-OFDM, 100% RB, 60 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.84	± 9.6 %
10927	AAB	5G NR (DFT-s-OFDM, 100% RB, 80 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	5.94	± 9.6 %
10928	AAC	5G NR (DFT-s-OFDM, 1 RB, 5 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.52	± 9.6 %
10929	AAC	5G NR (DFT-s-OFDM, 1 RB, 10 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.52	± 9.6 %
10930	AAC	5G NR (DFT-s-OFDM, 1 RB, 15 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.52	± 9.6 %
10931	AAC	5G NR (DFT-s-OFDM, 1 RB, 20 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.51	± 9.6 %
10932	AAC	5G NR (DFT-s-OFDM, 1 RB, 25 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.51	± 9.6 %
10933	AAC	5G NR (DFT-s-OFDM, 1 RB, 30 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.51	± 9.6 %
10934	AAC	5G NR (DFT-s-OFDM, 1 RB, 40 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.51	± 9.6 %
10935	AAD	5G NR (DFT-s-OFDM, 1 RB, 50 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.51	± 9.6 %
10936	AAC	5G NR (DFT-s-OFDM, 50% RB, 5 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.90	± 9.6 %
10937	AAC	5G NR (DFT-s-OFDM, 50% RB, 10 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.77	± 9.6 %
10938	AAC	5G NR (DFT-s-OFDM, 50% RB, 15 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.90	± 9.6 %
10939	AAC	5G NR (DFT-s-OFDM, 50% RB, 20 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.82	± 9.6 %
10940	AAC	5G NR (DFT-s-OFDM, 50% RB, 25 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.89	± 9.6 %
10941	AAC	5G NR (DFT-s-OFDM, 50% RB, 30 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.83	± 9.6 %
10942	AAC	5G NR (DFT-s-OFDM, 50% RB, 40 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.85	± 9.6 %
10943	AAD	5G NR (DFT-s-OFDM, 50% RB, 50 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.95	± 9.6 %
10944	AAC	5G NR (DFT-s-OFDM, 100% RB, 5 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.81	± 9.6 %
10945	AAC	5G NR (DFT-s-OFDM, 100% RB, 10 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.85	± 9.6 %
10946	AAC	5G NR (DFT-s-OFDM, 100% RB, 15 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.83	± 9.6 %
10947	AAC	5G NR (DFT-s-OFDM, 100% RB, 20 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.87	± 9.6 %
10948	AAC	5G NR (DFT-s-OFDM, 100% RB, 25 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.94	± 9.6 %
10949	AAC	5G NR (DFT-s-OFDM, 100% RB, 30 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.87	± 9.6 %
10950	AAC	5G NR (DFT-s-OFDM, 100% RB, 40 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.94	± 9.6 %
10951	AAD	5G NR (DFT-s-OFDM, 100% RB, 50 MHz, QPSK, 15 kHz)	5G NR FR1 FDD	5.92	± 9.6 %
10952	AAA	5G NR DL (CP-OFDM, TM 3.1, 5 MHz, 64-QAM, 15 kHz)	5G NR FR1 FDD	8.25	± 9.6 %
10953	AAA	5G NR DL (CP-OFDM, TM 3.1, 10 MHz, 64-QAM, 15 kHz)	5G NR FR1 FDD	8.15	± 9.6 %
10954	AAA	5G NR DL (CP-OFDM, TM 3.1, 15 MHz, 64-QAM, 15 kHz)	5G NR FR1 FDD	8.23	± 9.6 %
10955	AAA	5G NR DL (CP-OFDM, TM 3.1, 20 MHz, 64-QAM, 15 kHz)	5G NR FR1 FDD	8.42	± 9.6 %
10956	AAA	5G NR DL (CP-OFDM, TM 3.1, 5 MHz, 64-QAM, 30 kHz)	5G NR FR1 FDD	8.14	± 9.6 %
10957	AAA	5G NR DL (CP-OFDM, TM 3.1, 10 MHz, 64-QAM, 30 kHz)	5G NR FR1 FDD	8.31	± 9.6 %
10958	AAA	5G NR DL (CP-OFDM, TM 3.1, 15 MHz, 64-QAM, 30 kHz)	5G NR FR1 FDD	8.61	± 9.6 %
10959	AAA	5G NR DL (CP-OFDM, TM 3.1, 20 MHz, 64-QAM, 30 kHz)	5G NR FR1 FDD	8.33	± 9.6 %
10960	AAC	5G NR DL (CP-OFDM, TM 3.1, 5 MHz, 64-QAM, 15 kHz)	5G NR FR1 TDD	9.32	± 9.6 %
10961	AAB	5G NR DL (CP-OFDM, TM 3.1, 10 MHz, 64-QAM, 15 kHz)	5G NR FR1 TDD	9.36	± 9.6 %
10962	AAB	5G NR DL (CP-OFDM, TM 3.1, 15 MHz, 64-QAM, 15 kHz)	5G NR FR1 TDD	9.40	± 9.6 %
10963	AAB	5G NR DL (CP-OFDM, TM 3.1, 20 MHz, 64-QAM, 15 kHz)	5G NR FR1 TDD	9.55	± 9.6 %
10964	AAC	5G NR DL (CP-OFDM, TM 3.1, 5 MHz, 64-QAM, 30 kHz)	5G NR FR1 TDD	9.29	± 9.6 %
10965	AAB	5G NR DL (CP-OFDM, TM 3.1, 10 MHz, 64-QAM, 30 kHz)	5G NR FR1 TDD	9.37	± 9.6 %
10966	AAB	5G NR DL (CP-OFDM, TM 3.1, 15 MHz, 64-QAM, 30 kHz)	5G NR FR1 TDD	9.55	± 9.6 %
10967	AAB	5G NR DL (CP-OFDM, TM 3.1, 20 MHz, 64-QAM, 30 kHz)	5G NR FR1 TDD	9.42	± 9.6 %
10968	AAB	5G NR DL (CP-OFDM, TM 3.1, 100 MHz, 64-QAM, 30 kHz)	5G NR FR1 TDD	9.49	± 9.6 %
10972	AAB	5G NR (CP-OFDM, 1 RB, 20 MHz, QPSK, 15 kHz)	5G NR FR1 TDD	11.59	± 9.6 %
10973	AAB	5G NR (DFT-s-OFDM, 1 RB, 100 MHz, QPSK, 30 kHz)	5G NR FR1 TDD	9.06	± 9.6 %
10974	AAB	5G NR (CP-OFDM, 100% RB, 100 MHz, 256-QAM, 30 kHz)	5G NR FR1 TDD	10.28	± 9.6 %
10978	AAA	ULLA BDR	ULLA	2.23	± 9.6 %
10979	AAA	ULLA HDR4	ULLA	7.02	± 9.6 %
10980	AAA	ULLA HDR8	ULLA	8.82	± 9.6 %
10981	AAA	ULLA HDRp4	ULLA	1.50	± 9.6 %
10982	AAA	ULLA HDRp8	ULLA	1.44	± 9.6 %

E Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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Accreditation No.: **SCS 0108**

Client **KES (Dymstec)**

Certificate No: **D2450V2-896_Feb22**

CALIBRATION CERTIFICATE

Object	D2450V2 - SN:896
Calibration procedure(s)	QA CAL-05.v11 Calibration Procedure for SAR Validation Sources between 0.7-3 GHz
Calibration date:	February 11, 2022

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	09-Apr-21 (No. 217-03291/03292)	Apr-22
Power sensor NRP-Z91	SN: 103244	09-Apr-21 (No. 217-03291)	Apr-22
Power sensor NRP-Z91	SN: 103245	09-Apr-21 (No. 217-03292)	Apr-22
Reference 20 dB Attenuator	SN: BH9394 (20k)	09-Apr-21 (No. 217-03343)	Apr-22
Type-N mismatch combination	SN: 310982 / 06327	09-Apr-21 (No. 217-03344)	Apr-22
Reference Probe EX3DV4	SN: 7349	31-Dec-21 (No. EX3-7349_Dec21)	Dec-22
DAE4	SN: 601	01-Nov-21 (No. DAE4-601_Nov21)	Nov-22

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: MY41093315	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-20)	In house check: Oct-22
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-22

	Name	Function	Signature
Calibrated by:	Aidonia Georgiadou	Laboratory Technician	
Approved by:	Sven Kühn	Deputy Manager	i.V.

Issued: February 23, 2022

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

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Accreditation No.: **SCS 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEC/IEEE 62209-1528, "Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

c) DASY System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The source is mounted in a touch configuration below the center marking of the flat phantom.
- *Return Loss:* This parameter is measured with the source positioned under the liquid filled phantom (as described in the measurement condition clause). The Return Loss ensures low reflected power. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

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

Measurement Conditions

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

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.1 ± 6 %	1.86 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.4 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**52.5 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.11 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.1 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.3 Ω + 5.3 jΩ
Return Loss	- 23.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.158 ns

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

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

Additional EUT Data

Manufactured by	SPEAG

DASY5 Validation Report for Head TSL

Date: 11.02.2022

Test Laboratory: SPEAG, Zurich, Switzerland

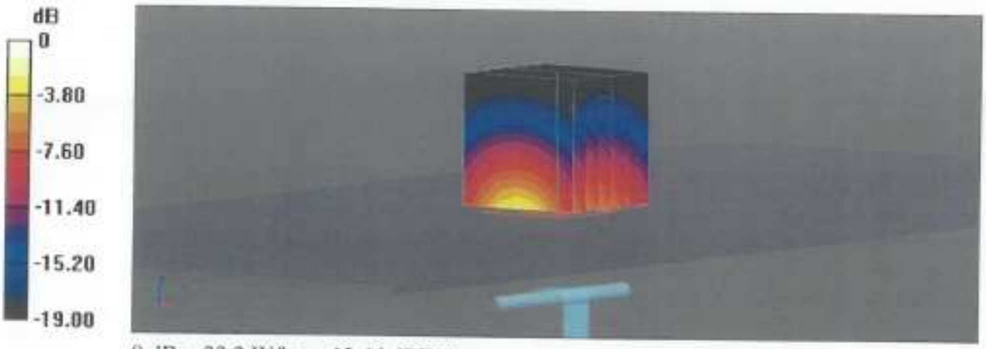
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 896

Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.86 S/m; ε_r = 38.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

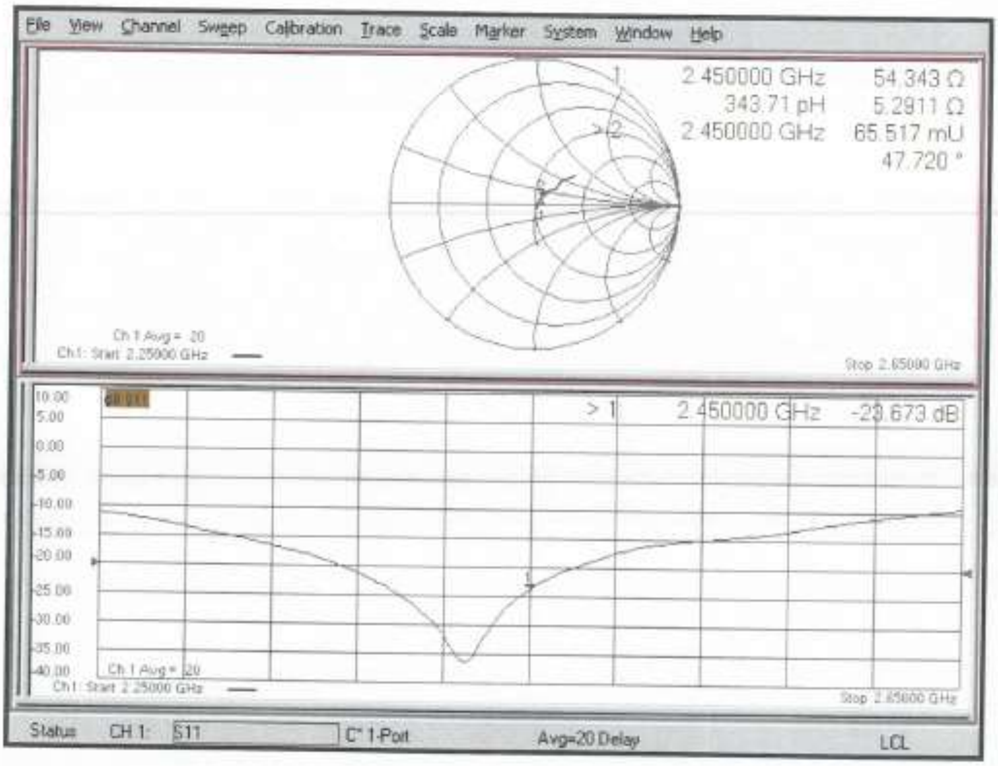
- Probe: EX3DV4 - SN7349; ConvF(7.96, 7.96, 7.96) @ 2450 MHz; Calibrated: 31.12.2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 01.11.2021
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 121.5 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 27.1 W/kg
SAR(1 g) = 13.4 W/kg; SAR(10 g) = 6.11 W/kg
Smallest distance from peaks to all points 3 dB below = 9 mm
Ratio of SAR at M2 to SAR at M1 = 49.3%
Maximum value of SAR (measured) = 22.2 W/kg



0 dB = 22.2 W/kg = 13.46 dBW/kg

Impedance Measurement Plot for Head TSL



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Accreditation No.: **SCS 0108**

Client **KES (Dymstec)**

Certificate No: **D5GHzV2-1170_Feb22**

CALIBRATION CERTIFICATE

Object: D5GHzV2 - SN:1170

Calibration procedure(s): QA CAL-22.v6
Calibration Procedure for SAR Validation Sources between 3-10 GHz

Calibration date: February 23, 2022

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	09-Apr-21 (No. 217-03291/03292)	Apr-22
Power sensor NRP-Z91	SN: 103244	09-Apr-21 (No. 217-03291)	Apr-22
Power sensor NRP-Z91	SN: 103245	09-Apr-21 (No. 217-03292)	Apr-22
Reference 20 dB Attenuator	SN: BH9394 (20k)	09-Apr-21 (No. 217-03343)	Apr-22
Type-N mismatch combination	SN: 310982 / 06327	09-Apr-21 (No. 217-03344)	Apr-22
Reference Probe EX3DV4	SN: 3503	31-Dec-21 (No. EX3-3503_Dec21)	Dec-22
DAE4	SN: 601	01-Nov-21 (No. DAE4-601_Nov21)	Nov-22

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: MY41093315	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-20)	In house check: Oct-22
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-22

	Name	Function	Signature
Calibrated by:	Jeffrey Katzman	Laboratory Technician	
Approved by:	Niels Kuster	Quality Manager	

Issued: March 1, 2022

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Accreditation No.: **SCS 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEC/IEEE 62209-1528, "Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

c) DASY System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The source is mounted in a touch configuration below the center marking of the flat phantom.
- *Return Loss:* This parameter is measured with the source positioned under the liquid filled phantom (as described in the measurement condition clause). The Return Loss ensures low reflected power. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

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

Measurement Conditions

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

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5200 MHz ± 1 MHz 5300 MHz ± 1 MHz 5500 MHz ± 1 MHz 5600 MHz ± 1 MHz 5800 MHz ± 1 MHz	

Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	36.0	4.66 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.1 ± 6 %	4.50 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5200 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.97 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**79.3 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.26 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.4 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.76 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.0 ± 6 %	4.60 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5300 MHz

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

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.33 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.1 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.6	4.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.7 ± 6 %	4.80 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5500 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.57 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**85.2 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.41 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.9 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.5 ± 6 %	4.90 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.50 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**84.4 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.41 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.8 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.3 ± 6 %	5.10 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.17 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**81.1 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.29 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.7 W/kg ± 19.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	50.2 Ω - 10.1 jΩ
Return Loss	- 20.0 dB

Antenna Parameters with Head TSL at 5300 MHz

Impedance, transformed to feed point	50.7 Ω - 6.8 jΩ
Return Loss	- 23.4 dB

Antenna Parameters with Head TSL at 5500 MHz

Impedance, transformed to feed point	53.0 Ω - 6.7 jΩ
Return Loss	- 22.9 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	57.0 Ω - 3.5 jΩ
Return Loss	- 22.7 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	56.1 Ω - 5.0 jΩ
Return Loss	- 22.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.201 ns

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

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

Additional EUT Data

Manufactured by	SPEAG

DASY5 Validation Report for Head TSL

Date: 23.02.2022

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1170

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; σ = 4.50 S/m; ε_r = 35.1; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5300 MHz; σ = 4.60 S/m; ε_r = 35.0; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5500 MHz; σ = 4.80 S/m; ε_r = 34.7; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5600 MHz; σ = 4.90 S/m; ε_r = 34.5; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5800 MHz; σ = 5.10 S/m; ε_r = 34.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.8, 5.8, 5.8) @ 5200 MHz, ConvF(5.49, 5.49, 5.49) @ 5300 MHz, ConvF(5.25, 5.25, 5.25) @ 5500 MHz, ConvF(5.1, 5.1, 5.1) @ 5600 MHz, ConvF(5.01, 5.01, 5.01) @ 5800 MHz; Calibrated: 31.12.2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 01.11.2021
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

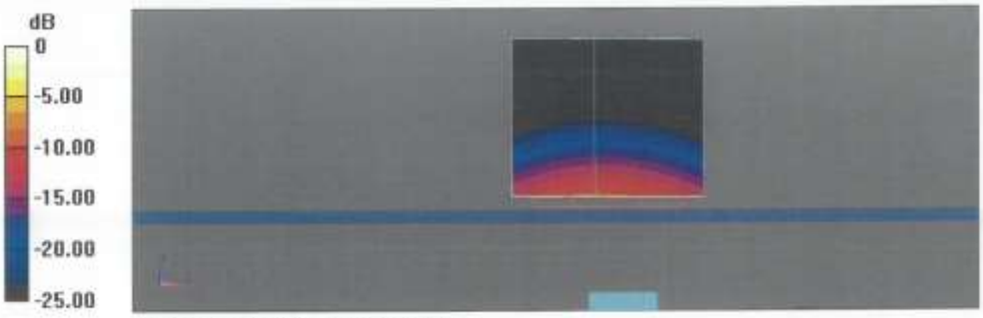
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 76.48 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 27.6 W/kg
SAR(1 g) = 7.97 W/kg; SAR(10 g) = 2.26 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 71.1%
Maximum value of SAR (measured) = 17.9 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 77.26 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 28.5 W/kg
SAR(1 g) = 8.20 W/kg; SAR(10 g) = 2.33 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 70.7%
Maximum value of SAR (measured) = 18.5 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 78.21 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 32.4 W/kg
SAR(1 g) = 8.57 W/kg; SAR(10 g) = 2.41 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 68.2%
Maximum value of SAR (measured) = 19.9 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 78.05 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 30.9 W/kg
SAR(1 g) = 8.50 W/kg; SAR(10 g) = 2.41 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 69.2%
Maximum value of SAR (measured) = 19.8 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 75.19 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 31.7 W/kg
SAR(1 g) = 8.17 W/kg; SAR(10 g) = 2.29 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 67.2%
Maximum value of SAR (measured) = 19.3 W/kg



0 dB = 19.9 W/kg = 12.98 dBW/kg

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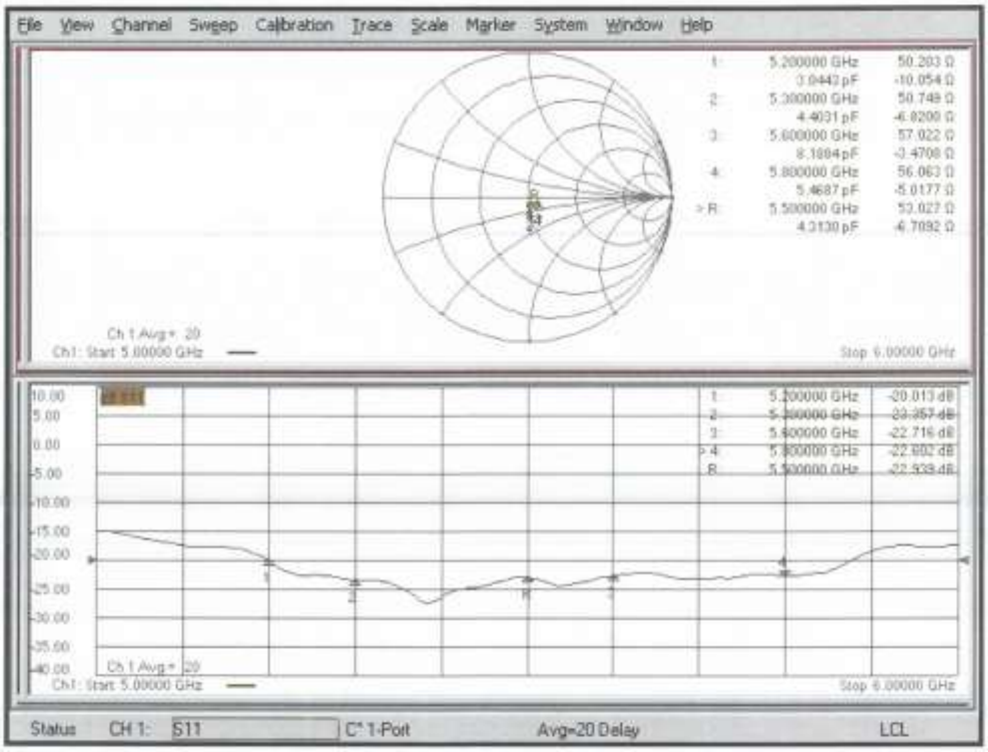
Impedance Measurement Plot for Head TSL



Appendix D. SAR Tissue Specifications

Measurement Procedure for Tissue verification:

1) The network analyzer and probe system was configured and calibrated.
2) The probe was immersed in the tissue. The tissue was placed in a nonmetallic container. Trapped air bubbles beneath the flange were minimized by placing the probe at a slight angle.
3) The complex admittance with respect to the probe aperture was measured.
4) The complex relative permittivity ε' can be calculated from the below equation (Pournaropoulos and Misra):

$$Y = \frac{j2\omega\varepsilon_r\varepsilon_0}{[\ln(b/a)]^2}\int_a^b\int_a^b\int_0^\pi \cos\phi' \frac{\exp\left[-j\omega r(\mu_0\varepsilon_r\varepsilon_0)^{1/2}\right]}{r}\, d\phi'\, d\rho'\, d\rho$$

where Y is the admittance of the probe in contact with the sample, the primed and unprimed coordinates refer to source and observation points, respectively, $r^2 = \rho^2 + \rho'^2 - 2\rho\rho'\cos\varphi'$, ω is the angular frequency, and $j = \sqrt{-1}$.

Table D-1 Composition of the Tissue Equivalent Matter - Head

Frequency (MHz)	2 450
Tissue type	Head
Ingredients (% by weight)	
DGBE	-
Mineral Oil	-
Emulsifiers	-
Nacl	0.1
Tween 20	45.0
Water	54.9

Table D-2 Recommended Tissue Dielectric Parameters (IEC 62209)

Frequency MHz	Relative permittivity ε_r	Conductivity (σ) S/m
300	45,3	0,87
450	43,5	0,87
750	41,9	0,89
835	41,5	0,90
900	41,5	0,97
1 450	40,5	1,20
1 500	40,4	1,23
1 640	40,2	1,31
1 750	40,1	1,37
1 800	40,0	1,40
1 900	40,0	1,40
2 000	40,0	1,40
2 100	39,8	1,49
2 300	39,5	1,67
2 450	39,2	1,80
2 600	39,0	1,96
3 000	38,5	2,40
3 500	37,9	2,91
4 000	37,4	3,43
4 500	36,8	3,94
5 000	36,2	4,45
5 200	36,0	4,66
5 400	35,8	4,86
5 600	35,5	5,07
5 800	35,3	5,27
6 000	35,1	5,48

Figure D-1 Liquid Height for Head & Body Position (SAM Twin Phantom)

Figure D-2 Liquid Height for Body Position (ELI Phantom)