SAR EVALUATION REPORT

FCC 47 CFR § 2.1093
IEEE Std. 1528-2013

For
UAV Remote Controller

FCC ID: SVNX820UAV-R
Model Name: DHI-UAV-R10-RH

Report Number: 4788103049-2-9

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Prepared for

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Revision History

Rev.	Date	Revisions	Revised By
V1.0	October 25, 2017	Initial Issue	

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1. Attestation of Test Results

Applicant Name	Zhejiang Dahua Vision Technology Co., Ltd.
Address	No.1199, Bin'an Road, Binjiang District, Hangzhou, P.R. China
Manufacturer	Zhejiang Dahua Vision Technology Co., Ltd.
Address	No.1199, Bin'an Road, Binjiang District, Hangzhou, P.R. China
EUT Name	UAV Remote Controller
Model Name	DHI-UAV-R10-RH
Sample Status	Normal
Brand	alhua TECHNOLOGY
Sample Received Date	August 1, 2017
Date of Tested	September 7, 2017 to September 7, 2017
Applicable Standards	FCC 47 CFR § 2.1093 IEEE Std. 1528-2013 KDB publication

SAR Limits (W/Kg)		
Exposure Category	Peak spatial-average(1g of tissue)	Extremities (hands, wrists, ankles, etc.) (10g of tissue)
General population / Uncontrolled exposure	1.6	4

The Highest Reported SAR (W/kg)		
RF Exposure Conditions	**Equipment Class**	
	915MHz 2FSK	**DTS**
Body	\	0.727
Extremities (10g)	\	0.340 (10g)
Simultaneous Transmission	Body	Extremity
	0.730	0.341
Test Results	Pass	

Tested By:	Reviewed By:	Approved By:
James Qin Engineer Project Associate	Shawn Wen Laboratory Leader	Stephen Guo Laboratory Manager

2. Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with IEEE Std. 1528-2013, the following FCC Published RF exposure KDB procedures:

- 248227 D01 802.11 Wi-Fi SAR
- 447498 D01 General RF Exposure Guidance
- 690783 D01 SAR Listings on Grants
- 865664 D01 SAR measurement 100 MHz to 6 GHz
- 865664 D02 RF Exposure Reporting
- 941225 D07 UMPC Mini Tablet

3. Facilities and Accreditation

The test site and measurement facilities used to collect data are located at

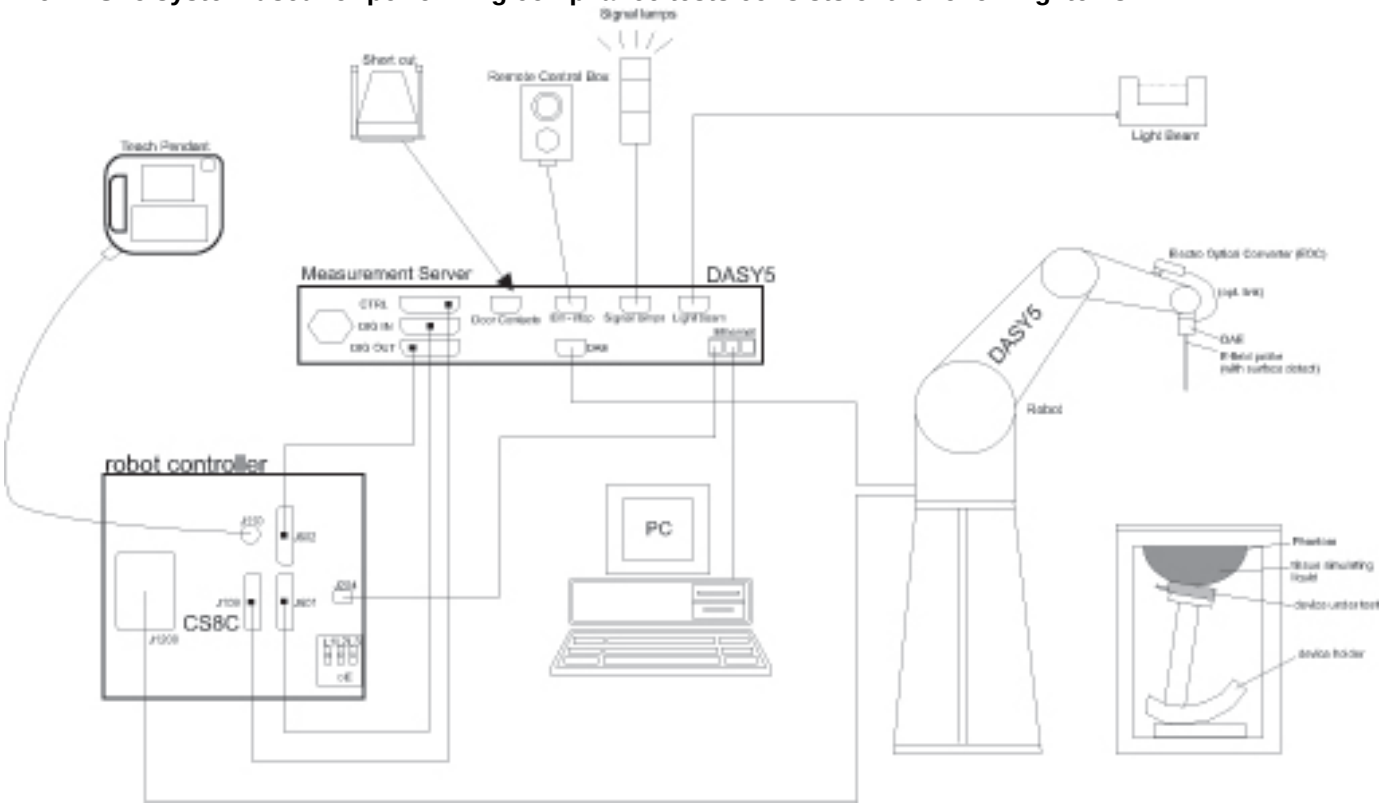
Ground Floor
SAR Test Room A

UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch is accredited by IAS & A2LA. Laboratory code TL-702 & 4102.01 respectively.

4. SAR Measurement System & Test Equipment

4.1. SAR Measurement System

The DASY5 system used for performing compliance tests consists of the following items:



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running Win7 and the DASY52 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.

4.2. SAR Scan Procedures

Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 2.1 mm. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

Step 2: Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE Standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan). If only one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of Zoom Scans has to be increased accordingly.

Area Scan Parameters extracted from KDB 865664 D01 v01r04 SAR Measurement 100 MHz to 6 GHz

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

Step 3: Zoom Scan

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

Zoom Scan Parameters extracted from KDB 865664 D01 v01r04 SAR Measurement 100 MHz to 6 GHz

			≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	≤ 1.5·$\Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

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

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

Step 4: Power drift measurement

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

Step 5: Z-Scan (FCC only)

The Z Scan measures points along a vertical straight line. The line runs along the Z-axis of a one-dimensional grid. In order to get a reasonable extrapolation the extrapolated distance should not be larger than the step size in Z-direction.

4.3. Test Equipment

The measuring equipment used to perform the tests documented in this report has been calibrated in accordance with the manufacturers' recommendations, and is traceable to recognized national standards.

Name of equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
ENA Network Analyzer	Keysight	E5080A	MY55100583	February 12, 2018
Dielectric Probe kit	SPEAG	SM DAK 040 SA	1155	NCR
DC power supply	Keysight	E36103A	MY55350020	February 9, 2018
Signal Generator	Rohde & Schwarz	SME06	837633\001	May 16, 2018
BI-Directional Coupler	WERLATONE	C8060-102	3423	February 12, 2018
Peak and Average Power Sensor	Keysight	E9323A	MY55440013	February 12, 2018
Peak and Average Power Sensor	Keysight	E9323A	MY55420006	February 12, 2018
Dual Channel PK Power Meter	Keysight	N1912A	MY55416024	February 12, 2018
Amplifier	CORAD TECHNOLOGY LTD	AMF-4D-00400600-50-30P	1983561	NCR
Dosimetric E-Field Probe	SPEAG	EX3DV4	7383	December 26, 2017
Data Acquisition Electronic	SPEAG	DAE3	427	December 8, 2017
Dipole Kit 2.45 GHz	SPEAG	D2450V2	977	January 14, 2019
Software	SPEAG	DASY52	N/A	NCR
ELI Phantom	SPEAG	ELI V5.0	1235	NCR
Thermometer	Control Company	4242	150709653	February 12, 2018
Thermometer	VICTOR	VC230	/	February 12, 2018

Note:

1) Per KDB865664D01 v01r04 requirements for dipole calibration, the test laboratory has adopted three-year extended calibration interval. Each measured dipole is expected to evaluate with the following criteria at least on annual interval in Appendix C.

a) There is no physical damage on the dipole;

b) System check with specific dipole is within 10% of calibrated value;

c) The most recent return-loss result, measured at least annually, deviates by no more than 20% from the previous measurement.

d) The most recent measurement of the real or imaginary parts of the impedance, measured at least annually is within 5Ω from the previous measurement.

2) Network analyzer probe calibration against air, distilled water and a shorting block performed before measuring liquid parameters.

5. Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std. 1528-2013 is not required in SAR reports submitted for equipment approval. The equivalent ratio (1.5/1.6) is applied to extremity and occupational exposure conditions.

6. SAR Test Configuration

The EUT support handheld using scenario, and may very close to the human body when used, the antenna can be bent 360 degree and bent 45 or 90 degree, the below configuration are regarded as the typical configuration which selected to perform SAR evaluation.

Antennas straight	Antennas bent 45 degree
	
Antennas bent 90 degree	N/A
	N/A

7. Device Under Test (DUT) Information

7.1. DUT Description

The EUT is a UAV ground station with IEEE 802.11b/g/n, 915MHz 2FSK radio.	
Battery Options	DC 10.65V, 8550mAh
Accessory	None
Serial Model	UAV-R10-RH, DHI-UAV-R1S-RVLW, UAV-R1S-RVLW
Difference	All the same with DHI-UAV-R10-RH except for the model name

7.2. Wireless Technology

Wireless technology	Frequency band	Operating mode
915MHz 2FSK	915MHz	2FSK
Wi-Fi	2.4 GHz	802.11 b 802.11 g 802.11 n(20M)

7.3. Maximum Output Power from Tune-up Procedure

KDB 447498 sec.4.1.d) at the maximum rated output power and within the tune-up tolerance range specified for the product, but not more than 2 dB lower than the maximum tune-up tolerance limit.

RF Air interface	Mode	Max. RF Output Power(dBm)
915MHz 2FSK	2FSK	-9
2.4G Wi-Fi	802.11 b	14
	802.11 g	7
	802.11 n(20M)	7

8. RF Exposure Conditions (Test Configurations)

Per FCC KDB 447498D01:
1. The 1-g SAR and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)]·[√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for product specific 10-g SAR, where:

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

2. The SAR exclusion threshold for distances >50mm is defined by the following equation, as illustrated in KDB 447498 D01 Appendix B:
a) at 100 MHz to 1500 MHz
[Power allowed at numeric threshold for 50 mm in step 1) + (test separation distance - 50 mm)·(f(MHz)/150)] mW
b) at > 1500 MHz and ≤ 6 GHz
[Power allowed at numeric Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·10] mW

For 915MHz 2FSK 1-g SAR

Mode	Frequency	Power (dBm)	Power (mW)	Separation Distance (mm)	Calculation Result	Threshold	SAR Test
915MHz 2FSK	919	-9.00	0.13	5.00	0.02	3.0	Excluded

For 915MHz 2FSK 10-g SAR

Mode	Frequency	Power (dBm)	Power (mW)	Separation Distance (mm)	Calculation Result	Threshold	SAR Test
915MHz 2FSK	919	-9.00	0.13	5.00	0.02	7.5	Excluded

For 2.4G Wi-Fi 1-g SAR

Position	Frequency (MHz)	Power (dBm)	Power (mW)	Separation Distance (mm)	Calculation Result	Threshold	SAR Test
Front surface	2462	14.00	25.12	10.00	3.94	3.0	Required
Back surface	2462	14.00	25.12	\	\	\	\
Left edge	2462	14.00	25.12	\	\	\	\
Right edge	2462	14.00	25.12	\	\	\	\
Top edge	2462	14.00	25.12	5.00	7.88	3.0	Required
Bottom edge	2462	14.00	25.12	\	\	\	\

Position	Frequency (MHz)	Power (dBm)	Power (mW)	Power allowed at 50mm	Separation Distance (mm)	Calculation Result	SAR Test
Front surface	2462	14	25.12	95.60	\	\	\
Back surface	2462	14	25.12	95.60	63.00	225.60	Excluded
Left edge	2462	14	25.12	95.60	100.00	595.60	Excluded
Right edge	2462	14	25.12	95.60	100.00	595.60	Excluded
Top edge	2462	14	25.12	95.60	\	\	\
Bottom edge	2462	14	25.12	95.60	215.00	1745.60	Excluded

For 2.4G Wi-Fi 10-g SAR

Position	Frequency (MHz)	Power (dBm)	Power (mW)	Separation Distance (mm)	Calculation Result	Threshold	SAR Test
Front surface	2462	14.00	25.12	10.00	3.94	7.5	Excluded
Back surface	2462	14.00	25.12	\	\	\	\
Left edge	2462	14.00	25.12	\	\	\	\
Right edge	2462	14.00	25.12	\	\	\	\
Top edge	2462	14.00	25.12	5.00	7.88	7.5	Required
Bottom edge	2462	14.00	25.12	\	\	\	\

Position	Frequency (MHz)	Power (dBm)	Power (mW)	Power allowed at 50mm	Separation Distance (mm)	Calculation Result (mW)	SAR Test
Front surface	2462	14	25.12	238.99	\	\	\
Back surface	2462	14	25.12	238.99	63	368.99	Excluded
Left edge	2462	14	25.12	238.99	100	738.99	Excluded
Right edge	2462	14	25.12	238.99	100	738.99	Excluded
Top edge	2462	14	25.12	238.99	\	\	\
Bottom edge	2462	14	25.12	238.99	215	1888.99	Excluded

9. Dielectric Property Measurements & System Check

9.1. Dielectric Property Measurements

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within ± 2°C of the temperature when the tissue parameters are characterized.
The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use; or earlier if the dielectric parameters can become out of tolerance; for example, when the parameters are marginal at the beginning of the measurement series.
Tissue dielectric parameters were measured at the low, middle and high frequency of each operating frequency range of the test device.

Tissue Dielectric Parameters

FCC KDB 865664 D01 v01r04 SAR Measurement 100 MHz to 6 GHz

Target Frequency (MHz)	Head		Body	
	ε_r	σ (S/m)	ε_r	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5000	36.2	4.45	49.3	5.07
5100	36.1	4.55	49.1	5.18
5200	36.0	4.66	49.0	5.30
5300	35.9	4.76	48.9	5.42
5400	35.8	4.86	48.7	5.53
5500	35.6	4.96	48.6	5.65
5600	35.5	5.07	48.5	5.77
5700	35.4	5.17	48.3	5.88
5800	35.3	5.27	48.2	6.00

IEEE Std 1528-2013
Refer to Table 3 within the IEEE Std 1528-2013

Dielectric Property Measurements Results:

Liquid	Freq.	Liquid Parameters				Delta(%)		Limit (%)	Temp. (℃)	Test Date
		Measured		Target						
		ϵ_r	σ	ϵ_r	σ	ϵ_r	σ			
Body 2450	2360	51.77	1.87	52.82	1.86	-1.99	0.59	±5	22.5	September 7, 2017
	2450	51.48	1.98	52.70	1.95	-2.31	1.49	±5		
	2540	51.16	2.09	52.59	2.08	-2.72	0.29	±5		

9.2. System Check

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device. The same SAR probe(s) and tissue-equivalent media combinations used with each specific SAR system for system verification must be used for device testing. When multiple probe calibration points are required to cover substantially large transmission bands, independent system verifications are required for each probe calibration point. A system verification must be performed before each series of SAR measurements using the same probe calibration point and tissue-equivalent medium. Additional system verification should be considered according to the conditions of the tissue-equivalent medium and measured tissue dielectric parameters, typically every three to four days when the liquid parameters are re-measured or sooner when marginal liquid parameters are used at the beginning of a series of measurements.

System Performance Check Measurement Conditions:

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness: 2.0 ±0.2 mm (bottom plate) filled with Body or Head simulating liquid of the following parameters.
- The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm for SAR measurements ≤ 3 GHz and ≥ 10.0 cm for measurements > 3 GHz.
- The DASY system with an E-Field Probe was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10mm (above 1GHZ) and 15mm (below 1GHz) from dipole center to the simulating liquid surface.
- For area scan, standard grid spacing for head measurements is 15 mm in x- and y- dimension(≤2GHz), 12 mm in x- and y-dimension(2-4 GHz) and 10mm in x- and y- dimension(4-6GHz).
- For zoom scan, Δx_{zoom}, Δy_{zoom}≤ 2GHz - ≤8mm, 2-4GHz - ≤5 mm and 4-6 GHz-≤4mm; Δz_{zoom} ≤3GHz - ≤5 mm, 3-4 GHz- ≤4mm and 4-6GHz-≤2mm.
- Distance between probe sensors and phantom surface was set to 3 mm except for 5 GHz band. For 5GHz band, Distance between probe sensors and phantom surface was set to 2.5 mm
- The dipole input power (forward power) was set to 100 mW or 250 mW depend on the certificate of the dipoles.
- The results are normalized to 1 W input power.

System Check Results

The 1-g and 10-g SAR measured with a reference dipole, using the required tissue-equivalent medium at the test frequency, must be within 10% of the manufacturer calibrated dipole SAR target.

System Dipole Serial #	T.S. Liquid		Measured Results: Zoom Scan (W/Kg)	Measured Results: Normalize to 1W (W/Kg)	Target (Ref. value)	Delta (%)	Limit (%)	Temp. (℃)	Test Date
977	Body 2450	1g	13.4	53.6	51.70	3.68	±10	22.5	September 7, 2017
		10g	6.38	25.52	24.30	5.02			

10. Conducted Output Power Measurement

10.1. 915MHZ 2FSK

Measured Results

Band	Freq.(MHz)	Avg. Pwr.(dBm)
915MHz	915	-10.21
	917.025	-10.56
	919.05	-10.35

10.2. 2.4GHz Wi-Fi

Band	Mode	Date Rate	Ch.#	Freq.(MHz)	Avg. Pwr.(dBm)
2.4GHz	802.11b	1Mbps	11	2462	13.85
	802.11g	6Mbps	11	2462	6.58
	802.11n (20M)	6.5Mbps	11	2462	6.53

11. Measured and Reported (Scaled) SAR Results

SAR Test Reduction criteria are as follows:

KDB 447498 D01 General RF Exposure Guidance:

A）Per KDB447498 D01 v06, all SAR measurement results are scaled to the maximum tune-up tolerance limit to demonstrate SAR compliance.

B）Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:

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

Per KDB865664 D01 v01r04:

For each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/Kg; if the deviation among the repeated measurement is ≤ 20%, and the measured SAR <1.45W/Kg, only one repeated measurement is required.

Per KDB 248227 D01 v02r02:

For Wi-Fi SAR testing, a communication link is set up with the testing software for Wi-Fi mode test. During the test, at the each test frequency channel, the EUT is operated at the RF continuous emission mode. The RF signal utilized in SAR measurement has 100% duty cycle and its crest factor is 1. The test procedures in KDB 248227 D01 v02r02 are applied. (Refer to KDB 248227D01 v02r02 for more details)

Initial Test Position Procedure

For exposure condition with multiple test position, such as handsets 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 ≤ 0.4W/kg, no additional testing for the remaining test position is required. Otherwise, SAR is evaluated at the subsequent highest peak SAR position until the reported SAR result is ≤ 0.8W/kg or all test position are measured. For all positions/configurations tested using the initial test position and subsequent test positions, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions /configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.

Initial Test Configuration Procedure

An initial test configuration is determined for OFDM transmission modes according to the channel bandwidth, modulation and data rate combination(s) with the highest maximum output power specified for production units in each standalone and aggregated frequency band. SAR is measured using the highest measured maximum output power channel. For configurations with the same specified or measured maximum output power, additional transmission mode and test channel selection procedures are required (see section 5.3.2 of KDB 248227D01 v02r02). SAR test reduction of subsequent highest output test channels is based on the reported SAR of the initial test configuration.

For next to the ear, hotspot mode and UMC mini-tablet exposure configurations where multiple test positions are required, the initial test position procedure is applied to minimize the number of test positions required for SAR measurement using the initial test configuration transmission mode. For fixed exposure conditions that do not have multiple SAR test positions, SAR is measured in the transmission mode determined by the initial test configuration.

When the reported SAR of the initial test configuration is > 0.8 W/kg, SAR measurement is required for the subsequent next highest measured output power channel(s) in the initial test configuration until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.

Sub Test Configuration Procedure

SAR measurement requirements for the remaining 802.11 transmission mode configurations that have not been tested in the initial test configuration are determined separately for each standalone and aggregated frequency band, in each exposure condition, according to the maximum output power specified for production units. When the highest reported SAR for the initial test configuration, according to the initial test position or fixed exposure position requirements, is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for that subsequent test configuration.

11.1. SAR Test Results of Wi-Fi 2.4G

Test Positon (Body 0mm)	Test Mode	Channel/ Frequency	Power (dBm)		SAR Value		Power Drift	Duty Factor (%)	Scaled 1g (W/Kg)	Scaled 10g (W/Kg)
			Tune-up	Meas.	1g (W/Kg)	10g (W/Kg)				
Front Surface-Antenna straight	802.11 b	11/2462	14.00	13.85	0.640	0.307	0.17	100.0	0.662	0.318
Top Edge-Antenna straight	802.11 b	11/2462	14.00	13.85	0.020	0.011	0.13	100.0	0.021	0.012
Top Edge-Antenna bent 45 degree	802.11 b	11/2462	14.00	13.85	0.030	0.017	0.05	100.0	0.031	0.017
Top Edge-Antenna bent 90 degree	802.11 b	11/2462	14.00	13.85	0.702	0.328	-0.18	100.0	0.727	0.340

Note: because the SAR result evaluated at 0mm meet the limit of 1-g SAR and 10-g SAR at the same time, so individual SAR evaluation at 10mm for 1-g SAR is not needed any more.

For 1-g SAR

Mode	Tune-up (dBm)	Tune-up (mW)	Highest Reported SAR (W/Kg)	Adjusted SAR (W/Kg)	SAR Test
802.11b	14	25.12	0.727	\	\
802.11g	7	5.01	\	0.145	Excluded
802.11n (20M)	7	5.01	\	0.145	Excluded

Note: because the adjusted 1-g SAR of 802.11g, 802.11n (20M) mode is less than 1.2 W/Kg, so 1-g SAR evaluation for the 2.4G Wi-Fi OFDM mode is not needed.

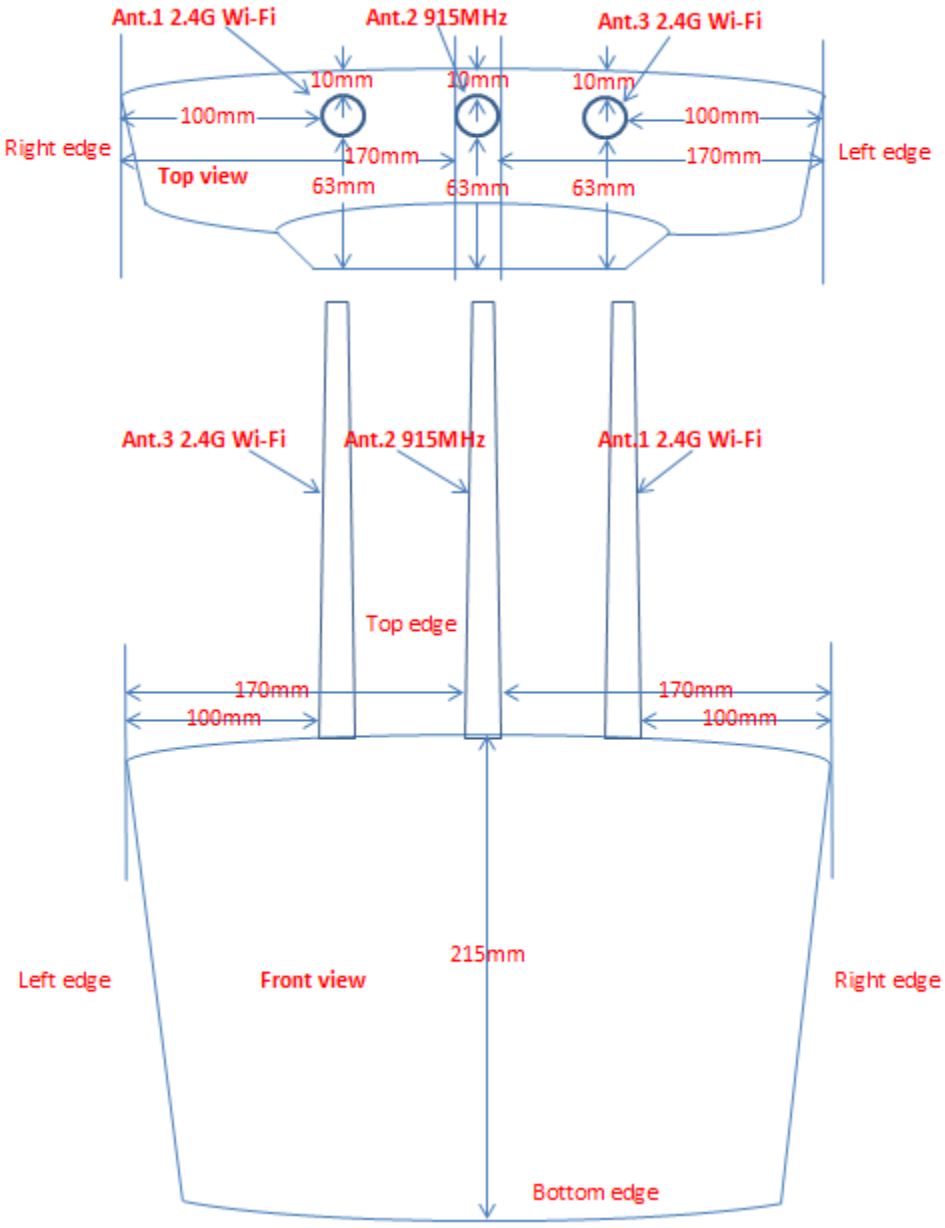
For 10-g SAR

Mode	Tune-up (dBm)	Tune-up (mW)	Highest Reported SAR (W/Kg)	Adjusted SAR (W/Kg)	SAR Test
802.11b	14	25.12	0.340	\	\
802.11g	7	5.01	\	0.068	Excluded
802.11n (20M)	7	5.01	\	0.068	Excluded

Note: because the adjusted 10-g SAR of 802.11g, 802.11n (20M) mode is less than 3 W/Kg, so 10-g SAR evaluation for the 2.4G Wi-Fi OFDM mode is not needed.

12. Simultaneous Transmission SAR Analysis

The antenna diagram of the device is showed as below, the two 2.4G Wi-Fi antennas can transmit simultaneously with the 915MHz antenna.



12.1. Estimated SAR

When standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:
(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)].
[√f(GHz)/x] W/kg for test separation distances ≤ 50 mm, where x = 7.5 for 1-g SAR and x = 18.75 for 10-g SAR.
When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion

Frequency (GHz)	Power (dBm)	Power (mW)	Separation Distance (mm)	Estimate 1g SAR (W/Kg)
0.919	-9.00	0.13	5	0.003

Frequency (GHz)	Power (dBm)	Power (mW)	Separation Distance (mm)	Estimate 10g SAR (W/Kg)
0.919	-9.00	0.13	5	0.001

For 1-g SAR

Test Position	Simultaneous Transmission Scenario	① 2.4G Wi-Fi (W/Kg)	② 915MHz (W/Kg)	①+②	
				SUM 1-g SAR (W/Kg)	SPLSR
Front Surface	①+②	0.662	0.003	0.665	Excluded
Back Surface	①+②	\	0.003	0.003	Excluded
Left Edge	①+②	\	0.003	0.003	Excluded
Right Edge	①+②	\	0.003	0.003	Excluded
Top Edge	①+②	0.727	0.003	0.730	Excluded
Bottom Edge	①+②	\	0.003	0.003	Excluded

Note: because the maximum SUM 1-g SAR ≤ 1.6 W/Kg, so the SPLSR analysis is not needed.

For 10-g SAR

Test Position	Simultaneous Transmission Scenario	① 2.4G Wi-Fi (W/Kg)	② 915MHz (W/Kg)	①+②	
				SUM 10-g SAR (W/Kg)	SPLSR
Front Surface	①+②	\	0.001	0.001	Excluded
Back Surface	①+②	\	0.001	0.001	Excluded
Left Edge	①+②	\	0.001	0.001	Excluded
Right Edge	①+②	\	0.001	0.001	Excluded
Top Edge	①+②	0.340	0.001	0.341	Excluded
Bottom Edge	①+②	\	0.001	0.001	Excluded

Note: because the maximum SUM 10-g SAR ≤ 4.0 W/Kg, so the SPLSR analysis is not needed.

Appendixes

Refer to separated files for the following appendixes.

4788103049-2-9_App A Photo

4788103049-2-9_App B System Check Plot

4788103049-2-9_App C Highest Test Plot

4788103049-2-9_App D Cal. Certificates

---------End of Report----------