SAR TEST REPORT

Test Report No.: 10834988S-A

Applicant : **SMK Corporation**
Type of Equipment : **WLAN Complete Module**
Model No. : **VRL4149-0601F** (*. Installed into the thermal printer)
FCC ID : **GT3FC016**
Test Standard : **FCC 47CFR §2.1093**
Test Result : **Complied**

Highest Reported SAR(1g) Value	Platform type	Platform model	Remarks
0.28 W/kg (*1)	Thermal printer	M327A	(DTS) 2412 MHz, IEEE 802.11b (1Mbps, DBPSK/DSSS) *1. SAR(1g) value measured: 0.180 W/kg (output power: 16.03 dBm).
0.73 W/kg (*2)			(UNII) 5500 MHz, IEEE 802.11a (6Mbps, BPSK/OFDM) *2. SAR(1g) value measured: 0.507 W/kg (output power: 10.44 dBm).

*. **The highest reported SAR (1g) value for body-worn is 0.73 W/kg (UNII).**

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Date of test: June 3, 9, 23 and 24, 2015

Test engineer: H. Naka

Hiroshi Naka
Engineer, Consumer Technology Division

Approved by: T. Imamura

Toyokazu Imamura
Leader, Consumer Technology Division

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RTL02610

REVISION HISTORY

Revision	Test report No.	Date	Page revised	Contents
Original	10834988S-A	July 23, 2015	-	-
-r01	10834988S-A	July 29, 2015	P1,2,12	(p12) Error correction.
-r02	10834988S-A	July 31, 2015	P1,2,3	(p3) Error correction.

*. By issue of new revision report, the report of an old revision becomes invalid.

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Contents of appendixes

SECTION 1: Customer information

Company Name	SMK Corporation
Address	5-6, Togoshi 6-chome, Shinagawa-ku, Tokyo 142-8511, Japan
Telephone Number	+81-3-3785-1111
Facsimile Number	+81-3-3785-1878
Contact Person	Mitsuhiko Goto

SECTION 2: Equipment under test (EUT)

2.1 Identification of EUT

	EUT	Platform
Type of Equipment	WLAN Complete Module	Thermal printer (*. WLAN Complete Module (EUT) was installed into this platform.)
Model Number	VRL4149-0601F	M327A
Serial Number	B109126	VMPF000507
Condition of EUT	Production prototype (*1)	Production model
	(*1. Not for sale: These samples are equivalent to mass-produced items.)	
Receipt Date of Sample	June 3, 2015 (*. EUT for SAR test.) *. No modification by the Lab. (During power measurement, the EUT that had been measured the power of SAR test reference, was installed into the SAR tested platform. After power measurement, the RF wiring was changed to the original antenna line form the antenna conducted power measurement line.)	
Country of Mass-production	Japan	China
Category Identified	Portable device (*. Since EUT may contact and/or very close to a human body during Wi-Fi operation, the partial-body SAR (1g) shall be observed.)	
Rating	DC 1.8 V (DC 1.71 V to 1.89 V) and DC 3.3 V (DC 3.0V to 3.6 V) *. The above the DC power was supplied form the host control device.	
Feature of EUT	The EUT is a WLAN Complete Module which installs into the specified platform.	
SAR Accessory	Belt clip (non metal) (*. During SAR test, this belt clip was removed to make the worst SAR setup condition.)	

2.2 Product Description

Equipment type	Transceiver
Model	VRL4149-0601F

Frequency band	**2.4GHz band**		**5GHz band**				
	Mode	**2.4GHz (DTS)**	Mode	**W52(UNII-1)**	**W53(UNII-2A)**	**W56(UNII-2C)**	**W58(UNII-3)**
Frequency of operation (MHz) (*.ch.: channel)	11b,g, n(20HT)	2412~2462 (*.ch.1~11)	11a, n(20HT)	5180~5240 (*.ch.36~48)	5260~5320 (*.ch.52~64)	5500~5700 (*.ch.100~140)	5745~5825 (*.ch.149~165)
Channel spacing (MHz)	5		20				
Bandwidth (MHz)	20		20				
Type of modulation	DSSS: DBPSK, DQPSK, CCK (11b), OFDM: BPSK, QPSK, 16QAM, 64QAM (11g,a,n(20HT))						
Transmit power (including manufacture variation) (dBm)	11b	18	11a:	13	13	12	12
	11g	13					
	n(20HT)	13	n(20HT)	12	12	11	11
	*. The measured Tx output power (conducted) refers to section 6 in this report.						
Antenna gain (dBi) (Maximum)	+1.47 (2412~2462 MHz)		-0.5 (5180~5260 MHz)		+1.15 (5260~5320 MHz)	-0.2 (above 5500 MHz)	
Q'ty of Antenna	1 pc						
Antenna type	Printed wire						
Antenna connector type	none						
Power supply	DC 1.8 V (DC 1.71 V to 1.89 V) and DC 3.3 V (DC 3.0V to 3.6 V)						
Operation temperature range	-20 deg.C. to +70 deg.C.						

*. The EUT do not use the special transmitting technique such as "beam-forming" and "time-space code diversity."

SECTION 3: Test specification, procedures and results

3.1 Test specification

The US Federal Communications Commission has released the report and order "Guidelines for Evaluating the Environmental Effects of RF Radiation", ET Docket No. 93-62 in August 1996. The order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 1.6 mW/g for an uncontrolled environment and 8.0 mW/g for an occupational/controlled environment as recommended by the ANSI/IEEE standard C95.1-1992. The device should be evaluated at maximum output power (radiated from the antenna) under "worst-case" conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling in accordance with the following measurement procedures..

KDB 447498 D01 (v05r02): General RF exposure guidance
KDB 248227 D01 (v02r01): SAR Guidance for IEEE 802.11 (Wi-Fi) transmitters
KDB 865664 D01 (v01r03): SAR measurement 100MHz to 6GHz
IEEE Std. 1528-2003: IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
IEEE Std. 1528-2013: IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.
(*. The reference for Uncertainty in SAR correction for deviations in permittivity and conductivity, in clause E.3.2.)

3.2 Exposure limit

Environments of exposure limit	Whole-Body (averaged over the entire body)	Partial-Body (averaged over any 1g of tissue)	Hands, Wrists, Feet and Ankles (averaged over any 10g of tissue)
(A) Limits for Occupational /Controlled Exposure (W/kg)	0.4	8.0	20.0
(B) Limits for General population /Uncontrolled Exposure (W/kg)	0.08	**1.6**	4.0

***. Occupational/Controlled Environments:** are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure, (i.e. as a result of employment or occupation).
***. General Population/Uncontrolled Environments:** are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

The limit applied in this test report is;

General population / uncontrolled exposure, Partial-Body (averaged over any 1g of tissue) limit: 1.6 W/kg

3.3 Procedures and Results

	Wi-Fi (DTS) 2412~2462 MHz	Wi-Fi (UNII-1) 5180~5240 MHz	Wi-Fi (UNII-2A) 5260~5320 MHz	Wi-Fi (UNII-2C) 5500~5700 MHz	Wi-Fi (UNII-3) 5745~5825 MHz
Test Procedure	SAR measurement; KDB 447498, KDB 248227, KDB 865664, IEEE Std.1528				
Category	FCC 47CFR §2.1093 (Portable device)				
Results (SAR(1g))	Complied	Complied	Complied	Complied	Complied
Reported SAR value	**0.28 W/kg**	**not applied** (*. ≤1.2 W/kg for UNII-2A)	**0.58 W/kg**	**0.73 W/kg**	**0.34 W/kg**
Measured SAR value	0.180 W/kg	-	0.451 W/kg	0.507 W/kg	0.249 W/kg
Operation mode	11b, 2412MHz	-	11a, 5320 MHz	11a, 5500 MHz	11a, 5745 MHz
Output power (scaled factor)	16.03 dBm (×1.57)	-	11.94 dBm (×1.28)	10.44 dBm (×1.43)	10.63 dBm (×1.37)

Note: UL Japan's SAR Work Procedures No.13-EM-W0429 and 13-EM-W0430. No addition, deviation nor exclusion has been made from standards

Test outline: Where this product is built into a new platform, it was verified whether multiplatform conditions can be suited in according with section 2) of 5.2.2 2 in KDB447498 D01 (v05r02).

Consideration of the test results: **The highest reported SAR (1g) of this platform was kept; ≤ 0.8 W/kg.**
Since highest reported SAR (1g) on this platform which obtained in accordance with KDB447498 (v05r02) was kept under 0.8 W/kg, this EUT was approved to operate multi-platform Highest reported SAR(1g) of EUT was 0.73 W/kg with this platform.

3.4 Test Location

No.7 shielded room (2.76 m (Width) × 3.76 m (Depth) × 2.4 m (Height)) for SAR testing.

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3.5 Confirmation before SAR testing

3.5.1 Average power for SAR tests

Before SAR test, the RF wiring for the sample had been switched to the antenna conducted power measurement line from the antenna line and the average power was measured. The result is shown in Section 6.

*. The EUT transmission power was verified that it was within 2dB lower than the maximum tune-up tolerance limit when it was set the rated power. (Clause 4.1, KDB447498 D01(v05))

Step.1 Check the power by data rate and operation channel

The data rate check was measured for all modes in one of default channel. For the SAR test reference, the average output power was measured on the low/middle/high channels with the worst data rate condition in.

11b		11g		11a		11n(20HT)		
Modulation	Data rate [Mbps]	Modulation	Data rate [Mbps]	Modulation	Data rate [Mbps]	Modulation	Spatial Stream	MCS Index
DBPSK/DSSS	1	BPSK/OFDM	6	BPSK/OFDM	6	BPSK/OFDM	1	MCS0
DQPSK/DSSS	2	BPSK/OFDM	9	BPSK/OFDM	9	QPSK/OFDM	1	MCS1
CCK/DSSS	5.5	QPSK/OFDM	12	QPSK/OFDM	12	QPSK/OFDM	1	MCS2
CCK/DSSS	11	QPSK/OFDM	18	QPSK/OFDM	18	16QAM/OFDM	1	MCS3
		16QAM/OFDM	24	16QAM/OFDM	24	16QAM/OFDM	1	MCS4
		16QAM/OFDM	36	16QAM/OFDM	36	64QAM/OFDM	1	MCS5
		64QAM/OFDM	48	64QAM/OFDM	48	64QAM/OFDM	1	MCS6
		64QAM/OFDM	54	64QAM/OFDM	54	64QAM/OFDM	1	MCS7

Step.2 Consideration of SAR test channel

For the SAR test reference, the average output power was measured on the low/middle/high channels with the worst data rate condition in step 1 in the above.

3.6 Confirmation after SAR testing

It was checked that the power drift [W] is within ±5% in the evaluation procedure of SAR testing. The verification of power drift during the SAR test is that DASY5 system calculates the power drift by measuring the e-filed at the same location at beginning and the end of the scan measurement for each test position.
The result is shown in APPENDIX 2.

*. DASY5 system calculation Power drift value[dB] =20log(Ea)/(Eb) (where, Before SAR testing: Eb[V/m] / After SAR testing: Ea[V/m])

Limit of power drift[W] = ±5%

Power drift limit (X) [dB] = 10log(P_drift)=10log(1.05/1)=10log(1.05)-10log(1)=0.21dB

from E-filed relations with power.

$S=E\times H=E^2/\eta=P/(4\times\pi\times r^2)$ (η: Space impedance) $\rightarrow P=(E^2\times 4\times\pi\times r^2)/\eta$

Therefore, The correlation of power and the E-filed

Power drift limit (X) dB=10log(P_drift)=10log(E_drift)^2=20log(E_drift)

From the above mentioned, **the calculated power drift of DASY5 system must be the less than ±0.21dB.**

3.7 Test setup of EUT and SAR measurement procedure

3.7.1 Consideration of SAR test reduction by the antenna separation distance

Antenna separation distances in each test setup plan are shown as follows.

Setup plan	Explanation of SAR test setup plan (*. Refer to Appendix 1 for test setup photographs which had been tested.)	D [mm]	SAR type
Top-front	When test is required, the front part on the top (near an antenna) of a platform is closed to the Flat phantom with 5mm separation gap.	2.5	Body-touch
Front	When test is required, the front surface of a platform is touched to the Flat phantom.	8.4	
Right	When test is required, the right surface of a platform is touched to the Flat phantom.	24	
Left	When test is required, the left surface of a platform is touched to the Flat phantom.	28	
Bottom	When test is required, the bottom surface of a platform is touched to the Flat phantom.	30	
Rear	When test is required, the rear surface of a platform is touched to the Flat phantom.	101.4	

*. **D:** Antenna separation distance. It is the distance from the EUT antenna inside a platform to the outer surface of platform which an operator may touch.
*. Size of EUT (VRL4149-0601F): 27 mm (width) × 35 mm (depth) × 2.5 mm max (thickness)
*. Size of platform: 79.0 mm (width) × 119.8 mm (depth) × 43.6 mm (height)

KDB 447498 D01 (v05) was taken into consideration to reduce SAR test.

Consideration of SAR test reduction by the antenna separation distance (100MHz~6GHz, ≤50mm)

Band, Mode		Setup Position	Minimum distance [mm]	Minimum distance [mm] (rounded)	Upper frequency [GHz]	Max. tune-up power [dBm]	Max. tune-up power [mW]	Max. tune-up power [mW] (rounded)	Exclusion factor (*1)	Standalone SAR Test Required? (>3, Tested)		Remarks
Wi-Fi, 2.4GHz	11b	Top-front	2.5	**5**	2.462	18	63.1	**63**	**19.8**	>3.0	**Require**	-
		Front	8.4	**8**	2.462	18	63.1	**63**	**12.4**	>3.0	**Require**	-
		Right	24	**24**	2.462	18	63.1	**63**	**4.1**	>3.0	**Require**	-
		Left	28	**28**	2.462	18	63.1	**63**	**3.5**	>3.0	**Require**	
		Bottom	30	**30**	2.462	18	63.1	**63**	**3.3**	>3.0	**Require**	-
	11g, n(20HT)	Top-front	2.5	**5**	2.462	13	20.0	**20**	**3.6**	>3.0	**Require**	
		Front	8.4	**8**	2.462	13	20.0	**20**	**3.9**	>3.0	**Require**	
		Right	24	**24**	2.462	13	20.0	**20**	**1.3**	≤3.0	Reduced	
		Left	28	**28**	2.462	13	20.0	**20**	**1.1**	≤3.0	Reduced	-
		Bottom	30	**30**	2.462	13	20.0	**20**	**1.0**	≤3.0	Reduced	-
Wi--Fi, W52&53	11a	Top-front	2.5	**5**	5.32	13	20.0	**20**	**9.2**	>3.0	**Require**	-
		Front	8.4	**8**	5.32	13	20.0	**20**	**5.8**	>3.0	**Require**	-
		Right	24	**24**	5.32	13	20.0	**20**	**1.9**	≤3.0	Reduced	SAR for 11n(20) is also reduced. (Power: 11a > n(20))
		Left	28	**28**	5.32	13	20.0	**20**	**1.6**	≤3.0	Reduced	
		Bottom	30	**30**	5.32	13	20.0	**20**	**1.5**	≤3.0	Reduced	
	11n (20HT)	Top-front	2.5	**5**	5.32	12	15.8	**16**	**7.4**	>3.0	**Require**	-
		Front	8.4	**8**	5.32	12	15.8	**16**	**4.6**	>3.0	**Require**	-
Wi--Fi, W56	11a	Top-front	2.5	**5**	5.7	12	15.8	**16**	**7.6**	>3.0	**Require**	-
		Front	8.4	**8**	5.7	12	15.8	**16**	**4.8**	>3.0	**Require**	-
		Right	24	**24**	5.7	12	15.8	**16**	**1.6**	≤3.0	Reduced	SAR for 11n(20) is also reduced. (Power: 11a > n(20))
		Left	28	**28**	5.7	12	15.8	**16**	**1.4**	≤3.0	Reduced	
		Bottom	30	**30**	5.7	12	15.8	**16**	**1.3**	≤3.0	Reduced	
	11n (20HT)	Top-front	2.5	**5**	5.7	11	12.6	**13**	**6.2**	>3.0	**Require**	-
		Front	8.4	**8**	5.7	11	12.6	**13**	**3.9**	>3.0	**Require**	-
Wi--Fi, W58	11a	Top-front	2.5	**5**	5.825	12	15.8	**16**	**7.7**	>3.0	**Require**	-
		Front	8.4	**8**	5.825	12	15.8	**16**	**4.8**	>3.0	**Require**	-
		Right	24	**24**	5.825	12	15.8	**16**	**1.6**	≤3.0	Reduced	SAR for 11n(20) is also reduced. (Power: 11a > n(20))
		Left	28	**28**	5.825	12	15.8	**16**	**1.4**	≤3.0	Reduced	
		Bottom	30	**30**	5.825	12	15.8	**16**	**1.3**	≤3.0	Reduced	
	11n (20HT)	Top-front	2.5	**5**	5.825	11	12.6	**13**	**6.3**	>3.0	**Require**	-
		Front	8.4	**8**	5.825	11	12.6	**13**	**3.9**	>3.0	**Require**	-

Consideration of SAR test reduction by the antenna separation distance (100MHz~6GHz, >50mm)

Band, Mode		Setup Position	Minimum distance [mm]	Minimum distance [mm] (rounded)	Upper frequency [GHz]	Max.tune-up power [dBm]	Max.tune-up power [mW]	Max.tune-up power [mW] (rounded)	Test exclusion thresholds [mW] (*2)	Standalone SAR test Required?	Remarks
Wi-Fi, 2.4GHz	11b	Rear	101.4	**101**	2.462	18	63.1	63	**606**	Reduced	SAR for 11g, n(20) is also reduced. (Power: 11b > 11g, n(20))
Wi-Fi, W52&53	11a	Rear	101.4	**101**	5.825	12	15.8	16	**575**	Reduced	SAR for 11n(20) is also reduced. (Power: 11a > n(20))
Wi-Fi, W56	11a	Rear	101.4	**101**	5.825	12	15.8	16	**573**	Reduced	
Wi-Fi, W58	11a	Rear	101.4	**101**	5.825	12	15.8	16	**572**	Reduced	

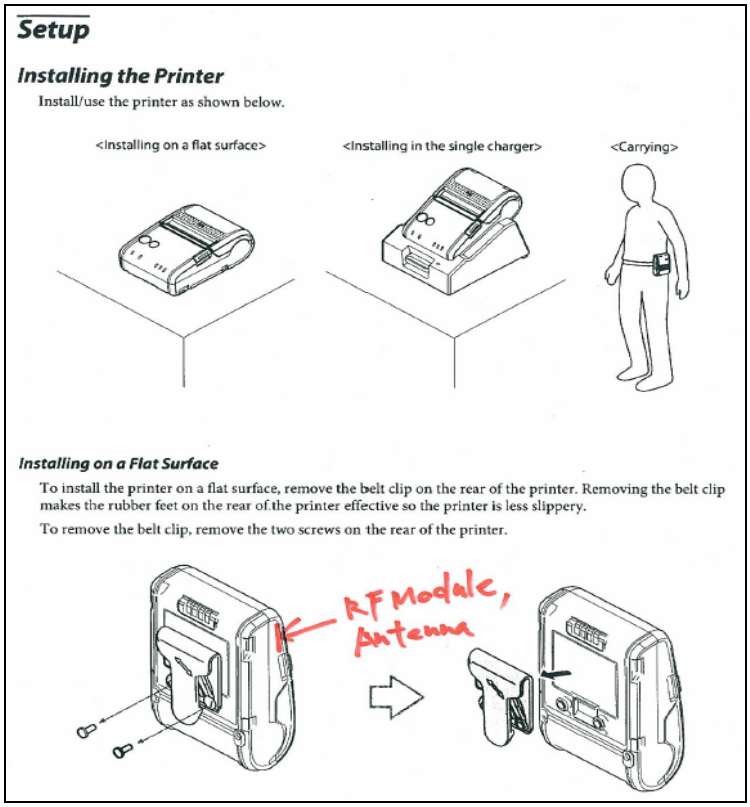
*1. Parenthesis 1), Clause 4.3.1, KDB 447498 D01 (v05r01) gives the following formula to calculate the SAR(1g) test exclusion thresholds for 100MHz-6GHz at test separation distance ≤50mm.
[(max.power of channel, including tune-up tolerance, mW) / (min.test separation distance, mm)] × [√f(GHz)] ≤ 3.0 (for SAR(1g)) ····· formula (1)
If power is calculated from the upper formula (1);
[SAR(1g) test exclusion thresholds, mW] = 3 × [test separation distance, mm] / [√f(GHz)] ····· formula (2)
*2. Parenthesis 2), Clause 4.3.1, KDB 447498 D01 (v05r01) gives the following formula to calculate the SAR(1g) test exclusion thresholds for 1.5-6GHz at test separation distance >50mm.
[test exclusion thresholds, mW] = [(Power allowed at numeric threshold for 50mm in formula (1))] + [(test separation distance, mm) - (50mm)] × 10 formula (3)

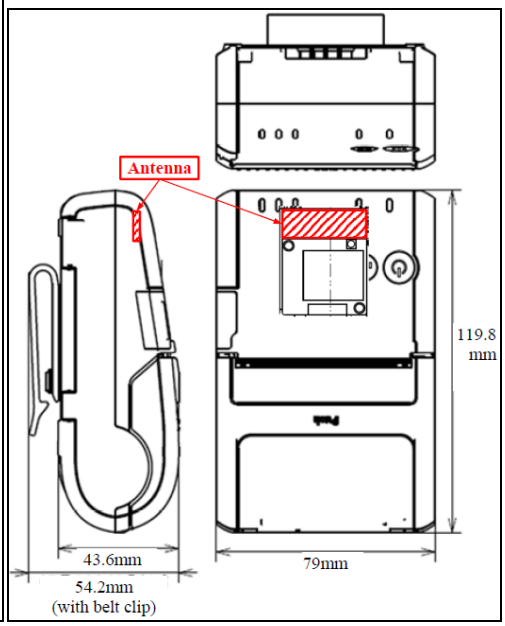
3.7.2 Consideration of SAR test setup

This printer which is a platform of EUT is maintained by a human body using a belt clip at the time of human body attachment as it was indicated on a manual.

- When using, user doesn't cover and touch top surface of printer closest to an antenna, because the printed paper is ejected from this top surface area.
- A possibility that a person besides the user touches this printer directly is very small. Because this printer is thin by 43.6mm and the body of user who attaches this printer makes interference.

Therefore a SAR test in the top-front surface on a platform was applied with the separation distance of 5mm.





3.7.3 Conclusion for consideration for SAR test reduction

1) For 2.4GHz and 11b mode, Top-front, Front, Right, Left and Bottom setup conditions of a platform are considered body-touch SAR and require the SAR evaluation in body-liquid. Rear setup conditions of a platform are reduced because there is enough antenna separation distance.
2) For 5GHz band and 11a mode, Top-front and Front setup conditions of a platform are considered body-touch SAR and require the SAR evaluation in body-liquid. Setup of other surfaces conditions of a platform are reduced because there is enough antenna separation distance.
3) Since the printer which is platform of EUT is carried by using the belt clip, SAR test of front-of-face is not considered.

By the determined test setup shown above, the SAR test was applied in the following procedures.

Step 1	For 2.4GHz band; Determine "Initial test position" by manufacture's antenna location drawing. Determine the highest reported SAR(1g) of DSSS mode. (*. 11b mode has highest average power.) Determine the highest reported SAR(1g) of OFDM mode.
Step 2	For 5GHz band; Determine the highest reported SAR(1g) of OFDM mode.

*. During SAR test, the radiated power is always monitored by Spectrum Analyzer.

SECTION 4: Operation of EUT during testing

4.1 Operating modes for SAR testing

This EUT has IEEE.802.11b/g/a/11n(20HT) continuous transmitting modes.
The frequency and the operation mode which carried out the SAR test are shown below.

Operation mode		11b	11g	11n(20HT)	11a	11n(20HT)	11a	11n(20HT)	11a	11n(20HT)	11a	11n(20HT)
Tx band [MHz]		2412~2462			5180~5240 (UNII-1)		5260~5320 (UNII-2A)		5500~5700 (UNII-2C)		5745~5825 (UNII-3)	
Frequency [MHz]		2412, 2437, 2462	2437	n/a (*2)	n/a (*3)	n/a (*3)	5260, 5300, 5320	n/a (*2)	5500, 5600, 5680	n.a (*2)	5745, 5785, 5825	n/a (*2)
(*1) Data rate [Mbps]		1	6	-	-	-	6	-	6	-	6	-
Modulation		DBPSK /DSSS	BPSK /OFDM	-	-	-	BPSK /OFDM	-	BPSK /OFDM	-	BPSK /OFDM	-
Controlled software		WiFi Control Application Ver.3.0 This software was installed to host PC. During conducted power measurement and SAR test, the host PC was connected to the EUT via ribbon flat cable to supply the power and to control the specified operation mode with tuning the power. The default power setting number of software and the tuned power setting number which is tuned within 2dB from the maximum power are shown below.										
Power setting [-]	Conducted	default: 18 tune-up: 19	default: 14 tune-up: -	default: 14 tune-up: -	default: 14 tune-up: -	default: 13 tune-up: -	default: 14 tune-up: -	default: 13 tune-up: -	default: 14 tune-up: -	default: 13 tune-up: 14,15	default: 14 tune-up: 16	default: 13 tune-up: 15
	SAR	tune-up: 19	default: 14	n/a	n/a	n/a	default: 14	n/a	default: 14	n/a	tune-up: 16	n/a

*. n/a: SAR test was not applied.
*1. (KDB248227, clause 5.3.2) The SAR was measured by lowest data rate.
*2. (KDB248227, clause 5.3.2) The SAR was only measured by lower order modulation of OFDM mode.
*3. (KDB248227, clause 5.3.1) Since highest reported SAR(1g) of UNII-2A was ≤1.2 W/kg, SAR measurement of UNII-1 band was omitted.

SECTION 5: Uncertainty Assessment (SAR measurement)

Uncertainty of SAR measurement (2.4-6GHz) (*.ε&σ: ≤ ± 5%, DAK3.5, Tx: ≈100% duty cycle) (v08)	1g SAR	10g SAR
Combined measurement uncertainty of the measurement system (k=1)	± 13.7%	± 13.6%
Expanded uncertainty (k=2)	± 27.4%	± 27.2%

	Error Description (2.4-6GHz) (v08)	Uncertainty Value	Probability distribution	Divisor	ci (1g)	ci (10g)	ui (1g)	ui (10g)	Vi, veff
A	**Measurement System** (DASY5)						(std. uncertainty)	(std. uncertainty)	
1	Probe Calibration Error	±6.55 %	Normal	1	1	1	±6.55 %	±6.55 %	∞
2	Axial isotropy Error	±4.7 %	Rectangular	√3	√0.5	√0.5	±1.9 %	±1.9 %	∞
3	Hemispherical isotropy Error	±9.6 %	Rectangular	√3	√0.5	√0.5	±3.9 %	±3.9 %	∞
4	Linearity Error	±4.7 %	Rectangular	√3	1	1	±2.7 %	±2.7 %	∞
5	Probe modulation response	±2.4 %	Rectangular	√3	1	1	±1.4 %	±1.4 %	∞
6	Sensitivity Error (detection limit)	±1.0 %	Rectangular	√3	1	1	±0.6 %	±0.6 %	∞
7	Boundary effects Error	±4.3%	Rectangular	√3	1	1	±2.5 %	±2.5 %	∞
8	Readout Electronics Error(DAE)	±0.3 %	Rectangular	√3	1	1	±0.3 %	±0.3 %	∞
9	Response Time Error	±0.8 %	Normal	1	1	1	±0.8 %	±0.8 %	∞
10	Integration Time Error (≈100% duty cycle)	±0 %	Rectangular	√3	1	1	0 %	0 %	∞
11	RF ambient conditions-noise	±3.0 %	Rectangular	√3	1	1	±1.7 %	±1.7 %	∞
12	RF ambient conditions-reflections	±3.0 %	Rectangular	√3	1	1	±1.7 %	±1.7 %	∞
13	Probe positioner mechanical tolerance	±3.3 %	Rectangular	√3	1	1	±1.9 %	±1.9 %	∞
14	Probe Positioning with respect to phantom shell	±6.7 %	Rectangular	√3	1	1	±3.9 %	±3.9 %	∞
15	Max. SAR evaluation (Post-processing)	±4.0 %	Rectangular	√3	1	1	±2.3 %	±2.3 %	∞
B	**Test Sample Related**								
16	Device Holder or Positioner Tolerance	±3.6 %	Normal	1	1	1	±3.6 %	±3.6 %	5
17	Test Sample Positioning Error	±5.0 %	Normal	1	1	1	±5.0 %	±5.0 %	145
18	Power scaling	±0%	Rectangular	√3	1	1	±0 %	±0 %	∞
19	Drift of output power (measured, <0.2dB)	±2.3%	Rectangular	√3	1	1	±2.9 %	±2.9 %	∞
C	**Phantom and Setup**								
20	Phantom uncertainty (shape, thickness tolerances)	±7.5 %	Rectangular	√3	1	1	±4.3 %	±4.3 %	∞
21	Algorithm for correcting SAR (ε',σ: ≤5%)	±1.2 %	Normal	1	1	0.84	±1.2 %	±0.97 %	∞
22	Measurement Liquid Conductivity Error (DAK3.5)	±3.0 %	Normal	1	0.78	0.71	±2.3 %	±2.1 %	7
23	Measurement Liquid Permittivity Error (DAK3.5)	±3.1 %	Normal	1	0.23	0.26	±0.7 %	±0.8 %	7
24	Liquid Conductivity-temp.uncertainty (≤2deg.C.)	±5.3 %	Rectangular	√3	0.78	0.71	±2.4 %	±2.2 %	∞
25	Liquid Permittivity-temp.uncertainty (≤2deg.C.)	±0.9 %	Rectangular	√3	0.23	0.26	±0.1 %	±0.1 %	∞
	Combined Standard Uncertainty						**±13.7** %	**±13.6** %	733
	Expanded Uncertainty (k=2)						**±27.4 %**	**±27.2 %**	

*. Table of uncertainties are listed for ISO/IEC 17025.
*. This measurement uncertainty budget is suggested by IEEE Std.1528(2013) and determined by Schmid & Partner Engineering AG (DASY5 Uncertainty Budget). Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r01 Section 2.8.1., when the highest measured SAR(1g) within a frequency band is < 1.5W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std.1528 (2013) is not required in SAR reports submitted for equipment approval.

SECTION 6: Confirmation before testing

6.1 SAR reference power measurement (antenna terminal conducted power) / Worst data rate, worst channel determination

Mode	Freq.	Data rate	Power Setting (soft)	Duty cycle	Duty factor	Duty scaled factor	Average power			Peak power	PAR	Target power & factor			SAR Tested/ Reduced	Remarks	Power Tune -up?
							Result		ΔRef.			Target (including variation)	Deviation from max (-2≤x<0)	Tune -up factor			
	[MHz]	[Mbps]	[-]	[%]	[dB]	[-]	[dBm]	[mW]	[dB]	[dB]	[dB]	[dBm]	[dB]	[-]			
11b	2412	1	18	100	0.00	×1.00	15.80	38.05	-0.23	18.29	2.5	18.0	-2.20	×1.66	-	Higher pwr-D/R.	default
	2412	2	18	100	0.00	×1.00	15.75	37.62	-	18.37	2.6	18.0	-2.25	×1.68	-	-	default
	2412	5.5	18	100	0.00	×1.00	15.69	37.10	-	18.37	2.7	18.0	-2.31	×1.70	-	-	default
	2412	11	18	100	0.00	×1.00	15.70	37.19	-	18.27	2.6	18.0	-2.30	×1.70	-	-	default
	2437	1	18	100	0.00	×1.00	16.03	40.12	Refb18	19.00	3.0	18.0	-1.97	×1.57	-	-	default
	2462	1	18	100	0.00	×1.00	16.20	41.73	0.17	18.40	2.2	18.0	-1.80	×1.51	-	-	default
	2412	1	19	100	0.00	×1.00	16.03	40.12	-0.13	18.59	2.6	18.0	-1.97	×1.57	**Tested**	-	Tune-up
	2437	1	19	100	0.00	×1.00	16.16	41.34	Refb19	19.10	2.9	18.0	-1.84	×1.53	**Tested**	-	Tune-up
	2462	1	19	100	0.00	×1.00	16.30	42.70	0.14	18.63	2.3	18.0	-1.70	×1.48	**Tested**	Highest pwr-ch.(11b)	Tune-up
11g	2412	6	14	100	0.00	×1.00	12.01	15.90	-0.18	21.17	9.2	13.0	-0.99	×1.25	Reduced	Higher pwr-D/R.	default
	2412	9	14	100	0.00	×1.00	11.95	15.68	-	20.42	8.5	13.0	-1.05	×1.27	-	-	default
	2412	12	14	100	0.00	×1.00	11.94	15.65	-	21.10	9.2	13.0	-1.06	×1.28	-	-	default
	2412	18	14	100	0.00	×1.00	11.90	15.50	-	20.72	8.8	13.0	-1.10	×1.29	-	-	default
	2412	24	14	100	0.00	×1.00	11.89	15.47	-	21.28	9.4	13.0	-1.11	×1.29	-	-	default
	2412	36	14	100	0.00	×1.00	11.82	15.22	-	20.82	9.0	13.0	-1.18	×1.31	-	-	default
	2412	48	14	100	0.00	×1.00	11.78	15.08	-	20.69	8.9	13.0	-1.22	×1.32	-	-	default
	2412	56	14	100	0.00	×1.00	11.74	14.94	-	20.94	9.2	13.0	-1.26	×1.34	-	-	default
	2437	6	14	100	0.00	×1.00	12.19	16.57	Refg14	21.36	9.2	13.0	-0.81	×1.20	**Tested**	Highest pwr-ch.(11g)	default
	2462	6	14	100	0.00	×1.00	12.15	16.42	-0.04	20.98	8.8	13.0	-0.85	×1.22	Reduced	-	default
11n (20HT)	2412	**MCS0**	14	100	0.00	×1.00	12.01	15.90	-0.05	20.62	8.6	13.0	-0.99	×1.25	Reduced	Higher pwr-D/R.	default
	2412	MCS1	14	100	0.00	×1.00	11.96	15.72	-	20.54	8.6	13.0	-1.04	×1.27	-	-	default
	2412	MCS2	14	100	0.00	×1.00	11.94	15.65	-	20.52	8.6	13.0	-1.06	×1.28	-	-	default
	2412	MCS3	14	100	0.00	×1.00	11.87	15.40	-	20.37	8.5	13.0	-1.13	×1.30	-	-	default
	2412	MCS4	14	100	0.00	×1.00	11.84	15.29	-	20.45	8.6	13.0	-1.16	×1.30	-	-	default
	2412	MCS5	14	100	0.00	×1.00	11.84	15.29	-	20.58	8.7	13.0	-1.16	×1.30	-	-	default
	2412	MCS6	14	100	0.00	×1.00	11.85	15.32	-	20.39	8.5	13.0	-1.15	×1.30	-	-	default
	2412	MCS7	14	100	0.00	×1.00	11.82	15.22	-	20.57	8.8	13.0	-1.18	×1.31	-	-	default
	2437	**MCS0**	14	100	0.00	×1.00	12.06	16.08	Ref2n14	20.86	8.8	13.0	-0.94	×1.24	Reduced	Highest pwr-ch.(n20)	default
	2462	**MCS0**	14	100	0.00	×1.00	11.92	15.57	-0.14	20.40	8.5	13.0	-1.08	×1.28	Reduced	-	default
11a	5180	6	14	100	0.00	×1.00	11.97	15.73	-0.02	22.52	10.6	13.0	-1.03	×1.27	-	-	default
	5200	6	14	100	0.00	×1.00	11.90	15.47	-0.09	22.40	10.5	13.0	-1.10	×1.29	-	-	default
	5220	6	14	100	0.00	×1.00	11.99	15.80	Ref.w52a14	22.42	10.4	13.0	-1.01	×1.26	Reduced	Highest pwr-ch.(w52)	default
	5240	6	14	100	0.00	×1.00	11.97	15.73	-0.02	22.26	10.3	13.0	-1.03	×1.27	-	-	default
	5260	6	14	100	0.00	×1.00	12.13	16.32	0.18	22.00	9.9	13.0	-0.87	×1.22	**Tested**	-	default
	5280	6	14	100	0.00	×1.00	11.85	15.30	-0.10	21.57	9.7	13.0	-1.15	×1.30	-	-	default
	5300	6	14	100	0.00	×1.00	11.95	15.65	Ref.w53a14	21.50	9.6	13.0	-1.05	×1.27	**Tested**	Highest pwr-ch.(w53)	default
	5320	6	14	100	0.00	×1.00	11.94	15.62	-0.01	21.55	9.6	13.0	-1.06	×1.28	**Tested**	-	default
	5500	6	14	100	0.00	×1.00	10.44	11.06	0.30	18.90	8.5	12.0	-1.56	×1.43	**Tested**	Higher pwr-D/R.	default
	5500	9	14	100	0.00	×1.00	10.42	11.01	-	18.46	8.0	12.0	-1.58	×1.44	-	-	default
	5500	12	14	100	0.00	×1.00	10.39	10.93	-	18.76	8.4	12.0	-1.61	×1.45	-	-	default
	5500	18	14	100	0.00	×1.00	10.39	10.93	-	18.78	8.4	12.0	-1.61	×1.45	-	-	default
	5500	24	14	100	0.00	×1.00	10.36	10.85	-	18.93	8.6	12.0	-1.64	×1.46	-	-	default
	5500	36	14	100	0.00	×1.00	10.28	10.66	-	18.61	8.3	12.0	-1.72	×1.49	-	-	default
	5500	48	14	100	0.00	×1.00	10.31	10.73	-	18.59	8.3	12.0	-1.69	×1.48	-	-	default
	5500	56	14	100	0.00	×1.00	10.30	10.71	-	18.49	8.2	12.0	-1.70	×1.48	-	-	default
	5520	6	14	100	0.00	×1.00	10.46	11.11	0.32	18.87	8.4	12.0	-1.54	×1.43	-	Highest pwr-ch.(w56)	default
	5540	6	14	100	0.00	×1.00	10.37	10.88	0.23	18.47	8.1	12.0	-1.63	×1.46	-	-	default
	5560	6	14	100	0.00	×1.00	10.18	10.41	0.04	18.18	8.0	12.0	-1.82	×1.52	-	-	default
	5580	6	14	100	0.00	×1.00	10.11	10.25	-0.03	18.16	8.1	12.0	-1.89	×1.55	-	-	default
	5600	6	14	100	0.00	×1.00	10.14	10.32	Ref.w56a14	18.17	8.0	12.0	-1.86	×1.54	**Tested**	-	default
	5620	6	14	100	0.00	×1.00	10.13	10.29	-0.01	18.16	8.0	12.0	-1.87	×1.54	-	-	default
	5640	6	14	100	0.00	×1.00	10.18	10.41	0.04	18.15	8.0	12.0	-1.82	×1.52	-	-	default
	5660	6	14	100	0.00	×1.00	10.12	10.27	-0.02	17.85	7.7	12.0	-1.88	×1.54	-	-	default
	5680	6	14	100	0.00	×1.00	10.02	10.04	-0.12	17.83	7.8	12.0	-1.98	×1.58	**Tested**	-	default
	5700	6	14	100	0.00	×1.00	9.16	8.23	-0.98	17.43	8.3	12.0	-2.84	×1.92	-	-	default
	5745	6	14	100	0.00	×1.00	9.46	8.82	-0.07	16.43	7.0	12.0	-2.54	×1.80	-	-	default
	5765	6	14	100	0.00	×1.00	9.33	8.56	-0.20	16.42	7.1	12.0	-2.67	×1.85	-	-	default
	5785	6	14	100	0.00	×1.00	9.53	8.97	Ref.w58a14	16.44	6.9	12.0	-2.47	×1.77	-	-	default
	5805	6	14	100	0.00	×1.00	9.36	8.62	-0.17	16.18	6.8	12.0	-2.64	×1.84	-	-	default
	5825	6	14	100	0.00	×1.00	9.33	8.56	-0.20	16.09	6.7	12.0	-2.67	×1.85	-	-	default
	5745	6	16	100	0.00	×1.00	10.63	11.55	-0.11	16.77	6.1	12.0	-1.37	×1.37	**Tested**	-	Tune-up
	5785	6	16	100	0.00	×1.00	10.74	11.85	Ref.w58a16	16.49	5.8	12.0	-1.26	×1.34	**Tested**	Highest pwr-ch.(w58)	Tune-up
	5825	6	16	100	0.00	×1.00	10.41	10.98	-0.33	15.57	5.2	12.0	-1.59	×1.44	**Tested**	-	Tune-up

(cont'd)

(cont'd)

Mode	Freq.	Data rate	Power Setting (soft)	Duty cycle	Duty factor	Duty scaled factor	Average power			Peak power	PAR	Target power & factor			SAR Tested/ Reduced	Remarks	Power Tune -up?
							Result		ΔRef.			Target (including variation)	Deviation from max (-2≤x<0)	Tune -up factor			
	[MHz]	[Mbps]	[-]	[%]	[dB]	[-]	[dBm]	[mW]	[dB]	[dB]	[dB]	[dBm]	[dB]	[-]			
11n (20HT)	5180	**MCS0**	13	100	0.00	×1.00	10.97	12.49	0.04	21.51	10.5	12.0	-1.03	×1.27	-	Highest pwr-ch.(w52)	default
	5200	**MCS0**	13	100	0.00	×1.00	10.95	12.43	0.02	20.76	9.8	12.0	-1.05	×1.27	-	-	default
	5220	**MCS0**	13	100	0.00	×1.00	10.93	12.38	Ref.w52n13	21.15	10.2	12.0	-1.07	×1.28	Reduced	-	default
	5240	**MCS0**	13	100	0.00	×1.00	10.88	12.23	-0.05	21.25	10.4	12.0	-1.12	×1.30	-	-	default
	5260	**MCS0**	13	100	0.00	×1.00	10.98	12.52	0.14	20.68	9.7	12.0	-1.02	×1.27	-	Highest pwr-ch.(w53)	default
	5280	**MCS0**	13	100	0.00	×1.00	10.81	12.04	-0.03	20.54	9.7	12.0	-1.19	×1.32	-	-	default
	5300	**MCS0**	13	100	0.00	×1.00	10.84	12.12	Ref.w53n13	20.49	9.7	12.0	-1.16	×1.31	Reduced	-	default
	5320	**MCS0**	13	100	0.00	×1.00	10.83	12.09	-0.01	20.79	10.0	12.0	-1.17	×1.31	-	-	default
	5500	**MCS0**	13	100	0.00	×1.00	9.22	8.35	0.69	18.15	8.9	11.0	-1.78	×1.51	-	Higher pwr-D/R.	default
	5500	MCS1	13	100	0.00	×1.00	9.20	8.31	-	17.85	8.7	11.0	-1.80	×1.51	-	-	default
	5500	MCS2	13	100	0.00	×1.00	9.15	8.21	-	17.96	8.8	11.0	-1.85	×1.53	-	-	default
	5500	MCS3	13	100	0.00	×1.00	9.11	8.14	-	18.21	9.1	11.0	-1.89	×1.55	-	-	default
	5500	MCS4	13	100	0.00	×1.00	9.10	8.12	-	18.26	9.2	11.0	-1.90	×1.55	-	-	default
	5500	MCS5	13	100	0.00	×1.00	9.08	8.08	-	17.81	8.7	11.0	-1.92	×1.56	-	-	default
	5500	MCS6	13	100	0.00	×1.00	9.09	8.10	-	17.76	8.7	11.0	-1.91	×1.55	-	-	default
	5500	MCS7	13	100	0.00	×1.00	9.02	7.97	-	17.70	8.7	11.0	-1.98	×1.58	-	-	default
	5520	**MCS0**	13	100	0.00	×1.00	9.05	8.03	0.52	17.73	8.7	11.0	-1.95	×1.57	-	-	default
	5540	**MCS0**	13	100	0.00	×1.00	9.02	7.97	0.49	17.42	8.4	11.0	-1.98	×1.58	-	-	default
	5560	**MCS0**	13	100	0.00	×1.00	9.00	7.94	0.47	17.37	8.4	11.0	-2.00	×1.59	-	-	default
	5580	**MCS0**	13	100	0.00	×1.00	8.77	7.53	0.24	17.13	8.4	11.0	-2.23	×1.67	-	-	default
	5600	**MCS0**	13	100	0.00	×1.00	8.53	7.12	Ref.w56n13	16.88	8.4	11.0	-2.47	×1.77	-	-	default
	5620	**MCS0**	13	100	0.00	×1.00	8.35	6.83	-0.18	16.50	8.2	11.0	-2.65	×1.84	-	-	default
	5640	**MCS0**	13	100	0.00	×1.00	8.11	6.47	-0.42	16.26	8.2	11.0	-2.89	×1.95	-	-	default
	5660	**MCS0**	13	100	0.00	×1.00	8.32	6.79	-0.21	16.38	8.1	11.0	-2.68	×1.86	-	-	default
	5680	**MCS0**	13	100	0.00	×1.00	8.10	6.45	-0.43	16.18	8.1	11.0	-2.90	×1.95	-	-	default
	5700	**MCS0**	13	100	0.00	×1.00	7.30	5.37	-1.23	15.59	8.3	11.0	-3.70	×2.35	-	-	default
	5500	**MCS0**	14	100	0.00	×1.00	10.33	10.78	-0.04	18.30	8.0	11.0	-0.67	×1.17	-	-	Tune-up
	5580	**MCS0**	14	100	0.00	×1.00	10.02	10.04	-0.35	17.56	7.5	11.0	-0.98	×1.25	-	-	Tune-up
	5600	**MCS0**	15	100	0.00	×1.00	10.37	10.88	Ref.w56n15	17.60	7.2	11.0	-0.63	×1.16	Reduced	Highest pwr-ch.(w56)	Tune-up
	5680	**MCS0**	15	100	0.00	×1.00	10.01	10.01	-0.36	17.17	7.2	11.0	-0.99	×1.26	-	-	Tune-up
	5700	**MCS0**	15	100	0.00	×1.00	9.49	8.88	-0.88	16.35	6.9	11.0	-1.51	×1.42	-	-	Tune-up
	5745	**MCS0**	13	100	0.00	×1.00	8.01	6.32	-0.05	15.47	7.5	11.0	-2.99	×1.99	-	-	default
	5765	**MCS0**	13	100	0.00	×1.00	7.86	6.10	-0.20	15.26	7.4	11.0	-3.14	×2.06	-	-	default
	5785	**MCS0**	13	100	0.00	×1.00	8.06	6.39	Ref.w58n13	15.39	7.3	11.0	-2.94	×1.97	-	-	default
	5805	**MCS0**	13	100	0.00	×1.00	7.97	6.26	-0.09	15.34	7.4	11.0	-3.03	×2.01	-	-	default
	5825	**MCS0**	13	100	0.00	×1.00	6.96	4.96	-1.10	13.93	7.0	11.0	-4.04	×1.54	-	-	default
	5745	**MCS0**	15	100	0.00	×1.00	9.83	9.61	0.23	16.02	6.2	11.0	-1.17	×1.31	-	Highest pwr-ch.(w58)	Tune-up
	5785	**MCS0**	15	100	0.00	×1.00	9.60	9.11	Ref.w58n15	15.93	6.3	11.0	-1.40	×1.38	Reduced	-	Tune-up
	5825	**MCS0**	15	100	0.00	×1.00	9.12	8.16	-0.48	14.80	5.7	11.0	-1.88	×1.54	-	-	Tune-up

*. : SAR test was applied.

*. Freq.: Frequency, PAR: Peak average ratio ("Peak power"-"Average power", in dBm), Ch: channel, D/R: Data Rate, pwr: power, Ref: Reference.
*. Calculating formula: Average power-result: Results (dBm) = (P/M Reading, dBm)+(Cable loss, dB)+(Attenuator, dB)+(duty factor, dB)
Duty factor: (duty factor, dBm) = 10 × log (100/(duty cycle, %))
Deviation form max.: (Power deviation, dB) = (results power (average, dBm)) - (Max.-specification output power (average, dBm))
Duty scaled factor: Duty cycle correction factor for obtained SAR value, Duty scaled factor [-] = 100(%) / (duty cycle, %)
Tune-up factor: Power tune-up factor for obtained SAR value, Tune-up factor [-] = 1 / (10 ^ ("Deviation from max., dB" / 10))
*. Date measured: June 3, 2015 / Measured by: Hiroshi Naka / Place: preparation room of No. 7 shielded room. (23 deg.C. / 42 %RH)
*. Uncertainty of antenna port conducted test; Power measurement uncertainty above 1GHz for this test was: (±) 1.5dB

6.2 Comparison of power of EMC sample

			Frequency [MHz] 2.4GHz								Frequency [MHz] W52			W53			W56			W58					
			2412	2437	2462	2412	2437	2462			5180	5220	5240	5260	5300	5320	5500	5580	5700	5745	5785	5825	5745	5785	5825
	D/R: Data rate		Power [dBm]								Power [dBm] (ave: average, pk: peak)														
	mode	D/R	ave	ave	ave	pk	pk	pk	mode	D/R	ave	ave	ave	ave	ave	ave	ave	ave	ave	ave	ave	ave	pk	pk	pk
Radio	11b	11				18.29	19.21	18.55	11a	6	12.26	12.28	12.17	12.62	11.90	11.58	9.98	10.13	8.68				16.39	16.13	15.24
	11b	1					19.03																		
	11g	6				21.49	21.65	21.21																	
SAR	11b	11	15.70			18.27			11a	6	11.97	11.99	11.97	12.13	11.95	11.94	10.44	10.11	9.16	9.46	9.53	9.33	16.43	16.44	16.09
	11b	1	15.80	16.03	16.20	18.29	19.00	18.40																	
	11g	6	12.01	12.19	12.15	21.17	21.36	20.98																	
(*1)Δ Radio -SAR	11b	11				0.02			11a	6		0.29		0.49	-0.05		-0.46	0.02					-0.04	-0.31	
	11b	1					0.03																		
	11g	6					0.29																		

*1. Calculating formula: "ΔRadio-SAR (dBm)" = "Radio power (dBm)"-" SAR power (dBm)", at max.SAR&Radio power in each band, at corresponded frequency
*. Radio power refers the test report: 32FE0117-SH-02-A, 32FE0117-SH-02-D, which are UL Japan published. (VRL4149-0601F serial number: 1)

SECTION 7: SAR Measurement results

7.1 SAR test results (Wi-Fi, 2.4 GHz band)

Measurement date: June 24, 2015 Measurement by: Hiroshi Naka

[Liquid measurement]

Target Frequency [MHz]	Liquid type	Liquid parameters (*a)								Temp. [deg.C.]	Depth [mm]	ΔSAR Coefficients(*c)		Date measured
		Permittivity (εr) [-]				Conductivity [S/m]								
		Target	Measured		Limit (*b)	Target	Measured		Limit (*b)			ΔSAR (1g) [%]	Correction required?	
			Meas.	Δεr [%]			Meas.	Δσ [%]						
2412	Body	52.75	50.96	-3.4	-5% ≤ εr-meas. ≤ 0%	1.914	1.935	+1.1	0% ≤ σ-meas. ≤ +5%	22.8	152	+1.31	not required.	June 24, 2015 before SAR test
2437		52.72	50.86	-3.5		1.938	1.961	+1.2				+1.38	not required.	
2462		52.68	50.74	-3.7		1.967	2.001	+1.7				+1.66	not required.	

[SAR measurement results]

*. Initial test was determined by the manufacture's detail drawing for antenna location of platform.

SAR measurement results												Reported SAR (1g) [W/kg]						Remarks
Mode	Freq. [MHz]	Data rate	EUT setup			Liq. temp. [deg.C.]	Power drift [dB]	SAR (1g) [W/kg] Max.value of multi-peak			SAR plot # in Appendix 2-2	Conducted power [dBm]		Scaled factor	Tuned -up SAR (*d)	Duty scaled factor [-]	SAR duty corrected	
			Position	Gap [mm]	Battery	Before /After		Meas.	ΔSAR [%]	ΔSAR corrected		Ave.	Max.					
11b	2437	1Mbps /DSSS	Top-front	5	installed	22.6/22.6	-0.02	0.153	+1.38	n/a (*c)	Plot 1-2	16.16	18	×1.53	0.23	×1.00	-(*e)	-
	2437		Front	0	installed	22.8/22.8	0.01	0.135	+1.38	n/a (*c)	Plot 1-3	16.16	18	×1.53	0.21	×1.00	-(*e)	-
	2412		Top-front	5	installed	22.6/22.6	0.01	0.180	+1.31	n/a (*c)	Plot 1-1	16.03	18	×1.57	0.28	×1.00	-(*e)	Highest, 2.4 GHz
	2462				installed	22.6/22.7	0	0.124	+1.66	n/a (*c)	Plot 1-4	16.30	18	×1.48	0.18	×1.00	-(*e)	-
11g	2437	6Mbps /OFDM	Top-front	5	installed	22.7/22.7	0.13	0.063	+1.38	n/a (*c)	Plot 1-5	12.19	13	×1.21	0.08	×1.00	-(*e)	-

Notes:

*. Freq.: Frequency; Gap: It is the separation distance between the nearest position of platform outer surface and the bottom outer surface of phantom; Liq.temp: Liquid temperature; Max.: maximum, Meas.: Measured value; Ave.: Average; n/a: not applied.

*. Calibration frequency of the SAR measurement probe (and used conversion factors)

SAR test frequency	Probe calibration frequency	Validity	Conversion factor	Uncertainty
2412, 2437, 2462MHz	2450MHz	within ±50MHz of calibration frequency	7.17	±12.0%

*. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

*a. The target value is a parameter defined in Appendix A of KDB865664 D01, the dielectric parameters suggested for head and body tissue simulating liquid are given at 2000, 2450 and 3000 MHz. Parameters for the frequencies 2000-3000 MHz were obtained using linear interpolation.

*b. Refer to KDB865664 D01, item 2), Clause 2.6; "When nominal tissue dielectric parameters are recorded in the probe calibration data; for example, only target values and tolerance are reported, the measured εr and σ of the liquid used in routine measurements must be: ≤ the target εr and ≥ the target σ values and also within 5% of the required target dielectric parameters."

c. The coefficients are parameters defined in clause E.3.3.2, IEEE Std 1528(2013). Since the measured liquid parameters were ≤ the target εr and ≥ the target σ values and also within 5% of the required target dielectric parameters, the measured SAR was not compensated by ΔSAR coefficients (. Clause 2) of 2.6, KDB865664 D01).

Calculating formula: $\Delta SAR(1g) = C\varepsilon r \times \Delta\varepsilon r + C\sigma \times \Delta\sigma$, $C\varepsilon = -7.854E\text{-}4 \times f^3 + 9.402E\text{-}3 \times f^2 - 2.742E\text{-}2 \times f + 0.2026$ / $C\sigma = 9.804E\text{-}3 \times f^3 - 8.661E\text{-}2 \times f^2 + 2.981E\text{-}2 \times f + 0.7829$

ΔSAR corrected SAR (1g) (W/kg) = (Meas. SAR(1g) (W/kg)) × (100 - (ΔSAR(%)) / 100

*d. Tuned-up SAR by scaled factor: Accordance with KDB 447498 D01; "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 (clause 4, 4.1, 4))." (Refer to section 6 in this report for "Scaled factor" of channels, each operation mode.)

Calculating formula: Tuned-up SAR (1g) (W/kg) = (ΔSAR corrected SAR (1g) (W/kg)) × (Scaled factor)

*e. (KDB248227 D01v02)(Clause 2.2; Duty Factor Control)

When 802.11 frame gaps are accounted for in the transmission, a maximum transmission duty factor of 92 - 96% is typically achievable in most test mode configurations. The reported SAR must be scaled to the maximum transmission duty factor to determine compliance.

Calculating formula: Reported SAR (1g) (=SAR duty corrected SAR (1g)) (W/kg) = (Tuned-up SAR (1g) (W/kg)) × (Duty scaled factor)

(Clause 5: SAR TEST PROCEDURE, in KDB248227 D01v02r01)

5.1.1 Initial Test Position SAR Test Reduction Procedure

1) When the reported SAR of the initial test position is ≤ 0.4 W/kg, further SAR measurement is not required for the other (remaining) test positions in that exposure configuration and 802.11 transmission mode combination within the frequency band or aggregated band. SAR is also not required for that exposure configuration in the subsequent test configuration(s).

7.2 SAR test result (Wi-Fi, 5 GHz band)

Measurement date: June 9 and 23, 2015 Measurement by: Hiroshi Naka

[Liquid measurement]

Target Frequency [MHz]	Liquid type	Liquid parameters (*a)								Temp. [deg.C.]	Depth [mm]	ΔSAR Coefficients(*c)		Date measured
		Permittivity (εr) [-]				Conductivity [S/m]								
		Target	Measured		Limit (*b)	Target	Measured		Limit (*b)			ΔSAR (1g) [%]	Correction required?	
			Meas.	Δεr [%]			Meas.	Δσ [%]						
5300	Body	48.88	47.09	-3.7	-5% ≤ εr-meas. ≤ 0%	5.416	5.523	+2.0	0% ≤ σ-meas. ≤ +5%	22.8	149	+0.67	not required.	June 9, 2015 before SAR test
5500		46.61	46.71	-3.9		5.650	5.812	+2.9				+0.66	not required.	
5785		48.22	46.44	-3.7		5.982	6.203	+3.7				+0.57	not required.	
5260	Body	48.93	47.16	-3.6	-5% ≤ εr-meas. ≤ 0%	5.369	5.464	+1.8	0% ≤ σ-meas. ≤ +5%	22.9	147	+0.68	not required.	June 23, 2015 before SAR test
5300		48.88	47.08	-3.7		5.416	5.546	+2.4				+0.66	not required.	
5320		48.85	47.05	-3.7		5.439	5.557	+2.2				+0.67	not required.	
5500		48.61	46.81	-3.7		5.650	5.816	+2.9				+0.62	not required.	
5600		48.47	46.63	-3.8		5.766	5.929	+2.8				+0.63	not required.	
5680		48.36	46.36	-4.1		5.860	6.013	+2.6				+0.70	not required.	
5745		48.27	46.33	-4.0		5.936	6.148	+3.6				+0.64	not required.	
5785		48.22	46.31	-4.0		5.982	6.148	+2.8				+0.66	not required.	
5825		48.17	46.27	-4.0		6.029	6.200	+2.8				+0.66	not required.	

[SAR measurement results]

*. Initial test was determined by the manufacture's detail drawing for antenna location of platform.

SAR measurement results													Reported SAR (1g) [W/kg]						Remarks
Mode	Freq. [MHz]	Data rate	EUT setup			Liq. temp. [deg.C.]	Power drift [dB]	SAR (1g) [W/kg] Max.value of multi-peak			SAR plot # in Appendix 2-2	Conducted power [dBm]		Scaled factor	Tuned -up SAR (*d)	Duty scaled factor [-]	SAR duty corrected	
			Position	Gap [mm]	Battery	Before /After		Meas.	ΔSAR [%]	ΔSAR corrected		Ave.	Max.					
W53 band (UNII-2A, 5260 MHz~5320 MHz):																			
11a	5300	6Mbps /OFDM	Top-front	5	installed	22.7/22.6	-0.02	**0.441**	+0.66	n/a (*c)	Plot 2-2	11.95	13	×1.27	**0.56**	×1.00	-(*e)	-
	5300		Front	0	installed	22.9/22.9	-0.20	**0.119**	+0.67	n/a (*c)	Plot 2-3	11.95	13	×1.27	**0.15**	×1.00	-(*e)	-
	5260		Top-front	5	installed	22.6/22.6	-0.02	**0.391**	+0.68	n/a (*c)	Plot 2-4	12.03	13	×1.22	**0.48**	×1.00	-(*e)	-
	5320				installed	22.6/22.6	-0.01	**0.457**	+0.67	n/a (*c)	Plot 2-1	11.94	13	×1.28	**0.58**	×1.00	-(*e)	Highest,w53
W56 band (UNII-2C, 5500 MHz~5700 MHz):																			
11a	5500	6Mbps /OFDM	Top-front	5	installed	22.6/22.6	-0.05	**0.507**	+0.62	n/a (*c)	Plot 3-1	10.44	12	×1.43	**0.73**	×1.00	-(*e)	Highest,W56 Highest,UNII
	5500		Front	0	installed	22.9/23.0	-0.11	**0.073**	+0.66	n/a (*c)	Plot 3-2	10.44	12	×1.43	**0.11**	×1.00	-(*e)	-
	5600		Top-front	5	installed	22.6/22.6	0.01	**0.326**	+0.63	n/a (*c)	Plot 3-3	10.14	12	×1.53	**0.50**	×1.00	-(*e)	-
	5680				installed	22.6/22.6	0.05	**0.220**	+0.70	n/a (*c)	Plot 3-4	10.02	12	×1.58	**0.35**	×1.00	-(*e)	-
W58 band (UNII-3, 5745 MHz~5825 MHz):																			
11a	5785	6Mbps /OFDM	Top-front	5	installed	22.6/22.6	0.02	**0.220**	+0.66	n/a (*c)	Plot 4-2	10.74	12	×1.34	**0.29**	×1.00	-(*e)	-
	5785		Front	0	installed	23.0/23.0	-0.12	**0.033**	+0.57	n/a (*c)	Plot 4-3	10.74	12	×1.34	**0.04**	×1.00	-(*e)	-
	5745		Top-front	5	installed	22.6/22.6	0.05	**0.249**	+0.64	n/a (*c)	Plot 4-1	10.63	12	×1.37	**0.34**	×1.00	-(*e)	Highest,w58
	5825				installed	22.6/22.7	0.02	**0.207**	+0.66	n/a (*c)	Plot 4-4	10.41	12	×1.44	**0.30**	×1.00	-(*e)	-

Notes:

*. (KDB248227, clause 5.3.1) Since highest reported SAR(1g) of UNII-2A was ≤1.2 W/kg, SAR measurement of UNII-1 band was omitted.

*. Freq.: Frequency; Gap: It is the separation distance between the nearest position of platform outer surface and the bottom outer surface of phantom; Liq.temp: Liquid temperature; Max.: maximum, Meas.: Measured value; Ave.: Average; n/a: not applied.

*. Calibration frequency of the SAR measurement probe (and used conversion factors)

SAR test frequency	Probe calibration frequency	Validity	Conversion factor	Uncertainty
5260, 5300, 5320 MHz	5250 MHz	within ±110 MHz of calibration frequency	4.53	±13.1 %
5500, 5600, 5680 MHz	5600 MHz	within ±110 MHz of calibration frequency	3.78	±13.1 %
5745, 5785, 5825 MHz	5750 MHz	within ±110 MHz of calibration frequency	4.06	±13.1 %

*. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

*a. The target value is a parameter defined in Appendix A of KDB865664 D01, the dielectric parameters suggested for head and body tissue simulating liquid are given at 3000 and 5800 MHz. Parameters for the frequencies 3000-5800 MHz were obtained using linear interpolation. Above 5800MHz were obtained using linear extrapolation.

*b. Refer to KDB865664 D01, item 2), Clause 2.6; "When nominal tissue dielectric parameters are recorded in the probe calibration data; for example, only target values and tolerance are reported, the measured εr and σ of the liquid used in routine measurements must be: ≤ the target εr and ≥ the target σ values and also within 5% of the required target dielectric parameters."

c. The coefficients are parameters defined in clause E.3.3.2, IEEE Std 1528(2013). Since the measured liquid parameters were ≤ the target εr and ≥ the target σ values and also within 5% of the required target dielectric parameters, the measured SAR was not compensated by ΔSAR coefficients (. Clause 2) of 2.6, KDB865664 D01).

Calculating formula: $\Delta SAR(1g) = C\varepsilon r \times \Delta\varepsilon r + C\sigma \times \Delta\sigma$, $C\varepsilon r = -7.854E\text{-}4 \times f^3 + 9.402E\text{-}3 \times f^2 - 2.742E\text{-}2 \times f + 0.2026$ / $C\sigma = 9.804E\text{-}3 \times f^3 - 8.661E\text{-}2 \times f^2 + 2.981E\text{-}2 \times f + 0.7829$

ΔSAR corrected SAR (1g) (W/kg) = (Meas. SAR(1g) (W/kg)) × (100 - (ΔSAR(%)) / 100

(cont'd)

(cont'd)

*d. Tuned-up SAR by scaled factor: Accordance with KDB 447498 D01; "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 (clause 4, 4.1, 4))." (Refer to section 6 in this report for "Scaled factor" of channels, each operation mode.)
Calculating formula: Tuned-up SAR (1g) (W/kg) = (ΔSAR corrected SAR (1g) (W/kg)) × (Scaled factor)

*e. (KDB248227 D01v02)(Clause 2.2; Duty Factor Control)
When 802.11 frame gaps are accounted for in the transmission, a maximum transmission duty factor of 92 - 96% is typically achievable in most test mode configurations. The reported SAR must be scaled to the maximum transmission duty factor to determine compliance.
Calculating formula: Reported SAR (1g) (=SAR duty corrected SAR (1g)) (W/kg) = (Tuned-up SAR (1g) (W/kg)) × (Duty scaled factor)

(Clause 5: SAR TEST PROCEDURE, in KDB248227 D01v02)

5.1.1 Initial Test Position SAR Test Reduction Procedure

1) When the reported SAR of the initial test position is ≤ 0.4 W/kg, further SAR measurement is not required for the other (remaining) test positions in that exposure configuration and 802.11 transmission mode combination within the frequency band or aggregated band. SAR is also not required for that exposure configuration in the subsequent test configuration(s).

2) When the reported SAR of the initial test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position using subsequent highest extrapolated or estimated 1-g SAR conditions determined by area scans or next closest/smallest test separation distance and maximum RF coupling test positions based on manufacturer justification, on the highest maximum output power channel, until the reported SAR is ≤ 0.8 W/kg or all required test positions (left, right, touch, tilt or subsequent surfaces and edges) are tested.

3) 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.