



# SAR TEST REPORT

Test Report No.: 10847257S-A

Applicant : Canon Inc.  
Type of Equipment : Wireless Module  
Model No. : WM236 (\*. It was installed into the specified platform (digital camera).)  
FCC ID : AZD236  
Test Standard : FCC 47CFR §2.1093  
Test Result : Complied

| Highest Reported SAR(1g) Value             | Platform type  | Platform model | Remarks                                                                               |
|--------------------------------------------|----------------|----------------|---------------------------------------------------------------------------------------|
| <b>0.70 W/kg</b><br>(Measured: 0.515 W/kg) | Digital camera | PC2270         | (DTS) 2462MHz, IEEE 802.11g (6Mbps, BPSK/OFDM)<br>(Output power measured: 12.71 dBm). |

\*. Highest reported SAR (1g) across this platform and exposure conditions (body-touch) = "0.70 W/kg" = grant listing.

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Date of test: November 4, 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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☒ There is no testing item of "Non-accreditation".



## REVISION HISTORY

| Revision | Test report No. | Date              | Page revised | Contents                |
|----------|-----------------|-------------------|--------------|-------------------------|
| Original | 10847257S-A     | November 20, 2015 | -            |                         |
| -r01     | 10847257S-A     | November 26, 2015 | p1,2,10      | (p10) Error correction. |

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

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## 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 | +81-3-5482-8070                                          |
| Facsimile Number | +81-3-3757-8431                                          |
| Contact Person   | Hironobu Saida                                           |

## SECTION 2: Equipment under test (EUT)

### 2.1 Identification of EUT

|                            | EUT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Platform              |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| Type of Equipment          | Wireless Module                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Digital camera        |
| Model Number               | WM236                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | PC2270                |
| Serial Number              | 60128BD5EFF4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 56                    |
| Condition of EUT           | Engineering prototype<br>(*: Not for sale: These samples are equivalent to mass-produced items.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Engineering prototype |
| Receipt Date of Sample     | June 13, 2015 (*: EUT for power measurement.) *: No modification by the Lab.<br>October 23, 2015 (*: EUT for SAR test.) *: No modification by the Lab.<br>(*: The EUT that had been measured the power of SAR test reference, was installed into the platform-digital camera (model: PC2270) from the beginning. After power measurement, the EUT was returned to the customer, and the RF wiring was changed to the original antenna line from the antenna conducted power measurement line for SAR test. The EUT was installed into a platform which SAR tested, by the customer.) |                       |
| Country of Mass-production | Philippines                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Japan                 |
| Category Identified        | Portable device<br>*: 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                     | DC3.3V and DC1.8V supplied from the platform<br>*: The EUT is installed into the specified the platform that was operated by the re-chargeable Li-ion battery. Therefore, each SAR test, the platform which had built-in EUT was operated with full-charged battery.                                                                                                                                                                                                                                                                                                                 |                       |
| Feature of EUT             | The EUT is a Wireless Module which installs into the specified platform: digital camera.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                       |
| SAR Accessory              | None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                       |

### 2.2 Product Description (Wireless module: WM236)

|                                                      |                                                                                                                            |                         |                              |
|------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|-------------------------|------------------------------|
| Equipment type                                       | Transceiver                                                                                                                |                         |                              |
| Frequency of operation                               | 2412-2462MHz (11b, 11g, 11n(20HT))                                                                                         |                         |                              |
| Channel spacing                                      | 5MHz                                                                                                                       |                         |                              |
| Bandwidth                                            | 20MHz                                                                                                                      |                         |                              |
| Type of modulation                                   | DSSS(11b): CCK, DQPSK, DBPSK<br>OFDM(11g, 11n(20HT)): 64QAM, 16QAM, QPSK, BPSK                                             |                         |                              |
| Q'ty of Antenna                                      | 1 pc.                                                                                                                      |                         |                              |
| Antenna type                                         | Monopole type chip antenna (Parts No.: AMD0302-ST01T, Manufacture: Mitsubishi Material Corp.)                              |                         |                              |
| Antenna gain (peak)                                  | -3.10dBi (2442MHz)                                                                                                         |                         |                              |
| Transmit power and tolerance (Manufacture variation) | 11b: 12dBm +2dB/-2.5dB                                                                                                     | 11g: 12dB m +2dB/-2.5dB | 11n(20HT): 12dBm +2dB/-2.5dB |
|                                                      | *: Refer to clause 2.3 for more detail.<br>*: The measured Tx output power (conducted) refers to section 6 in this report. |                         |                              |
| Maximum output power which may possible              | 11b: 14dBm                                                                                                                 | 11g: 14dBm              | 11n(20HT): 14dBm             |
|                                                      | *: Refer to clause 2.4 for more detail.                                                                                    |                         |                              |
| Power supply                                         | DC 3.3V, DC1.8V (*: The power of DC3.3V and DC1.8V are supplied from the platform via constant voltage circuit.)           |                         |                              |

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

## 2.3 Tx output power specification (antenna port terminal conducted)

|       |    | Typical power [dBm] (average) |    |     |    |     |    |    |    |    |    |    |    |      |      |           |      |      |      |      |      |      |      |       |       |       |       |       |       |
|-------|----|-------------------------------|----|-----|----|-----|----|----|----|----|----|----|----|------|------|-----------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|
|       |    | 11b                           |    |     |    | 11g |    |    |    |    |    |    |    |      |      | 11n(20HT) |      |      |      |      |      |      |      |       |       |       |       |       |       |
| [MHz] | CH | 1                             | 2  | 5.5 | 11 | 6   | 9  | 12 | 18 | 24 | 36 | 48 | 54 | MCS0 | MCS1 | MCS2      | MCS3 | MCS4 | MCS5 | MCS6 | MCS7 | MCS8 | MCS9 | MCS10 | MCS11 | MCS12 | MCS13 | MCS14 | MCS15 |
| 2412  | 1  | 12                            | 12 | 12  | 12 | 12  | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12   | 12   | 12        | 12   | 12   | 12   | 12   | 12   | -    | -    | -     | -     | -     | -     | -     | -     |
| 2417  | 2  | 12                            | 12 | 12  | 12 | 12  | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12   | 12   | 12        | 12   | 12   | 12   | 12   | 12   | -    | -    | -     | -     | -     | -     | -     | -     |
| 2422  | 3  | 12                            | 12 | 12  | 12 | 12  | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12   | 12   | 12        | 12   | 12   | 12   | 12   | 12   | -    | -    | -     | -     | -     | -     | -     | -     |
| 2427  | 4  | 12                            | 12 | 12  | 12 | 12  | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12   | 12   | 12        | 12   | 12   | 12   | 12   | 12   | -    | -    | -     | -     | -     | -     | -     | -     |
| 2432  | 5  | 12                            | 12 | 12  | 12 | 12  | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12   | 12   | 12        | 12   | 12   | 12   | 12   | 12   | -    | -    | -     | -     | -     | -     | -     | -     |
| 2437  | 6  | 12                            | 12 | 12  | 12 | 12  | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12   | 12   | 12        | 12   | 12   | 12   | 12   | 12   | -    | -    | -     | -     | -     | -     | -     | -     |
| 2442  | 7  | 12                            | 12 | 12  | 12 | 12  | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12   | 12   | 12        | 12   | 12   | 12   | 12   | 12   | -    | -    | -     | -     | -     | -     | -     | -     |
| 2447  | 8  | 12                            | 12 | 12  | 12 | 12  | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12   | 12   | 12        | 12   | 12   | 12   | 12   | 12   | -    | -    | -     | -     | -     | -     | -     | -     |
| 2452  | 9  | 12                            | 12 | 12  | 12 | 12  | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12   | 12   | 12        | 12   | 12   | 12   | 12   | 12   | -    | -    | -     | -     | -     | -     | -     | -     |
| 2457  | 10 | 12                            | 12 | 12  | 12 | 12  | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12   | 12   | 12        | 12   | 12   | 12   | 12   | 12   | -    | -    | -     | -     | -     | -     | -     | -     |
| 2462  | 11 | 12                            | 12 | 12  | 12 | 12  | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12   | 12   | 12        | 12   | 12   | 12   | 12   | 12   | -    | -    | -     | -     | -     | -     | -     | -     |

## 2.4. Maximum output power which may possible

|       |    | Maximum output power [dBm] (average) |    |     |    |     |    |    |    |    |    |    |    |           |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |
|-------|----|--------------------------------------|----|-----|----|-----|----|----|----|----|----|----|----|-----------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|
|       |    | 11b                                  |    |     |    | 11g |    |    |    |    |    |    |    | 11n(20HT) |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |
| [MHz] | CH | 1                                    | 2  | 5.5 | 11 | 6   | 9  | 12 | 18 | 24 | 36 | 48 | 54 | MCS0      | MCS1 | MCS2 | MCS3 | MCS4 | MCS5 | MCS6 | MCS7 | MCS8 | MCS9 | MCS10 | MCS11 | MCS12 | MCS13 | MCS14 | MCS15 |
| 2412  | 1  | 14                                   | 14 | 14  | 14 | 14  | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14        | 14   | 14   | 14   | 14   | 14   | 14   | 14   | -    | -    | -     | -     | -     | -     | -     | -     |
| 2417  | 2  | 14                                   | 14 | 14  | 14 | 14  | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14        | 14   | 14   | 14   | 14   | 14   | 14   | 14   | -    | -    | -     | -     | -     | -     | -     | -     |
| 2422  | 3  | 14                                   | 14 | 14  | 14 | 14  | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14        | 14   | 14   | 14   | 14   | 14   | 14   | 14   | -    | -    | -     | -     | -     | -     | -     | -     |
| 2427  | 4  | 14                                   | 14 | 14  | 14 | 14  | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14        | 14   | 14   | 14   | 14   | 14   | 14   | 14   | -    | -    | -     | -     | -     | -     | -     | -     |
| 2432  | 5  | 14                                   | 14 | 14  | 14 | 14  | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14        | 14   | 14   | 14   | 14   | 14   | 14   | 14   | -    | -    | -     | -     | -     | -     | -     | -     |
| 2437  | 6  | 14                                   | 14 | 14  | 14 | 14  | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14        | 14   | 14   | 14   | 14   | 14   | 14   | 14   | -    | -    | -     | -     | -     | -     | -     | -     |
| 2442  | 7  | 14                                   | 14 | 14  | 14 | 14  | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14        | 14   | 14   | 14   | 14   | 14   | 14   | 14   | -    | -    | -     | -     | -     | -     | -     | -     |
| 2447  | 8  | 14                                   | 14 | 14  | 14 | 14  | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14        | 14   | 14   | 14   | 14   | 14   | 14   | 14   | -    | -    | -     | -     | -     | -     | -     | -     |
| 2452  | 9  | 14                                   | 14 | 14  | 14 | 14  | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14        | 14   | 14   | 14   | 14   | 14   | 14   | 14   | -    | -    | -     | -     | -     | -     | -     | -     |
| 2457  | 10 | 14                                   | 14 | 14  | 14 | 14  | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14        | 14   | 14   | 14   | 14   | 14   | 14   | 14   | -    | -    | -     | -     | -     | -     | -     | -     |
| 2462  | 11 | 14                                   | 14 | 14  | 14 | 14  | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14        | 14   | 14   | 14   | 14   | 14   | 14   | 14   | -    | -    | -     | -     | -     | -     | -     | -     |

## 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 (v06):** General RF exposure guidance  
**KDB 248227 D01 (v02r02):** SAR Guidance for IEEE 802.11 (Wi-Fi) transmitters  
**KDB 865664 D01 (v01r04):** SAR measurement 100MHz to 6GHz  
**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.

### 3.2 Exposure limit

| Environments of exposure limit                                  | Whole-Body<br>(averaged over the entire body) | Partial-Body<br>(averaged over any 1g of tissue) | Hands, Wrists, Feet and Ankles<br>(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                                          | <b>1.6</b>                                       | 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) / in Platform: digital camera                          |
|-------------------------------------|--------------------------------------------------------------------|
| Test Procedure                      | SAR measurement; KDB 447498, KDB 248227, KDB 865664, IEEE Std.1528 |
| Category                            | FCC 47CFR §2.1093 (Portable device)                                |
| Results (SAR(1g))                   | <b>Complied</b>                                                    |
| Reported SAR value (*, Scaled)      | <b>0.70 W/kg</b>                                                   |
| Measured SAR value                  | 0.515 W/kg                                                         |
| Operation mode, channel             | 802.11g (6Mbps, BPSK/OFDM), 2462MHz (11ch)                         |
| Power measured/max. (scaled factor) | 12.71 dBm/14dBm (×1.35)                                            |

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 (v06).

Consideration of the test results: Since highest reported SAR (1g) on a platform for WM236 (EUT) obtained in accordance with KDB447498 D01 (v06) was  $\geq 0.4$  W/kg and  $\leq 0.8$  W/kg, this EUT is approved to operate in multiple host platform.

### 3.4 Test Location

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

**UL Japan, Inc., Shonan EMC Lab.**

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(v06))

#### 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 lower, middle, upper channels with the worst data rate condition in.

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

### 3.6 Confirmation after SAR testing

It was checked that the power drift [W] is within  $\pm 5\%$  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] =  $20\log(E_a)/(E_b)$  (where, Before SAR testing:  $E_b[V/m]$  / After SAR testing:  $E_a[V/m]$ )

Limit of power drift[W] =  $\pm 5\%$

Power drift limit (X) [dB] =  $10\log(P\_drift) = 10\log(1.05/1) = 10\log(1.05) - 10\log(1) = 0.21dB$

from E-filed relations with power.

$S = E \times H = E^2 / \eta = P / (4 \times \pi \times r^2)$  ( $\eta$ : 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 =  $10\log(P\_drift) = 10\log(E\_drift)^2 = 20\log(E\_drift)$

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

### 3.7 Test setup of EUT and SAR measurement procedure

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

| Setup plan   | Explanation of SAR test setup plan<br>(* 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 a digital camera is touched to the Flat phantom.                     | 4.05   | Tested                   | Body-touch |
| Rear (LCD)   | When test is required, the rear side (LCD) of digital camera is touched to the Flat phantom.                    | 11.78  | Tested                   |            |
| Front-left   | When test is required, the left portion of front surface of a digital camera is touched to the Flat phantom.    | 14.20  | Tested                   |            |
| Bottom       | When test is required, the bottom flat surface of digital camera is touched to the Flat phantom.                | 20.38  | Tested                   |            |
| Front (Lens) | When test is required, the front side (Lens) of a digital camera is touched to the Flat phantom.                | ≈30    | Reduced                  |            |
| Top-left     | When test is required, the left portion of top surface of a digital camera is touched to the Flat phantom.      | 38.98  | Tested                   |            |
| Right        | When test is required, the right-hand grip surface of digital camera is touched to the Flat phantom.            | 101.00 | 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 (WM235): 22.5 mm (width) × 11.5 mm (depth) × 2.05 mm max (thickness)  
\*. Size of platform: 105.5 mm (width) × 60.9 mm (height) × 42.0 mm (depth) (This size is when the lens is in closed position. The convex portion is not contained in size.)

#### \*1. KDB 447498 D01 (v06) was taken into consideration to reduce SAR test.

| Consideration of SAR test reduction by the antenna separation distance (100MHz~6GHz, ≤50mm) |              |                  |                |                       |                       |       |                |                                                    |                               |         |                                     |
|---------------------------------------------------------------------------------------------|--------------|------------------|----------------|-----------------------|-----------------------|-------|----------------|----------------------------------------------------|-------------------------------|---------|-------------------------------------|
| Band, Mode                                                                                  | Position     | Minimum distance |                | Upper frequency [GHz] | Maximum tune-up power |       |                | Calculation of exclusion: ≤ 3.0 (*2)               | Standalone SAR test Required? |         | Remarks                             |
|                                                                                             |              | [mm]             | [mm] (rounded) |                       | [dBm]                 | [mW]  | [mW] (rounded) |                                                    |                               |         |                                     |
| WLAN2.4GHz                                                                                  | Left         | 4.05             | 4 (≤ 5)        | 2.462                 | 14.00                 | 25.12 | 25             | 7.8                                                | > 3.0                         | Tested  | -                                   |
|                                                                                             | Rear (LCD)   | 11.78            | 12             | 2.462                 | 14.00                 | 25.12 | 25             | 3.3                                                | > 3.0                         | Tested  | *. Initial position search applied. |
|                                                                                             | Front-left   | 14.20            | 14             | 2.462                 | 14.00                 | 25.12 | 25             | 2.8                                                | ≤ 3.0                         | Reduced | *.SAR test was applied. (*4)        |
|                                                                                             | Bottom       | 20.38            | 20             | 2.462                 | 14.00                 | 25.12 | 25             | 2.0                                                | ≤ 3.0                         | Reduced | *. Initial position search applied. |
|                                                                                             | Front (Lens) | ≈30              | 30             | 2.462                 | 14.00                 | 25.12 | 25             | 1.3                                                | ≤ 3.0                         | Reduced | -                                   |
|                                                                                             | Top-left     | 38.98            | 39             | 2.462                 | 14.00                 | 25.12 | 25             | 1.0                                                | ≤ 3.0                         | Reduced | *. Initial position search applied. |
| Consideration of SAR test reduction by the antenna separation distance (100MHz~6GHz, >50mm) |              |                  |                |                       |                       |       |                |                                                    |                               |         |                                     |
| Band, Mode                                                                                  | Position     | Minimum distance |                | Upper frequency [GHz] | Maximum tune-up power |       |                | Calculation of test exclusion thresholds [mW] (*3) | Standalone SAR test           | Remarks |                                     |
|                                                                                             |              | [mm]             | [mm] (rounded) |                       | [dBm]                 | [mW]  | [mW] (rounded) |                                                    |                               |         |                                     |
| WLAN2.4GHz                                                                                  | Right        | 101.00           | 101            | 2.462                 | 14.00                 | 25.12 | 25             | 605.6                                              | Reduced                       | -       |                                     |

- \*2. Parenthesis 1), Clause 4.3.1, KDB 447498 D01 (v06) gives the following formula to calculate the SAR(1g) test exclusion thresholds for 100MHz-6GHz at test separation distance ≤50mm.  

$$[(\text{max.power of channel, including tune-up tolerance, mW}) / (\text{min.test separation distance, mm})] \times [\sqrt{f(\text{GHz})}] \leq 3.0 \text{ (for SAR(1g))} \dots\dots\dots \text{formula (1)}$$
If power is calculated from the upper formula (1);  

$$[\text{SAR(1g) test exclusion thresholds, mW}] = 3 \times [\text{test separation distance, mm}] / [\sqrt{f(\text{GHz})}] \dots\dots\dots \text{formula (2)}$$

$$[\text{SAR(1g) test exclusion thresholds, mW}] = 3 \times 50 / \text{SQRT}(2.462) = 96\text{mW, where test separation distance}=50\text{mm}$$
\*3. Parenthesis 2), Clause 4.3.1, KDB 447498 D01 (v06) gives the following formula to calculate the SAR(1g) test exclusion thresholds for 1.5-6GHz at test separation distance >50mm.  

$$[\text{test exclusion thresholds, mW}] = [(\text{Power allowed at numeric threshold for 50mm in formula (1)})] + [(\text{test separation distance, mm}) - (50\text{mm})] \times 10 \text{ formula (3)}$$
\*4. Even if a SAR test was judged exclusion by SAR threshold power, the near antenna section setup are considered body-touch SAR and are applied the SAR test in body-liquid, because the platform is small size of a compact digital camera.

#### <Conclusion for consideration for SAR test reduction>

- 1) Initial position search of OFDM mode was applied the near antenna section setup conditions which includes Left, Front-left, Rear (LCD), Top-left and Bottom.
- 2) Since a platform of digital camera does not have a view finder, the SAR test of head liquid (front of face setup) was reduced.

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

|        |                                                                                                                                                                                       |
|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Step 1 | Worst SAR search of OFDM mode<br>Searching "Initial test position" of OFDM mode.<br>Determine the highest reported SAR(1g) of OFDM mode. (*. Change the channel, if it is necessary.) |
| Step 2 | Change operation mode.                                                                                                                                                                |
| Step 3 | Change channels.                                                                                                                                                                      |

- \*. 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, 11g and 11n(20HT) continuous transmitting modes.  
The frequency and the modulation used in the SAR testing are shown as a following.

| Operation mode                    | 11b             | 11g                        | 11n(20HT)                  |
|-----------------------------------|-----------------|----------------------------|----------------------------|
| Tx frequency band                 | 2412-2462MHz    |                            |                            |
| SAR tested/reduced?               | Tested          | Tested                     | Tested                     |
| Tested condition                  | Frequency       | 2437 MHz                   | 2412, 2437, 2462 MHz (*1)  |
|                                   | Modulation      | DBPSK/DSSS                 | BPSK/OFDM                  |
|                                   | Data rate       | 1 Mbps                     | 6 Mbps                     |
| Controlled software               | “RF TEST” mode. |                            |                            |
| Power setting (power measurement) | default: 12     | default: 12<br>Tune-up: 13 | default: 12<br>Tune-up: 13 |
| Power setting (SAR)               | default: 12     | Tune-up: 13                | Tune-up: 13                |

\*1. Any output power reducing for channel 1 and 11 to meet restricted band requirements was not observed. Therefore channel 1 and 11 was tested.

\*2. (KDB248227 D01 (v02r02)) Since the reported SAR of the highest measured maximum output power channel is  $\leq 0.8$  W/kg, the SAR testing for other channels were omitted. However, the SAR testing was applied to lower, middle and upper channels for the worst SAR condition.

## SECTION 5: Uncertainty Assessment (SAR measurement)

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

\*. 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 (v01r04) SAR Measurement 100 MHz to 6 GHz, Section 2.8.1., when the highest measured SAR(1g) within a frequency band is  $< 1.5$ W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std.1528 (2013) is not required in SAR reports submitted for equipment approval.

## SECTION 6: Confirmation before testing

### 6.1 SAR reference power measurement (antenna terminal conducted average power of EUT) - Worst data rate/channel determination

| Mode       | Freq. | Data rate | Power Setting | Duty cycle | Duty factor | Duty scaled factor | Average power |      |          | PAR   | Power tolerance & correction |                    |                | SAR Tested/ Reduced | Remarks (WM235 Serial number: 60128BD5EFF4) | Power Tune-up? |
|------------|-------|-----------|---------------|------------|-------------|--------------------|---------------|------|----------|-------|------------------------------|--------------------|----------------|---------------------|---------------------------------------------|----------------|
|            |       |           |               |            |             |                    | Result        |      | ΔRef.    |       | Target & (+)tolerance        | Deviation from max | Tune-up factor |                     |                                             |                |
|            | [MHz] | [Mbps]    | [dBm]         | [%]        | [dB]        | [-]                | [dBm]         | [mW] |          | [dB]  |                              |                    |                | [dB]                | [dBm]                                       | (-2≤x<0)[dB]   |
| 11b        | 2412  | 1         | 12            | 100        | 0.00        | ×1.00              | 12.19         | 16.6 | -0.13    |       | 12.0+2                       | -1.81              | ×1.52          | Reduced             | -                                           | default        |
|            | 2437  | 1         | 12            | 100        | 0.00        | ×1.00              | 12.32         | 17.1 | Ref.b12  | 2.58  | 12.0+2                       | -1.68              | ×1.47          | Tested              | Higher pwr-D/R.(11b)                        | default        |
|            | 2437  | 2         | 12            | 100        | 0.00        | ×1.00              | 12.31         | 17.0 | -        | 2.65  | 12.0+2                       | -1.69              | ×1.48          | -                   | -                                           | default        |
|            | 2437  | 5.5       | 12            | 100        | 0.00        | ×1.00              | 12.32         | 17.1 | -        | 1.99  | 12.0+2                       | -1.68              | ×1.47          | -                   | -                                           | default        |
|            | 2437  | 11        | 12            | 100        | 0.00        | ×1.00              | 12.29         | 16.9 | -        | 2.60  | 12.0+2                       | -1.71              | ×1.48          | -                   | -                                           | default        |
|            | 2462  | 1         | 12            | 100        | 0.00        | ×1.00              | 12.34         | 17.1 | 0.02     |       | 12.0+2                       | -1.66              | ×1.47          | Reduced             | Max.output ch.(11b)                         | default        |
| 11g        | 2412  | 6         | 12            | 100        | 0.00        | ×1.00              | 11.64         | 14.6 | -0.17    | 9.94  | 12.0+2                       | -2.36              | ×1.72          | -                   | -                                           | default        |
|            | 2437  | 6         | 12            | 100        | 0.00        | ×1.00              | 11.81         | 15.2 | Ref.g12  | 9.36  | 12.0+2                       | -2.19              | ×1.66          | -                   | Higher pwr-D/R..(11g)                       | default        |
|            | 2437  | 9         | 12            | 100        | 0.00        | ×1.00              | 11.79         | 15.1 | -        | 9.19  | 12.0+2                       | -2.21              | ×1.66          | -                   | -                                           | default        |
|            | 2437  | 12        | 12            | 100        | 0.00        | ×1.00              | 11.73         | 14.9 | -        | 9.44  | 12.0+2                       | -2.27              | ×1.69          | -                   | -                                           | default        |
|            | 2437  | 18        | 12            | 100        | 0.00        | ×1.00              | 11.79         | 15.1 | -        | 8.70  | 12.0+2                       | -2.21              | ×1.66          | -                   | -                                           | default        |
|            | 2437  | 24        | 12            | 100        | 0.00        | ×1.00              | 11.78         | 15.1 | -        | 9.92  | 12.0+2                       | -2.22              | ×1.67          | -                   | -                                           | default        |
|            | 2437  | 36        | 12            | 100        | 0.00        | ×1.00              | 11.65         | 14.6 | -        | 9.32  | 12.0+2                       | -2.35              | ×1.72          | -                   | -                                           | default        |
|            | 2437  | 48        | 12            | 100        | 0.00        | ×1.00              | 11.62         | 14.5 | -        | 10.45 | 12.0+2                       | -2.38              | ×1.73          | -                   | -                                           | default        |
|            | 2437  | 56        | 12            | 100        | 0.00        | ×1.00              | 11.63         | 14.6 | -        | 10.73 | 12.0+2                       | -2.37              | ×1.73          | -                   | -                                           | default        |
|            | 2462  | 6         | 12            | 100        | 0.00        | ×1.00              | 11.80         | 15.1 | -0.01    | 9.37  | 12.0+2                       | -2.20              | ×1.66          | -                   | -                                           | default        |
|            | 2412  | 6         | 13            | 100        | 0.00        | ×1.00              | 12.59         | 18.2 | -0.13    | 9.19  | 12.0+2                       | -1.41              | ×1.38          | Tested              | -                                           | tune-up        |
|            | 2437  | 6         | 13            | 100        | 0.00        | ×1.00              | 12.72         | 18.7 | Ref.g13  | 9.14  | 12.0+2                       | -1.28              | ×1.34          | Tested              | Higher pwr-ch.(11g)                         | tune-up        |
|            | 2462  | 6         | 13            | 100        | 0.00        | ×1.00              | 12.71         | 18.7 | -0.01    | 9.14  | 12.0+2                       | -1.29              | ×1.35          | Tested              | -                                           | tune-up        |
| 11n (20HT) | 2412  | MCS0      | 12            | 100        | 0.00        | ×1.00              | 11.60         | 14.5 | -0.24    | 9.27  | 12.0+2                       | -2.40              | ×1.74          | -                   | -                                           | default        |
|            | 2437  | MCS0      | 12            | 100        | 0.00        | ×1.00              | 11.84         | 15.3 | Ref.2n12 | 9.23  | 12.0+2                       | -2.16              | ×1.64          | -                   | Higher pwr-D/R..(n20)                       | default        |
|            | 2437  | MCS1      | 12            | 100        | 0.00        | ×1.00              | 11.79         | 15.1 | -        | 9.06  | 12.0+2                       | -2.21              | ×1.66          | -                   | -                                           | default        |
|            | 2437  | MCS2      | 12            | 100        | 0.00        | ×1.00              | 11.83         | 15.2 | -        | 9.97  | 12.0+2                       | -2.17              | ×1.65          | -                   | -                                           | default        |
|            | 2437  | MCS3      | 12            | 100        | 0.00        | ×1.00              | 11.79         | 15.1 | -        | 9.29  | 12.0+2                       | -2.21              | ×1.66          | -                   | -                                           | default        |
|            | 2437  | MCS4      | 12            | 100        | 0.00        | ×1.00              | 11.83         | 15.2 | -        | 9.03  | 12.0+2                       | -2.17              | ×1.65          | -                   | -                                           | default        |
|            | 2437  | MCS5      | 12            | 100        | 0.00        | ×1.00              | 11.59         | 14.4 | -        | 9.96  | 12.0+2                       | -2.41              | ×1.74          | -                   | -                                           | default        |
|            | 2437  | MCS6      | 12            | 100        | 0.00        | ×1.00              | 11.69         | 14.8 | -        | 10.76 | 12.0+2                       | -2.31              | ×1.70          | -                   | -                                           | default        |
|            | 2437  | MCS7      | 12            | 100        | 0.00        | ×1.00              | 11.68         | 14.7 | -        | 10.22 | 12.0+2                       | -2.32              | ×1.71          | -                   | -                                           | default        |
|            | 2462  | MCS0      | 12            | 100        | 0.00        | ×1.00              | 11.79         | 15.1 | -0.05    | 9.19  | 12.0+2                       | -2.21              | ×1.66          | -                   | -                                           | default        |
|            | 2412  | MCS0      | 13            | 100        | 0.00        | ×1.00              | 12.57         | 18.1 | -0.16    | 9.11  | 12.0+2                       | -1.43              | ×1.39          | Reduced             | -                                           | tune-up        |
|            | 2437  | MCS0      | 13            | 100        | 0.00        | ×1.00              | 12.73         | 18.7 | Ref.2n13 | 9.03  | 12.0+2                       | -1.27              | ×1.34          | Tested              | Max.output ch.(n20)                         | tune-up        |
|            | 2462  | MCS0      | 13            | 100        | 0.00        | ×1.00              | 12.73         | 18.7 | 0.00     | 9.03  | 12.0+2                       | -1.27              | ×1.34          | Reduced             | Max.output ch.(n20)                         | tune-up        |

\*.     : 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, pwr: power, Max.: Maximum, 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) =  $10 \times \log(100/(\text{duty cycle, \%}))$

Deviation from 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 [-] =  $100\% / (\text{duty cycle, \%})$

Tune-up factor: Power tune-up factor for obtained SAR value, Tune-up factor [-] =  $1 / (10^{(Deviation from max., dB / 10)})$

\*. Date measured: July 7, 2015 / Measured by: Hiroshi Naka / Place: preparation room of No. 7 shielded room. (25 deg.C. / 55 %RH)

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

### 6.2 Comparison of power of EMC sample

|            | Platform#      | Platform model No. | RF serial No. | Date power measured | Reference report#         | Tx mode | Data rate [Mbps] | Average power [dBm] (***) Highest |                 |        |        |
|------------|----------------|--------------------|---------------|---------------------|---------------------------|---------|------------------|-----------------------------------|-----------------|--------|--------|
|            |                |                    |               |                     |                           |         |                  | Max. [dBm]                        | Frequency [MHz] |        |        |
|            |                |                    |               |                     |                           |         |                  |                                   | 2412            | 2437   | 2462   |
| EMC (Ref.) | -              | -                  | F48139F1C455  | Aug. 19, 2014       | 10407961S-N               | 11b     | 5.5              | 14                                | 13.03           | 13.37* | 13.28  |
|            |                |                    |               |                     |                           | 11g     | 18               | 14                                | 12.05           | 12.40  | 12.71* |
|            |                |                    |               |                     |                           | n20     | MCS2             | 14                                | 12.43           | 12.53* | 12.48  |
| SAR test   | Digital camera | PC2270             | 60128BD5EFF4  | July 7, 2015        | 10847257S-A (This report) | 11b     | 1                | 14                                | 12.19           | 12.32* | 12.34  |
|            |                |                    |               |                     |                           | 11g     | 6                | 14                                | 12.59           | 12.72* | 12.71  |
|            |                |                    |               |                     |                           | n20     | MCS0             | 14                                | 12.57           | 12.73* | 12.73  |

## SECTION 7: SAR Measurement results

### 7.1 SAR test results

Measurement date: November 4, 2015

Measurement by: Hiroshi Naka

#### [Liquid measurement]

| Target Frequency [MHz] | Liquid type | Liquid parameters (*a) |          |         |                     |                    |          |        |                    | ASAR Coefficients(*c) |            | Date measured |               |                                  |
|------------------------|-------------|------------------------|----------|---------|---------------------|--------------------|----------|--------|--------------------|-----------------------|------------|---------------|---------------|----------------------------------|
|                        |             | Permittivity (εr) [-]  |          |         |                     | Conductivity [S/m] |          |        |                    | Temp. [deg.C.]        | Depth [mm] |               | ΔSAR (1g) [%] | Correction required?             |
|                        |             | Target                 | Measured |         | Limit (※)           | Target             | Measured |        | Limit (※)          |                       |            |               |               |                                  |
|                        |             |                        | Meas.    | Δεr [%] |                     |                    | Meas.    | Δσ [%] |                    |                       |            |               |               |                                  |
| 2412                   | Body        | 52.75                  | 50.71    | -3.9    | -5% ≤ εr-meas. ≤ 0% | 1.914              | 1.970    | +3.0   | 0% ≤ σ-meas. ≤ +5% | 21.9                  | 153        | +2.32         | not required. | November 4, 2015 before SAR test |
| 2437                   |             | 52.72                  | 50.58    | -4.1    |                     | 1.938              | 2.002    | +3.3   |                    |                       |            | +2.53         | not required. |                                  |
| 2462                   |             | 52.68                  | 50.42    | -4.3    |                     | 1.967              | 2.036    | +3.5   |                    |                       |            | +2.65         | not required. |                                  |

#### [Searching initial test position (OFDM)]

| Mode | Freq. [MHz] | Data rate   | EUT setup  |              |                       |          |         | Liq. temp. [deg.C.] | SAR [W/kg] (max.value of multi-peak) |                                     |                                 | Remarks                   |
|------|-------------|-------------|------------|--------------|-----------------------|----------|---------|---------------------|--------------------------------------|-------------------------------------|---------------------------------|---------------------------|
|      |             |             | Position   | LCD position | Antenna Distance [mm] | Gap [mm] | Bty. ID |                     | A/S max. (measured) (as pos.#1)      | A/S max. (interpolated) (as pos.#2) | Peak (extrapolated) (at pos.#2) |                           |
| 11g  | 2437        | 6Mbps /OFDM | Left       | close        | 4.05                  | 0        | #1      | 21.9~22.0           | 0.887                                | 0.947                               | 1.21                            | *. Initial test position. |
|      |             |             |            | op180        | 4.05                  | 0        | #1      |                     | 0.769                                | 0.793                               | 1.15                            | 2 <sup>nd</sup>           |
|      |             |             | Front-left | close        | 14.20                 | 0        | #1      |                     | 0.160                                | 0.219                               | 0.311                           | 3 <sup>rd</sup>           |
|      |             |             | Rear(LCD)  | close        | 11.78                 | 0        | #2      |                     | 0.00498                              | 0.00598                             | 0.00367                         | -(*.small enough)         |
|      |             |             |            | op180        | 11.78                 | 0        | #2      |                     | 0.00514                              | 0.0102                              | 0.00757                         | -(*.small enough)         |
|      |             |             | Bottom     | close        | 20.38                 | 0        | #2      |                     | 0.0473                               | 0.0531                              | 0.0588                          | -(*.small enough)         |
|      |             |             | Top-left   | close        | 38.98                 | 0        | #2      |                     | 0.0403                               | 0.0418                              | 0.0438                          | -(*.small enough)         |
|      |             |             |            | close        | 38.98                 | 0        | #2      |                     |                                      |                                     |                                 |                           |

#### [SAR measurement results]

| SAR measurement results                    |                              |                  |            |          |         |              |                  |                         |          |                | Reported SAR (1g) [W/kg]   |                       |             |                                 |            |                | Remarks |                    |
|--------------------------------------------|------------------------------|------------------|------------|----------|---------|--------------|------------------|-------------------------|----------|----------------|----------------------------|-----------------------|-------------|---------------------------------|------------|----------------|---------|--------------------|
| Mode                                       | Frequency [MHz]<br>(Channel) | Data rate [Mbps] | EUT setup  |          |         |              | Power drift [dB] | SAR (1g) [W/kg]         |          |                | SAR plot # in Appendix 2-2 | Duty cycle correction |             | Output average power correction |            |                |         | SAR Corrected (*d) |
|                                            |                              |                  | Position   | Gap [mm] | Bty. ID | LCD position |                  | Max.value of multi-peak |          |                |                            | Duty [%]              | Duty scaled | Meas. [dBm]                     | Max. [dBm] | Tune-up factor |         |                    |
|                                            |                              |                  |            |          |         |              |                  | Meas.                   | ASAR [%] | ASAR corrected |                            |                       |             |                                 |            |                |         |                    |
| Step 1: Worst SAR search of OFDM mode.     |                              |                  |            |          |         |              |                  |                         |          |                |                            |                       |             |                                 |            |                |         |                    |
| 11g                                        | 2437(6)                      | 6                | Left       | 0        | #1      | close        | 0.17             | 0.516                   | +2.53    | n/a (*c)       | Plot 1-1                   | 100                   | ×1.00       | 12.72                           | 14.0       | ×1.34          | 0.691   | Initial test pos.  |
|                                            |                              |                  | Left       | 0        | #1      | op180        | 0.09             | 0.500                   | +2.53    | n/a (*c)       | Plot 1-2                   | 100                   | ×1.00       | 12.72                           | 14.0       | ×1.34          | 0.670   | -                  |
|                                            |                              |                  | Front-left | 0        | #1      | close        | 0.08             | 0.131                   | +2.53    | n/a (*c)       | Plot 1-3                   | 100                   | ×1.00       | 12.72                           | 14.0       | ×1.34          | 0.176   | -                  |
| Step 2: Change operation mode (OFDM&DSSS). |                              |                  |            |          |         |              |                  |                         |          |                |                            |                       |             |                                 |            |                |         |                    |
| 11n (20HT)                                 | 2437(6)                      | MCS0             | Left       | 0        | #3      | close        | 0.11             | 0.504                   | +2.53    | n/a (*c)       | Plot 2-1                   | 100                   | ×1.00       | 12.73                           | 14.0       | ×1.34          | 0.675   | Initial test pos.  |
| 11b                                        | 2437(6)                      | 1                | Left       | 0        | #3      | close        | 0.08             | 0.434                   | +2.53    | n/a (*c)       | Plot 2-2                   | 100                   | ×1.00       | 12.32                           | 14.0       | ×1.47          | 0.638   | Initial test pos.  |
| Step 3: Change channels.                   |                              |                  |            |          |         |              |                  |                         |          |                |                            |                       |             |                                 |            |                |         |                    |
| 11g                                        | 2462(11)                     | 6                | Left       | 0        | #3      | close        | 0.12             | 0.515                   | +2.65    | n/a (*c)       | Plot 3-1                   | 100                   | ×1.00       | 12.71                           | 14.0       | ×1.35          | 0.695   | *. Highest.        |
|                                            | 2412(1)                      |                  |            |          | #3      | close        | 0.11             | 0.470                   | +2.32    | n/a (*c)       | Plot 3-2                   | 100                   | ×1.00       | 12.59                           | 14.0       | ×1.38          | 0.645   | -                  |

#### Notes:

- \*. Gap: It is the separation distance between the nearest position of platform outer surface and the bottom outer surface of phantom.
- Bty.: Battery; Max.: maximum; Meas.: Measured; n/a: not applied.
- \*. Battery ID No.#1, #2 and #3 were same model (Refer to Appendix 1); LCD position; The condition of "LCD position" is shown in Appendix 1 in this report.
- \*. During test, the EUT was operated with full charged battery and without all interface cables.
- \*. Calibration frequency of the SAR measurement probe (and used conversion factors)

| SAR test frequency   | Probe calibration frequency | Validity                               | Conversion factor | Uncertainty |
|----------------------|-----------------------------|----------------------------------------|-------------------|-------------|
| 2412, 2437, 2462 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 (v01r04), the dielectric parameters suggested for head and body tissue simulating liquid are given at 2000 and 2450MHz. Parameters for the frequencies 2000-2450MHz were obtained using linear interpolation. (Refer to appendix 3-4.)
- \*b. Refer to KDB865664 D01 (v01r04), 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. Calculating formula:  $\Delta \text{ASAR}(1\text{g}) = C_{\text{er}} \times \Delta \text{er} + C_{\text{σ}} \times \Delta \text{σ}$ ,  $C_{\text{er}} = 7.854\text{E-}4 \times \text{f}^2 + 9.402\text{E-}3 \times \text{f}^2 - 2.742\text{E-}2 \times \text{f} + 0.2026$ ,  $C_{\text{σ}} = 9.804\text{E-}3 \times \text{f}^3 - 8.661\text{E-}2 \times \text{f}^2 + 2.981\text{E-}2 \times \text{f} + 0.7829$   
 $\Delta \text{ASAR corrected SAR (1g) (W/kg)} = (\text{Meas. SAR(1g) (W/kg)}) \times (100 - (\Delta \text{ASAR}(\%) / 100)$   
 $\text{Reported SAR (1g) (W/kg)} = (\text{Measured SAR (1g) (W/kg)}) \times (\text{Duty scaled}) \times (\text{Tune-up factor})$   
Duty scaled = 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)

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**SECTION 7: SAR Measurement results (cont'd)**

(cont'd)

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**(Clause 5: SAR TEST PROCEDURE, in KDB248227 D01(v02r02))****5.1.1 Initial Test Position SAR Test Reduction Procedure**

- 1) When the reported SAR of the initial test position is  $\leq 0.4$  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  $\leq 0.8$  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  $\leq 1.2$  W/kg or all required channels are tested.

**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  $\leq 0.8$  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.

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**\*. SAR Measurement Variability**

In accordance with published RF Exposure KDB procedure 865664 D01 (v01r04) 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  $\geq 0.80$  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  $\geq 1.45$  W/kg ( $\sim 10\%$  from the 1-g SAR limit).
- 4) Perform a third repeated measurement only if the original, first or second repeated measurement is  $\geq 1.5$  W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is  $> 1.20$ .