SAR TEST REPORT

Test Report No.: 10882639S-A

Applicant : **Canon Inc.**

Type of Equipment : **Wireless Module**

Model No. : **ES201** (*. Installed into the limited platform: Wireless transmitter)

FCC ID : **AZD233**

Test Standard : **FCC 47CFR §2.1093**

Test Result : **Complied**

Highest Reported SAR(1g) Value	Platform		Host device		Remarks
	Type	Model	Type	Model	
0.70 W/kg (measured: 0.589W/kg)	Wireless File Transmitter	DS586091	Digital Camera	DS126561	(DTS) 2437 MHz, 802.11b (1Mbps, DSSS) (output power: 14.78 dBm).
1.18 W/kg (measured: 0.842W/kg)					(UNII) 5500 MHz, 802.11a (6Mbps, OFDM) (output power: 12.06 dBm)

*. **Highest reported SAR (1g) across this platform and exposure conditions (body-touch) = "1.18 W/kg" = grant listing.**
*. Since highest reported SAR (1g) on a platform with a specified host device for DS586091 (EUT) which obtained in accordance with KDB447498 D01 (v05r02) was > 0.8 W/kg and ≤ 1.2 W/kg, this EUT is approved to operate a single platform

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Date of test: September 28, 29 and 30, 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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JAB Testing RTL02610

REVISION HISTORY

Revision	Test report No.	Date	Page revised	Contents
Original	10882639S-A	December 1, 2015	-	-
-r01	10882639S-A	December 21, 2015	p1,2,12,28,31	(p12,28,31) 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	Canon Inc.
Brand Name	Canon
Address	30-2, Shimomaruko 3-chome, Ohta-ku, Tokyo 146-8501 Japan
Telephone Number	+81-3-3757-6218
Facsimile Number	+81-3-3757-8431
Contact Person	Takato Matsuura

SECTION 2: Equipment under test (EUT)

2.1 Identification of EUT

	EUT	Platform	Host device
Type of Equipment	Wireless Module	Wireless File Transmitter	Digital camera
Model Number	ES201	DS586091	DS126561
Serial Number	5I52	36	DK0000118
Condition of EUT	Engineering prototype	Engineering prototype	Engineering prototype
	(*. Not for sale: These samples are equivalent to mass-produced items.)		
Country of Mass-production	Japan	Japan	Japan
Receipt Date of Sample	July 30, 2015 (*. EUT for power measurement) *. No modification by the Lab. September 28, 2015 (*. EUT for SAR test.) *. No modification by the Lab. (*. The EUT that had been measured the power of SAR test reference, was installed into the platform: Wireless File Transmitter from the beginning. After power measurement, the EUT was returned to the customer in order to install a platform which SAR tested.)		
Category Identified	Portable device *. Since EUT may contact and very close to a human body during Wi-Fi operation, the partial-body SAR (1g) shall be observed.		
Rating	DC3.3V supplied form the host device. *. The EUT is installed into the Wireless File Transmitter that was operated by the dc power supplied from the constant voltage circuit of the host device.		
Feature of EUT	The EUT is a Wireless Module which installs into the Wireless File Transmitter which was connected with the limited host device.		
SAR Accessory	None		

2.2 Product Description (ES201)

Equipment type	Transceiver		
Frequency of operation	2.4GHz band: 2412-2462 MHz (b,g,n(HT20)) / 2422-2452 MHz (n(HT40)); W52 (U-NII-1): 5180-5240 MHz (a,n(HT20),ac(VHT20)) / 5190-5230 MHz (n(HT40),ac(VHT40)) / 5210 MHz (ac(VHT80)); W53 (U-NII-2A): 5260-5320 MHz (a,n(HT20),ac(VHT20)) / 5270-5310 MHz (n(HT40),ac(VHT40)) / 5290 MHz (ac(VHT80)); W56 (U-NII-2C): 5500-5700 MHz (a,n(HT20),ac(VHT20)) / 5510-5670 MHz (n(HT40),ac(HT40)) / 5530-5610 MHz (ac(VHT80)) W58 (U-NII-3): 5745-5825 MHz (a,n(HT20),ac(VHT20)) / 5755-55795 MHz (n(HT40),ac(HT40)), 5775 MHz (ac(VHT40))		
Channel spacing	5 MHz (2.4GHz band), 20 MHz (W52, W53, W56, W58)		
Bandwidth	20 MHz (b,g,a,n(HT20),ac(VHT20)), 40 MHz (n(HT20),ac(VTH20)), 80 MHz (ac(VHT80),		
Type of modulation	DSSS: DBPSK, DQPSK, CCK OFDM: BPSK, QPSK, 16QAM, 64QAM, (256QAM) (*.256QAM is only supported by 11ac.)		
Q'ty of Antenna	1 pc.	Antenna type	PIFA (Planar Inverted F Antenna)
Antenna model name	Dual Band WLAN Antenna Cable Assembly 2011 (2174096-1)		
Antenna connector type	RF module side: W.FL (Hirose) / Antenna side: soldered.		
Antenna gain (Peak, with cable loss.)	1.95 dBi (2400~2500 MHz), -1.32 dBi (5160~5340 MHz), 0.3 dBi (5480~5720 MHz), -0.43 dBi (5725~5845 MHz),		

	Mode	2.4GHz	U-NII-1 (W52)	UN-NII-2A (W53)	U-NII-2C (W56)	U-NII-3 (W58)
Transmit power and tolerance (Manufacture variation)	b	13 ± 2.5dBm				
	g	11 ± 2.5dBm				
	a		11 ± 2.5dBm	11 ± 2.5dBm	11 ± 2.5dBm	11 ± 2.5dBm
	n(HT20)	11 ± 2.5dBm	11 ± 2.5dBm	11 ± 2.5dBm	11 ± 2.5dBm	11 ± 2.5dBm
	n(HT40)	9 ± 2.5dBm	8 ± 2.5dBm	8 ± 2.5dBm	8 ± 2.5dBm	8 ± 2.5dBm
	ac(VHT20)		11 ± 2.5dBm, 10 ± 2.5dBm (MCS8)	11 ± 2.5dBm, 10 ± 2.5dBm (MCS8)	11 ± 2.5dBm, 10 ± 2.5dBm (MCS8)	11 ± 2.5dBm, 10 ± 2.5dBm (MCS8)
	ac(VHT40)		8 ± 2.5dBm	8 ± 2.5dBm	8 ± 2.5dBm	8 ± 2.5dBm
	ac(VHT80)		7 + 1.5 / -2.5 dBm	7 + 1.5 / -2.5 dBm	7 ± 2.5dBm	7 ± 2.5dBm
	*. The measured Tx output power (conducted) refers to section 6 in this report.					
Power rating	DC 3.3V, *.The dc power is supplied from the constant voltage circuit of the host device.					
Operation temperature	0 ~ + 45 deg.C. (*. Operation temperature of a platform.)					

*. 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 (U-NII-1) 5180~5240 MHz (W52)	Wi-Fi (U-NII-2A) 5260~5320 MHz (W53)	Wi-Fi (U-NII-2C) 5500~5700 MHz (W56)	Wi-Fi (U-NII-3) 5745~5825 MHz (W58)
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	0.70 W/kg	not applied (*. ≤1.2 W/kg for U-NII-2A)	0.76 W/kg	1.18 W/kg	0.79 W/kg
Measured SAR value	0.589 W/kg	-	0.543 W/kg	0.842 W/kg	0.573 W/kg
Operation mode	11b, 2437 MHz	-	11a, 5300 MHz	11a, 5500 MHz	11a, 5785 MHz
Duty cycle (duty cycle factor)	99.9 % (×1.00)	-	99.4 % (×1.01)	99.4 % (×1.01)	99.4 % (×1.01)
Output power (scaled factor)	14.78 dBm (×1.18)	-	12.11 dBm (×1.38)	12.06 dBm (×1.39)	12.17 dBm (×1.36)

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 in KDB447498 D01 (v05r02).

Consideration of the test results: Since highest reported SAR (1g) on a platform for ES201 (EUT) which obtained in accordance with KDB447498 (v05r02) was > 0.8 W/kg and ≤ 1.2 W/kg, this EUT is approved to operate a single 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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1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 JAPAN
Telephone number: +81 463 50 6400 / Facsimile number: +81 463 50 6401

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 (v05r02))

Step.1 Data rate check (*. The EUT supported the following data rate in each operation mode.)

802.11b		802.11g		802.11a	
Modulation	Data rate [Mbps]	Modulation	Data rate [Mbps]	Modulation	Data rate [Mbps]
DBPSK/DSSS	1	BPSK/OFDM	6	BPSK/OFDM	6
DQPSK/DSSS	2	BPSK/OFDM	9	BPSK/OFDM	9
CCK/DSSS	5.5	QPSK/OFDM	12	QPSK/OFDM	12
CCK/DSSS	11	QPSK/OFDM	18	QPSK/OFDM	18
		16QAM/OFDM	24	16QAM/OFDM	24
		16QAM/OFDM	36	16QAM/OFDM	36
		64QAM/OFDM	48	64QAM/OFDM	48
		64QAM/OFDM	54	64QAM/OFDM	54

802.11n(HT20)			802.11n(HT40)			802.11ac(VHT20)			802.11ac(VHT40)			802.11ac(VHT80)		
MCS Index	Spatial Stream	Modulation	MCS Index	Spatial Stream	Modulation	MCS Index	Spatial Stream	Modulation	MCS Index	Spatial Stream	Modulation	MCS Index	Spatial Stream	Modulation
0	1	BPSK/OFDM	0	1	BPSK/OFDM	0	1	BPSK/OFDM	0	1	BPSK/OFDM	0	1	BPSK/OFDM
1	1	QPSK/OFDM	1	1	QPSK/OFDM	1	1	QPSK/OFDM	1	1	QPSK/OFDM	1	1	QPSK/OFDM
2	1	QPSK/OFDM	2	1	QPSK/OFDM	2	1	QPSK/OFDM	2	1	QPSK/OFDM	2	1	QPSK/OFDM
3	1	16QAM/OFDM	3	1	16QAM/OFDM	3	1	16QAM/OFDM	3	1	16QAM/OFDM	3	1	16QAM/OFDM
4	1	16QAM/OFDM	4	1	16QAM/OFDM	4	1	16QAM/OFDM	4	1	16QAM/OFDM	4	1	16QAM/OFDM
5	1	64QAM/OFDM	5	1	64QAM/OFDM	5	1	64QAM/OFDM	5	1	64QAM/OFDM	5	1	64QAM/OFDM
6	1	64QAM/OFDM	6	1	64QAM/OFDM	6	1	64QAM/OFDM	6	1	64QAM/OFDM	6	1	64QAM/OFDM
7	1	64QAM/OFDM	7	1	64QAM/OFDM	7	1	64QAM/OFDM	7	1	64QAM/OFDM	7	1	64QAM/OFDM
-	-	-	-	-	-	8	1	256QAM/OFDM	8	1	256QAM/OFDM	8	1	256QAM/OFDM
-	-	-	-	-	-	-	-	-	9	1	256QAM/OFDM	9	1	256QAM/OFDM

Step.2 Consideration of SAR test channel

For the SAR test reference, on each operation band, the average output power was measured on the low/middle/upper and specified channels with the worst data rate condition in step 1 in the above.

*. The worst SAR position search was done by the worst operation mode and on near the middle channels.

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×H=E^2/η=P/(4×π×r^2) (η: Space impedance) → P=(E^2×4×π×r^2)/η

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 Tested /Reduced(*1)	SAR type
Left	When test is required, the left surface of platform connected with the host device is touched to the Flat phantom.	**2.95**	***Tested***	Body-touch
Front-right	When test is required, the front-right edge of platform connected with the host device is touched to the Flat phantom.	**2.95**	***Tested***	
Front	When test is required, the front upper portion of platform connected with the host device is touched to the Flat phantom.	**7.60**	***Tested***	
Top (tip)	When test is required, the top surface of platform connected with the host device is touched to the Flat phantom.	**7.79**	***Tested***	
Rear	Since the rear surface of platform is connector to connect the host device, SAR test is excluded.	**≈13**	**Reduced**	
Bottom	Since the body of a host device makes interference to touch the bottom surface of platform, SAR test is excluded.	**≈40**	**Reduced**	

*. **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 (ES201): 19.5 mm (width) × 22.9 mm (depth) × 2.9 mm max (thickness)
*. Size of platform: 24.65 mm (width) × 23.94 mm (depth) × 56.97 mm (height)
*. Size of host device (digital camera): 157.9 mm (width) × 82.6 mm (depth) × 167.6 mm (height)

***1. KDB 447498 D01 (v05r02) 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)	Calculation of exclusion: ≤ 3.0 (*2)	Standalone SAR Test Required? (>3, Tested)		Remarks
WLAN 2.4GHz 11b	Left	2.95	**3 (≤5)**	2.462	15.5	35.48	**35**	**11.0**	***>3.0***	***Required***	-
	Front-right	2.95	**3 (≤5)**	2.462	15.5	35.48	**35**	**11.0**	***>3.0***	***Required***	-
	Front	7.60	**8**	2.462	15.5	35.48	**35**	**11.0**	***>3.0***	***Required***	-
	Top (tip)	7.79	**8**	2.462	15.5	35.48	**35**	**6.9**	***>3.0***	***Required***	-
	Rear	≈13	**13**	2.462	15.5	35.48	**35**	**4.2**	***>3.0***	***Required***	(*3) SAR test was reduced.
	Bottom	≈40	**40**	2.462	15.5	35.48	**35**	**1.4**	**≤3.0**	**Required**	-
WLAN W52&53 a, n(HT20), ac(VHT20)	Left	2.95	**3 (≤5)**	5.32	13.5	22.39	**22**	**10.1**	***>3.0***	***Required***	-
	Front-right	2.95	**3 (≤5)**	5.32	13.5	22.39	**22**	**10.1**	***>3.0***	***Required***	-
	Front	7.60	**8**	5.32	13.5	22.39	**22**	**6.3**	***>3.0***	***Required***	-
	Top (tip)	7.79	**8**	5.32	13.5	22.39	**22**	**6.3**	***>3.0***	***Required***	-
	Rear	≈13	**13**	5.32	13.5	22.39	**22**	**3.9**	***>3.0***	***Required***	(*3) SAR test was reduced.
	Bottom	≈40	**40**	5.32	13.5	22.39	**22**	**1.3**	**≤3.0**	**Reduced**	-
WLAN W56 a, n(HT20), ac(VHT20)	Left	2.95	**3 (≤5)**	5.7	13.5	22.39	**22**	**10.5**	***>3.0***	***Required***	-
	Front-right	2.95	**3 (≤5)**	5.7	13.5	22.39	**22**	**10.5**	***>3.0***	***Required***	-
	Front	7.60	**8**	5.7	13.5	22.39	**22**	**6.6**	***>3.0***	***Required***	-
	Top (tip)	7.79	**8**	5.7	13.5	22.39	**22**	**6.6**	***>3.0***	***Required***	-
	Rear	≈13	**13**	5.7	13.5	22.39	**22**	**4.0**	***>3.0***	***Required***	(*3) SAR test was reduced.
	Bottom	≈40	**40**	5.7	13.5	22.39	**22**	**1.3**	**≤3.0**	**Reduced**	-
WLAN W58 a, n(HT20), ac(VHT20)	Left	2.95	**3 (≤5)**	5.825	13.5	22.39	**22**	**10.6**	***>3.0***	***Required***	-
	Front-right	2.95	**3 (≤5)**	5.825	13.5	22.39	**22**	**10.6**	***>3.0***	***Required***	-
	Front	7.60	**8**	5.825	13.5	22.39	**22**	**6.6**	***>3.0***	***Required***	-
	Top (tip)	7.79	**8**	5.825	13.5	22.39	**22**	**6.6**	***>3.0***	***Required***	-
	Rear	≈13	**13**	5.825	13.5	22.39	**22**	**4.1**	***>3.0***	***Required***	(*3) SAR test was reduced.
	Bottom	≈40	**40**	5.825	13.5	22.39	**22**	**1.3**	**≤3.0**	**Reduced**	-

*2. Parenthesis 1), Clause 4.3.1, KDB 447498 D01 (v05r02) 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)
[SAR(1g) test exclusion thresholds, mW] = 3 × 50 / SQRT(2.462) = 96mW, where test separation distance=50mm
*3. SAR test was reduced, because it was connector side and connected with a specified host device in normal use.

<Conclusion for consideration for SAR test reduction>

1) Left, Front-right, Front and Top (tip) setup conditions of a platform are considered body-touch SAR and require the SAR evaluation in body-liquid.
2) The SAR tests for Rear setup conditions of platform are reduced because it is connector side and connected with a specified host device (digital camera) in normal operation.
3) The SAR tests for Bottom setup conditions of platform are reduced because it is enough antenna separation distance.
4) The SAR test of head liquid (front-of-face) was reduced because the location of a platform which was installed on the host device was far enough from the human face.

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

Step 1	On 2.4GHz band, Worst SAR search by 11b (DSSS, *. highest output power) mode. (*. Change the channel, if it is necessary.)
Step 2 ~ Step 4	On W53 band, Worst SAR search of 11a (*. highest output power and lowest data rate) mode. (*. Change the channel, if it is necessary.) Repeat for W56 (Step 3) and W58 (Step 4) band.
Step 5	Check SAR measurement variability, when if the measured SAR(1g) was ≥ 0.80 W/kg and on a highest measured SAR(1g) condition.

*. 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, n(HT20), n(HT40), ac(VHT20), ac(VTH40) and ac(VHT80) continuous transmitting modes. The frequency and the modulation used in the SAR testing are shown as a following.

Operation mode	b	g	n(HT20)	n(HT40)
Tx band [MHz]	2412~2462			2422~2452
Bandwidth [MHz]	20	20	20	40
Max.power [dBm]	15.5	13.5	13.5	11.5
SAR Tested/Reduced?	Tested	Reduced	Reduced	Reduced
Frequency tested [MHz]	2437	-(*3)	-(*3)	-(*3)
Data rate [Mbps]	1	6	6.5	13
Modulation	DSSS	OFDM	OFDM	OFDM

Operation mode	a	n(HT20)	ac(VHT20)	n(HT40)	ac(VHT40)	ac(VHT80)	a	n(HT20)	ac(VHT20)	n(HT40)	ac(VHT40)	ac(VHT80)
band	W52 (U-NII-1) (*2)						W53 (U-NII-2A)					
Tx band [MHz]	5180~5240			5190~5230		5210	5260~5320			5270~5310		5290
Bandwidth [MHz]	20	20	20	40	40	80	20	20	20	40	40	80
Max.power [dBm]	13.5	13.5	13.5	10.5	10.5	8.5	13.5	13.5	13.5	10.5	10.5	8.5
SAR Tested/Reduced?	Reduced	Reduced	Reduced	Reduced	Reduced	Reduced	Tested	Reduced	Reduced	Reduced	Reduced	Reduced
Frequency tested [MHz]	-	-	-	-	-	-	5300	-	-	-	-	-
Data rate [Mbps]	6	6.5	7.2	13	15.0	32.5	6 (*1)	6.5	7.2	13	15.0	32.5
Modulation	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM

Operation mode	a	n(HT20)	ac(VHT20)	n(HT40)	ac(VHT40)	ac(VHT80)	a	n(HT20)	ac(VHT20)	n(HT40)	ac(VHT40)	ac(VHT80)
band	W56 (U-NII-2C)						W58 (U-NII-3)					
Tx band [MHz]	5500~5700			5510~5670		5530~5690	5745~5825			5755~5795		5775
Bandwidth [MHz]	20	20	20	40	40	80	20	20	20	40	40	80
Max.power [dBm]	13.5	13.5	13.5	10.5	10.5	9.5	13.5	13.5	13.5	10.5	10.5	9.5
SAR Tested/Reduced?	Tested	Reduced	Reduced	Reduced	Reduced	Reduced	Tested	Reduced	Reduced	Reduced	Reduced	Reduced
Frequency tested [MHz]	5600, 5580 5500, 5700	-	-	-	-	-	5785	-	-	-	-	-
Data rate [Mbps]	6 (*1)	6.5	7.2	13	15.0	32.5	6 (*1)	6.5	7.2	13	15.0	32.5
Modulation	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM	OFDM

Controlled software	"rftest" mode

Note: SAR test reduction consideration

[Table A-1. Output power measured and SAR test channel selection]

802.11 Modes		b	g	n		a (*1)	n(HT)		ac(VHT)		
Ch. Bandwidth [MHz]		20	20	20	40	20	20	40	20	40	80
Lowest data rate [Mbps]		1	6	6.5	6.5	6 (*1)	6.5	13	7.2	15.0	32.5
§15.247 (2.4GHz)	Ch.	*1/6/11*	*1/6/11*	*1/6/11*	*6*						
	mW	30/30/29	18/17/18	17/17/18	lower power						
U-NII-1 (W52)	Ch.					*36/40/44/48*	*36/40/44/48*	*38/46*	*36/40/44/48*	*38/46*	*42*
	mW					17/16/16/16	17/16/16/16	lower power	16/16/16/16	lower power	lower power
U-NII-2A (W53)	Ch.					*52/56/60/64*	*52/56/60/64*	*54/62*	*52/56/60/64*	*54/62*	*58*
	mW					16/16/16/16	16/16/17/17	lower power	17/17/17/17	lower power	lower power
U-NII-2C (W56)	Ch.					*100/118/120/140*	*100/118/120/140*	*102/118/134*	*100/118/120/140*	*102/118/134*	*106/122*
	mW					16/16/16/16	15/16/16/16	lower power	16/16/16/16	lower power	lower power
U-NII-3 (W58)	Ch.					*149/157/165*	*149/157/165*	*151/159*	*149/157/165*	*151/159*	*155*
	mW					16/16/17	16/17/17	lower power	16/17/17	lower power	lower power

[Table A-2. Reported SAR(1g) and test reduction plan]

802.11 Modes		b	g	n		a (*1)	n(HT)		ac(VHT)		
Ch. Bandwidth [MHz]		20	20	20	40	20	20	40	20	40	80
Lowest data rate [Mbps]		1	6	6.5	6.5	6 (*1)	6.5	13	7.2	15.0	32.5
§15.247 (2.4GHz)	Ch.	*1/6/11*	*1/6/11*	*1/6/11*	*6*						
	mW	**0.70**	(*3) SAR not required for OFDM, 802..1b adjusted SAR ≤ 1.2W/kg								
U-NII-1 (*2) (W52)	Ch.					*36/40/44/48*	*36/40/44/48*	*38/46*	*36/40/44/48*	*38/46*	*42*
	mW					*. U-NII-2A exclusion applied (*2)					
U-NII-2A (W53)	Ch.					*52/56/60/64*	*52/56/60/64*	*54/62*	*52/56/60/64*	*54/62*	*58*
	mW					**0.76**	-	lower power	-	lower power	lower power
U-NII-2C (W56)	Ch.					100/118/120/140	*100/118/120/140*	*102/118/134*	*100/118/120/140*	*102/118/134*	*106/122*
	mW					**1.18/1.16/1.11/1.02**	-	lower power	-	lower power	lower power
U-NII-3 (W58)	Ch.					*149/157/165*	*149/157/165*	*151/159*	*149/157/165*	*151/159*	*155*
	mW					**0.79**	-	lower power	-	lower power	lower power

*1. (KDB248227 D01 (v02r01), clause 5.3.2) At same specified maximum output power mode, the lower order modulation, lowest data rate configuration (802.11a) is selected.
*2. (KDB248227 D01 (v02r01), clause 5.3.1) Since highest reported SAR(1g) of U-NII-2A was ≤1.2 W/kg, SAR measurement of U-NII-1 band was omitted.
*3. (KDB248227 D01 (v02r01), clause 5.2.2) SAR test of OFDM mode was reduced, because the estimate reported SAR(1g) of OFDM mode was ≤ 1.2 W/kg by using the highest reported SAR(1g) of DSSS mode

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 (e',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 (v01r03) SAR Measurement 100 MHz to 6 GHz 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

(*. The power data measured by radio test was used for SAR test. Refer to radio test report: 10882638S-M&-N for more detail data information.)

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]	CH	[Mbps]	[-]	[%]	[dB]	[-]	[dBm]	[mW]	[dB]	[dB]	[dB]	[dBm]	[dB]	[-]			
b	2412	1	**1**	15	99.9	0.00	×1.00	**14.71**	29.58	-0.07	18.08	3.4	15.5	-0.79	×1.20	Reduced	*. ≤ 0.8W/kg (ch6)	-
	2437	6	**1**	15	99.9	0.00	×1.00	**14.78**	30.06	ref	18.03	3.3	15.5	-0.72	×1.18	**Tested**	-	-
	2462	11	**1**	15	99.9	0.00	×1.00	**14.61**	28.91	-0.17	17.96	3.4	15.5	-0.89	×1.23	Reduced	*. ≤ 0.8W/kg (ch6)	-
g	2412	1	**6**	12	99.5	0.02	×1.00	**12.45**	17.58	0.10	23.56	11.1	13.5	-1.05	×1.27	-	-	-
	2437	6	**6**	12	99.5	0.02	×1.00	**12.35**	17.18	ref	23.51	11.2	13.5	-1.15	×1.30	-	-	-
	2462	11	**6**	12	99.5	0.02	×1.00	**12.55**	17.99	0.20	23.37	10.8	13.5	-0.95	×1.24	Reduced	-	-
n HT20	2412	1	**MCS0**	12	99.4	0.03	×1.01	**12.41**	17.42	-0.01	23.74	11.3	13.5	-1.09	×1.29	-	-	-
	2437	6	**MCS0**	12	99.4	0.03	×1.01	**12.42**	17.46	ref	23.59	11.2	13.5	-1.08	×1.28	-	-	-
	2462	11	**MCS0**	12	99.4	0.03	×1.01	**12.52**	17.86	0.10	23.07	10.6	13.5	-0.98	×1.25	Reduced	-	-
n HT40	2422	3	**MCS0**	10	98.7	0.06	×1.01	**10.42**	11.02	-0.04	23.18	12.8	11.5	-1.08	×1.28	-	-	-
	2437	6	**MCS0**	10	98.7	0.06	×1.01	**10.46**	11.12	ref	23.43	13.0	11.5	-1.04	×1.27	Reduced	-	-
	2452	9	**MCS0**	10	98.7	0.06	×1.01	**10.40**	10.96	-0.06	23.19	12.8	11.5	-1.10	×1.29	-	-	-
a (W52)	5180	36	**6**	12	99.4	0.03	×1.01	**12.27**	16.87	0.12	21.98	9.7	13.5	-1.23	×1.33	-	-	-
	5200	40	**6**	12	99.4	0.03	×1.01	**12.03**	15.96	-0.12	21.10	9.1	13.5	-1.47	×1.40	-	-	-
	5220	44	**6**	12	99.4	0.03	×1.01	**12.15**	16.41	ref	21.77	9.6	13.5	-1.35	×1.36	Reduced	*. ≤ 1.2W/kg (W53)	-
	5240	48	**6**	12	99.4	0.03	×1.01	**12.08**	16.14	-0.07	21.77	9.7	13.5	-1.42	×1.39	-	-	-
(W53)	5260	52	**6**	12	99.4	0.03	×1.01	**12.06**	16.07	-0.05	21.73	9.7	13.5	-1.44	×1.39	Reduced	*. ≤ 0.8W/kg (ch60)	-
	5280	56	**6**	12	99.4	0.03	×1.01	**12.00**	15.85	-0.11	21.15	9.2	13.5	-1.50	×1.41	-	-	-
	5300	60	**6**	12	99.4	0.03	×1.01	**12.11**	16.26	ref	21.61	9.5	13.5	-1.39	×1.38	**Tested**	-	-
	5320	64	**6**	12	99.4	0.03	×1.01	**12.11**	16.26	0.00	21.50	9.4	13.5	-1.39	×1.38	Reduced	*. ≤ 0.8W/kg (ch60)	-
(W56)	5500	100	**6**	12	99.4	0.03	×1.01	**12.06**	16.07	0.01	21.80	9.7	13.5	-1.44	×1.39	**Tested**	-	-
	5560	112	**6**	12	99.4	0.03	×1.01	**11.87**	15.38	-0.18	21.31	9.4	13.5	-1.63	×1.46	-	-	-
	5580	116	**6**	12	99.4	0.03	×1.01	**12.05**	16.03	ref	22.11	10.1	13.5	-1.45	×1.40	**Tested**	-	-
	5600	120	**6**	12	99.4	0.03	×1.01	**12.02**	15.92	-0.03	21.38	9.4	13.5	-1.48	×1.41	**Tested**	-	-
	5640	128	**6**	12	99.4	0.03	×1.01	**12.02**	15.92	-0.03	21.12	9.1	13.5	-1.48	×1.41	-	-	-
	5660	132	**6**	12	99.4	0.03	×1.01	**12.00**	15.85	-0.05	21.13	9.1	13.5	-1.50	×1.41	-	-	-
	5700	140	**6**	12	99.4	0.03	×1.01	**12.02**	15.92	-0.03	21.55	9.5	13.5	-1.48	×1.41	**Tested**	-	-
(W58)	5745	149	**6**	12	99.4	0.03	×1.01	**12.06**	16.07	-0.11	21.99	9.9	13.5	-1.44	×1.39	Reduced	*. ≤ 0.8W/kg (ch157)	-
	5785	157	**6**	12	99.4	0.03	×1.01	**12.17**	16.48	ref	22.21	10.0	13.5	-1.33	×1.36	**Tested**	-	-
	5825	165	**6**	12	99.4	0.03	×1.01	**12.20**	16.60	0.03	21.98	9.8	13.5	-1.30	×1.35	Reduced	*. ≤ 0.8W/kg (ch157)	-
n HT20 (W52)	5180	36	**MCS0**	12	99.4	0.03	×1.01	**12.24**	16.75	0.10	22.31	10.1	13.5	-1.26	×1.34	-	-	-
	5200	40	**MCS0**	12	99.4	0.03	×1.01	**11.99**	15.81	-0.15	21.26	9.3	13.5	-1.51	×1.42	-	-	-
	5220	44	**MCS0**	12	99.4	0.03	×1.01	**12.14**	16.37	ref	22.04	9.9	13.5	-1.36	×1.37	Reduced	*. 11a was selected.	-
	5240	48	**MCS0**	12	99.4	0.03	×1.01	**12.03**	15.96	-0.11	21.94	9.9	13.5	-1.47	×1.40	-	-	-
(W53)	5260	52	**MCS0**	12	99.4	0.03	×1.01	**12.23**	16.71	-0.06	22.18	10.0	13.5	-1.27	×1.34	-	-	-
	5280	56	**MCS0**	12	99.4	0.03	×1.01	**12.10**	16.22	-0.19	20.86	8.8	13.5	-1.40	×1.38	-	-	-
	5300	60	**MCS0**	12	99.4	0.03	×1.01	**12.29**	16.94	ref	22.09	9.8	13.5	-1.21	×1.32	Reduced	*. 11a was selected.	-
	5320	64	**MCS0**	12	99.4	0.03	×1.01	**12.31**	17.02	0.02	21.82	9.5	13.5	-1.19	×1.32	-	-	-
(W56)	5500	100	**MCS0**	12	99.4	0.03	×1.01	**11.90**	15.49	-0.09	22.27	10.4	13.5	-1.60	×1.45	-	-	-
	5560	112	**MCS0**	12	99.4	0.03	×1.01	**11.88**	15.42	-0.11	21.14	9.3	13.5	-1.62	×1.45	-	-	-
	5580	116	**MCS0**	12	99.4	0.03	×1.01	**11.99**	15.81	ref	22.60	10.6	13.5	-1.51	×1.42	-	-	-
	5600	120	**MCS0**	12	99.4	0.03	×1.01	**11.99**	15.81	0.00	21.41	9.4	13.5	-1.51	×1.42	Reduced	*. 11a was selected.	-
	5640	128	**MCS0**	12	99.4	0.03	×1.01	**11.99**	15.81	0.00	21.14	9.2	13.5	-1.51	×1.42	-	-	-
	5660	132	**MCS0**	12	99.4	0.03	×1.01	**11.93**	15.60	-0.06	21.32	9.4	13.5	-1.57	×1.44	-	-	-
	5700	140	**MCS0**	12	99.4	0.03	×1.01	**12.07**	16.11	0.08	22.02	10.0	13.5	-1.43	×1.39	-	-	-
(W58)	5745	149	**MCS0**	12	99.4	0.03	×1.01	**12.17**	16.48	-0.06	22.76	10.6	13.5	-1.33	×1.36	-	-	-
	5785	157	**MCS0**	12	99.4	0.03	×1.01	**12.23**	16.71	ref	22.27	10.1	13.5	-1.27	×1.34	Reduced	*. 11a was selected.	-
	5825	165	**MCS0**	12	99.4	0.03	×1.01	**12.31**	17.02	0.08	22.29	10.0	13.5	-1.19	×1.32	-	-	-
ac VHT20 (W52)	5180	36	**MCS0**	12	99.4	0.03	×1.01	**12.14**	16.37	0.03	22.34	10.2	13.5	-1.36	×1.37	-	-	-
	5200	40	**MCS0**	12	99.4	0.03	×1.01	**12.05**	16.03	-0.07	21.36	9.3	13.5	-1.45	×1.40	-	-	-
	5220	44	**MCS0**	12	99.4	0.03	×1.01	**12.11**	16.26	ref	22.09	10.0	13.5	-1.39	×1.38	Reduced	*. 11a was selected.	-
	5240	48	**MCS0**	12	94.2	0.29	×1.01	**12.00**	15.85	-0.11	21.96	10.0	13.5	-1.50	×1.41	-	-	-
(W53)	5260	52	**MCS0**	12	99.4	0.03	×1.01	**12.23**	16.71	-0.06	22.08	9.9	13.5	-1.27	×1.34	-	-	-
	5280	56	**MCS0**	12	99.4	0.03	×1.01	**12.19**	16.56	-0.08	21.39	9.2	13.5	-1.31	×1.35	-	-	-
	5300	60	**MCS0**	12	99.4	0.03	×1.01	**12.29**	16.94	ref	21.95	9.7	13.5	-1.21	×1.32	Reduced	*. 11a was selected.	-
	5320	64	**MCS0**	12	99.4	0.03	×1.01	**12.33**	17.10	0.04	21.84	9.5	13.5	-1.17	×1.31	-	-	-
(W56)	5500	100	**MCS0**	12	99.4	0.03	×1.01	**12.02**	15.92	-0.04	22.27	10.3	13.5	-1.48	×1.41	-	-	-
	5560	112	**MCS0**	12	99.4	0.03	×1.01	**11.97**	15.74	-0.09	21.23	9.3	13.5	-1.53	×1.42	-	-	-
	5580	116	**MCS0**	12	99.4	0.03	×1.01	**12.06**	16.07	ref	22.32	10.3	13.5	-1.44	×1.39	-	-	-
	5600	120	**MCS0**	12	99.4	0.03	×1.01	**11.97**	15.74	-0.09	21.22	9.3	13.5	-1.53	×1.42	Reduced	*. 11a was selected.	-
	5640	128	**MCS0**	12	99.4	0.03	×1.01	**11.99**	15.81	-0.07	21.15	9.2	13.5	-1.51	×1.42	-	-	-
	5660	132	**MCS0**	12	99.4	0.03	×1.01	**11.94**	15.63	-0.12	21.33	9.4	13.5	-1.56	×1.43	-	-	-
	5700	140	**MCS0**	12	99.4	0.03	×1.01	**12.12**	16.29	0.06	22.07	10.0	13.5	-1.38	×1.37	-	-	-
(W58)	5745	149	**MCS0**	12	99.4	0.03	×1.01	**12.13**	16.33	-0.12	22.51	10.4	13.5	-1.37	×1.37	-	-	-
	5785	157	**MCS0**	12	99.4	0.03	×1.01	**12.25**	16.79	ref	22.37	10.1	13.5	-1.25	×1.33	Reduced	*. 11a was selected.	-
	5825	165	**MCS0**	12	99.4	0.03	×1.01	**12.27**	16.87	0.02	22.10	9.8	13.5	-1.23	×1.33	-	-	-

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]	CH	[Mbps]	[-]	[%]	[dB]	[-]	[dBm]	[mW]	[dB]	[dB]	[dB]	[dBm]	[dB]	[-]			
n,HT40 (W52)	5190	38	**MCS0**	9	98.8	0.06	×1.01	**9.32**	8.55	0.22	21.58	12.3	10.5	-1.18	×1.31	-	-	-
	5230	46	**MCS0**	9	98.8	0.06	×1.01	**9.10**	8.13	ref	21.42	12.3	10.5	-1.40	×1.38	Reduced	*. lower power	-
(W53)	5270	54	**MCS0**	9	98.8	0.06	×1.01	**9.23**	8.38	0.02	21.46	12.2	10.5	-1.27	×1.34	-	-	-
	5310	62	**MCS0**	9	98.8	0.06	×1.01	**9.21**	8.34	ref	21.15	11.9	10.5	-1.29	×1.35	Reduced	*. lower power	-
(W56)	5510	102	**MCS0**	9	98.8	0.06	×1.01	**8.94**	7.83	-0.03	20.80	11.9	10.5	-1.56	×1.43	-	-	-
	5550	110	**MCS0**	9	98.8	0.06	×1.01	**8.97**	7.89	ref	20.39	11.4	10.5	-1.53	×1.42	-	-	-
	5590	118	**MCS0**	9	98.8	0.06	×1.01	**8.81**	7.60	-0.16	20.36	11.6	10.5	-1.69	×1.48	Reduced	*. lower power	-
	5630	126	**MCS0**	9	98.8	0.06	×1.01	**8.67**	7.36	-0.30	19.47	10.8	10.5	-1.83	×1.52	-	-	-
	5670	134	**MCS0**	9	98.8	0.06	×1.01	**9.05**	8.04	0.08	21.03	12.0	10.5	-1.45	×1.40	-	-	-
(W58)	5755	151	**MCS0**	9	98.8	0.06	×1.01	**9.18**	8.28	-0.04	21.64	12.5	10.5	-1.32	×1.36	-	-	-
	5795	159	**MCS0**	9	98.8	0.06	×1.01	**9.22**	8.36	ref	21.36	12.1	10.5	-1.28	×1.34	Reduced	*. lower power	-
ac,VHT40 (W52)	5190	38	**MCS0**	9	98.8	0.03	×1.01	**9.29**	8.49	ref	20.96	11.7	10.5	-1.21	×1.32	-	-	-
	5240	48	**MCS0**	9	98.8	0.03	×1.01	**9.09**	8.11	-0.20	20.80	11.7	10.5	-1.41	×1.38	Reduced	*. lower power	-
(W53)	5270	54	**MCS0**	9	98.8	0.03	×1.01	**9.24**	8.39	-0.09	20.57	11.3	10.5	-1.26	×1.34	-	-	-
	5310	62	**MCS0**	9	98.8	0.03	×1.01	**9.33**	8.57	ref	20.09	10.8	10.5	-1.17	×1.31	Reduced	*. lower power	-
(W56)	5510	102	**MCS0**	9	98.8	0.03	×1.01	**8.80**	7.59	-0.08	20.42	11.6	10.5	-1.70	×1.48	-	-	-
	5550	110	**MCS0**	9	98.8	0.03	×1.01	**8.88**	7.73	ref	20.24	11.4	10.5	-1.62	×1.45	-	-	-
	5590	118	**MCS0**	9	98.8	0.03	×1.01	**8.79**	7.57	-0.09	19.07	10.3	10.5	-1.71	×1.48	Reduced	*. lower power	-
	5630	126	**MCS0**	9	98.8	0.03	×1.01	**8.78**	7.55	-0.10	19.49	10.7	10.5	-1.72	×1.49	-	-	-
	5670	134	**MCS0**	9	98.8	0.03	×1.01	**9.01**	7.96	0.13	20.42	11.4	10.5	-1.49	×1.41	-	-	-
(W58)	5755	151	**MCS0**	9	98.8	0.03	×1.01	**9.20**	8.32	-0.02	20.49	11.3	10.5	-1.30	×1.35	-	-	-
	5795	159	**MCS0**	9	98.8	0.03	×1.01	**9.22**	8.36	ref	20.74	11.5	10.5	-1.28	×1.34	Reduced	*. lower power	-
ac,VHT80 (W52)	5210	42	**MCS0**	8	97.4	0.06	×1.01	**8.22**	6.64	-	19.71	11.5	9.5	-1.28	×1.34	Reduced	*. lower power	-
(W53)	5290	58	**MCS0**	8	97.4	0.06	×1.01	**8.25**	6.68	-	19.69	11.4	9.5	-1.25	×1.33	Reduced	*. lower power	-
(W56)	5530	106	**MCS0**	8	97.4	0.06	×1.01	**7.95**	6.24	ref	20.36	12.4	9.5	-1.55	×1.43	-	-	-
	5610	122	**MCS0**	8	97.4	0.06	×1.01	**8.03**	6.35	0.08	19.10	11.1	9.5	-1.47	×1.40	Reduced	*. lower power	-
(W58)	5775	155	**MCS0**	8	97.4	0.06	×1.01	**8.30**	6.76	-	19.74	11.4	9.5	-1.20	×1.32	Reduced	*. lower power	-

*. : SAR test was applied. *. xx.xx highlight is shown the maximum measured output power.

*. Freq.: Frequency, PAR: Peak average ratio ("Peak power"-"Average power", in dBm), Ch: channel, D/R: Data Rate, Higher-P.ch.: Higher power channel, 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))

*. The ES201 of serial number: 5I52 with which power was measured in EMC test was used for a SAR test.

*. Date measured: August 7-10, 2015 / by: S. Takano, T. Hara / Place: No. 1 and No.5 shielded room. (Refer to Test report: 10882638S-M&-N.)
(For some additional frequencies) September 3, 2015 / by: Hiroshi Naka / Place: preparation room of No. 7 shielded room. (24 deg.C. / 55 %RH)

*. Uncertainty of antenna port conducted test; Power measurement uncertainty above 1GHz for this test was: (±) 0.63 dB

SECTION 7: SAR Measurement results

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

Measurement date: September 28, 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 [%]						
2437	Body	*52.72*	50.43	-4.4	-5% ≤ εr-meas. ≤ 0%	*1.938*	1.998	+3.1	0% ≤ σ-meas. ≤ +5%	22.3	152	+2.48	not required.	September 28, 2015 before SAR test

[SAR measurement results]

Mode	Frequency [MHz] (Channel)	Data rate [Mbps]	EUT setup: Position	Gap [mm]	Power supply	Power drift [dB]	SAR (1g) [W/kg] Max.value of multi-peak: Meas.	ΔSAR [%]	ΔSAR corrected	SAR plot # in Appendix 2-2	Reported SAR (1g) [W/kg] Duty cycle correction: Duty [%]	Duty scaled	Output average power correction: Meas. [dBm].	Max. [dBm]	Tune-up factor	SAR Corrected (*d)	Remarks
Step 1 (2.4GHz): Worst SAR search by 11b(DSSS) mode.																	
11b	2437(6)	1	**Front**	0	adaptor	-0.06	**0.281**	+2.48	n/a (*c)	Plot 1-2	99.9	×1.00	14.78	15.5	×1.18	**0.332**	-
			Front-right	0	adaptor	0.03	**0.273**	+2.48	n/a (*c)	Plot 1-3	99.9	×1.00	14.78	15.5	×1.18	**0.322**	-
			Top(tip)	0	adaptor	-0.09	**0.075**	+2.48	n/a (*c)	Plot 1-4	99.9	×1.00	14.78	15.5	×1.18	**0.089**	-
			Left	0	adaptor	0.07	**0.589**	+2.48	n/a (*c)	Plot 1-1	99.9	×1.00	14.78	15.5	×1.18	**0.695**	Highest, 2.4GHz

Notes:

*. SAR test of OFDM mode was reduced, because the estimate reported SAR of OFDM mode was ≤ 1.2 W/kg by using the highest reported SAR of DSSS mode.

OFDM mode	Maximum tune-up tolerance limit: DSSS [dBm]	DSSS [mW] (a)	OFDM [dBm]	OFDM [mW] (b)	OFDM scaled factor [-] (b)/(a)×100	DSSS reported SAR(1g) value: Setup	[W/kg]	Estimated SAR(1g) value: OFDM [W/kg]	Exclusion limit [W/kg]	Standalone SAR test require?
11g	15.5	35.48	13.5	22.39	0.631	Left	0.721	**0.455**	**≤ 1.2**	**No**
n(HT20)	15.5	35.48	13.5	22.39	0.631	Left	0.721	**0.455**	**≤ 1.2**	**No**
n(40HT)	15.5	35.48	11.5	14.13	0.398	Left	0.721	**0.287**	**≤ 1.2**	**No**

*. 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.

*. During test, the EUT was operated with no interface cable and with DC power supplied from the host device which was operated with ac adaptor.

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

SAR test frequency	Probe calibration frequency	Validity	Conversion factor	Uncertainty
2437 MHz	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 (v01r03), 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 (v01r03),, 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 (v01r03)).

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. Calculating formula: Reported SAR (1g) (W/kg) = (Measured SAR (1g) (W/kg)) × (Duty scaled) × (Tune-up factor)

Duty scaled = 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))

(Clause 5.2, 2.4GHz SAR Procedures, in KDB248227 D01 (v02r01))

5.2.1 802.11b DSSS 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 (section 3.1) 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.

5.2.2 2.4 GHz 802.11g/n OFDM SAR Test Exclusion Requirements

When SAR measurement is required for 2.4 GHz 802.11g/n OFDM configurations, the measurement and test reduction procedures for OFDM are applied (section 5.3, including sub-sections). SAR is not required for the following 2.4 GHz OFDM conditions.

1) When KDB Publication 447498 SAR test exclusion applies to the OFDM configuration.
2) When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

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

Measurement date: September 29 and 30, 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 [%]						
5500	Body	48.61	46.74	-3.8	-5% ≤ εr-meas. ≤ 0%	5.650	5.822	+3.1	0% ≤ σ-meas. ≤ +5%	22.9	146	+0.67	not required.	September 29, 2015 before SAR test
5580		48.50	46.68	-3.8		5.743	5.936	+3.4				+0.60	not required.	
5600		48.47	46.64	-3.8		5.766	5.955	+3.3				+0.61	not required.	
5700		48.34	46.46	-3.9		5.883	6.085	+3.4				+0.62	not required.	
5300	Body	48.88	47.05	-3.8		5.416	5.537	+2.2		22.9	146	+0.69	not required.	September 30, 2015 before SAR test
5785		48.22	46.32	-3.9		5.982	6.236	+4.2				+0.59	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]						
Mode	Frequency [MHz] (Channel)	Data rate [Mbps]	EUT setup			Power drift [dB]	SAR (1g) [W/kg] Max.value of multi-peak			SAR plot # in Appendix 2-2	Duty cycle correction		Output average power correction			SAR Corrected (*d)	Remarks
			Position	Gap [mm]	Power supply		Meas.	ΔSAR [%]	ΔSAR corrected		Duty [%]	Duty scaled	Meas. [dBm].	Max. [dBm]	Tune-up factor		
Step 2 (5GHz): Worst SAR search; W53 band (UNII-2A, 5260 MHz~5320 MHz)																	
11a	5300(60)	6	Left	0	adaptor	-0.18	**0.304**	+0.69	n/a (*c)	Plot 2-1	99.4	×1.01	12.11	13.5	×1.38	**0.424**	-
			Front-right	0	adaptor	-0.17	**0.353**	+0.69	n/a (*c)	Plot 2-2	99.4	×1.01	12.11	13.5	×1.38	**0.492**	-
			Front	0	adaptor	-0.04	**0.543**	+0.69	n/a (*c)	Plot 2-3	99.4	×1.01	12.11	13.5	×1.38	**0.757**	Highest w53
			Top(tip)	0	adaptor	-0.06	**0.396**	+0.69	n/a (*c)	Plot 2-4	99.4	×1.01	12.11	13.5	×1.38	**0.552**	-
Step 3 (5GHz): Worst SAR search; W56 band (UNII-2C, 5500 MHz~5700 MHz)																	
11a	5600(120)	6	Front	0	adaptor	-0.03	**0.778**	+0.61	n/a (*c)	Plot 3-2	99.4	×1.01	12.02	13.5	×1.41	**1.108**	-
	5580(116)		Front	0	adaptor	-0.05	**0.821**	+0.60	n/a (*c)	Plot 3-3	99.4	×1.01	12.05	13.5	×1.40	**1.161**	-
			Left	0	adaptor	-0.20	**0.378**	+0.60	n/a (*c)	Plot 3-4	99.4	×1.01	12.05	13.5	×1.40	**0.534**	-
			Front-right	0	adaptor	-0.20	**0.554**	+0.60	n/a (*c)	Plot 3-5	99.4	×1.01	12.05	13.5	×1.40	**0.783**	-
			Top(tip)	0	adaptor	-0.13	**0.513**	+0.60	n/a (*c)	Plot 3-6	99.4	×1.01	12.05	13.5	×1.40	**0.725**	-
	5500(100)		Front	0	adaptor	-0.05	**0.832**	+0.67	n/a (*c)	Plot 3-1	99.4	×1.01	12.06	13.5	×1.39	**1.168**	>0.8W/kg(*1)
	5700(140)				adaptor	-0.03	**0.713**	+0.62	n/a (*c)	Plot 3-7	99.4	×1.01	12.02	13.5	×1.41	**1.015**	-
Step 4 (5GHz): Worst SAR search; W58 band (UNII-3, 5745 MHz~5825 MHz)																	
11a	5785(157)	6	Left	0	adaptor	-0.07	**0.237**	+0.59	n/a (*c)	Plot 4-1	99.4	×1.01	12.17	13.5	×1.36	**0.326**	-
			Front-right	0	adaptor	-0.07	**0.405**	+0.59	n/a (*c)	Plot 4-2	99.4	×1.01	12.17	13.5	×1.36	**0.556**	-
			Front	0	adaptor	0.03	**0.573**	+0.59	n/a (*c)	Plot 4-3	99.4	×1.01	12.17	13.5	×1.36	**0.787**	Highest w58
			Top(tip)	0	adaptor	-0.09	**0.312**	+0.59	n/a (*c)	Plot 4-4	99.4	×1.01	12.17	13.5	×1.36	**0.429**	-
Step 5 (5GHz): SAR Measurement Variability (*1)																	
11a	5500(100)	6	Front	0	adaptor	-0.05	**0.842**	+0.67	n/a (*c)	Plot 5-1	99.4	×1.01	12.06	13.5	×1.39	**1.182**	Highest, w56, Highest, 5Ghz

Notes:

*. (KDB248227 D01 (v02r01), 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.

*. During test, the EUT was operated with no interface cable and with DC power supplied from the host device which was operated with ac adaptor.

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

SAR test frequency	Probe calibration frequency	Validity	Conversion factor	Uncertainty
5300 MHz	5250 MHz	within ±110 MHz of calibration frequency	4.53	±13.1 %
5500, 5580, 5600, 5700 MHz	5600 MHz	within ±110 MHz of calibration frequency	3.78	±13.1 %
5785 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 (v01r03), 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 (v01r03), 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 (v01r03)).

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

*d. Calculating formula: Reported SAR (1g) (W/kg) = (Measured SAR (1g) (W/kg)) × (Duty scaled) × (Tune-up factor)

Duty scaled = 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))

(cont'd)

(cont'd)

(Clause 5: SAR TEST PROCEDURE, in KDB248227 D01 (v02r01))

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.

***1. SAR Measurement Variability**

In accordance with published RF Exposure KDB procedure 865664 D01 (v01r03) SAR measurement 100 MHz to 6 GHz. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.
2) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.
3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).
4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

Mode	Freq. [MHz]	Data rate	EUT setup	Measured SAR (1g) [W/kg]		Largest to Smallest SAR Ratio	Remarks
				Original	Repeated		
11a	5500	6Mbps	**Front**	**0.832**	**0.842**	**1.012**	*. Second Repeated Measurement is not required since the ratio of the largest to smallest SAR for the original and first repeated measurement is not > 1.20.