SAR TEST REPORT

Test Report No. : 32DE0235-HO-F-R1

Applicant	:	**SAMSUNG ELECTRONICS CO., LTD.**
Type of Equipment	:	**GSM/GPRS 1900 Phone with 802.11abgn, BT3.0 (EDR)**
Model No.	:	**SHW-M410K**
FCC ID	:	**A3LSHWM410k**
Test regulation	:	**FCC47CFR 2.1093** **FCC OET Bulletin 65, Supplement C (Edition 01-01)**
Test Result	:	**Complied**

FCC Part 24E	Head	: 0.273W/kg
	Body(Hotspot)	: 0.531W/kg (10mm distance)
FCC Part15.247	Head	: 0.187W/kg
	Body(Hotspot)	: 0.052W/kg (10mm distance)
FCC Part15.407	Head	: 0.143W/kg
	Body-worn	: 0.032W/kg (15mm distance)

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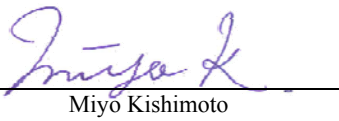
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
6 This report is a revised version of 32DE0235-O-F. 32DE0235-HO-F is replaced with this report.

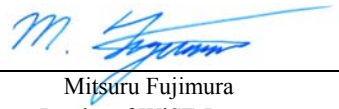
Date of test: November 22 to28, 2011

Representative test engineer:



Miyo Kishimoto
Engineer of WiSE Japan,
UL Verification Service

Approved by :



Mitsuru Fujimura
Leader of WiSE Japan
UL Verification Service

NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
*As for the range of Accreditation in NVLAP, you may refer to the WEB address, http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap

SECTION 1: Customer information

Company Name	SAMSUNG ELECTRONICS CO., LTD.
Address	416, MAETAN 3-DONG, YEONGTONG-GU SUWON-CITY, GYEONGGI-DO 443-742, SOUTH KOREA

SECTION 2: Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of EUT	GSM/GPRS 1900 Phone with 802.11abgn, BT3.0 (EDR)
Model No.	SHW-M410K
Serial No.	FI-294-C
Rating	DC3.7V
Receipt Date of Sample	November 21, 2011
Modification of EUT	No Modification by the test lab
Option Battery	N/A
Body-worn Accessory	Ear phone (typical)
Device category	Portable
Antenna to antenna separation distance	117mm from WWAN antenna to WLAN/BT antenna 0cm from WLAN antenna to Bluetooth antenna (shared with BT)
Simultaneous transmission	WWAN can transmit simultaneously with WLAN(2.4GHz) WWAN can transmit simultaneously with Bluetooth WWAN cannot transmit simultaneously with WLAN(5GHz) WLAN cannot transmit simultaneously with Bluetooth

2.2 Product description

Radio Specification

Bluetooth

Equipment Type	Transceiver
Frequency of Operation	2402-2480MHz
Type of Modulation	FHSS
Bandwidth & Channel spacing	1MHz & 1MHz
Antenna Gain	-11.5dBi

WLAN (IEEE802.11a/b/g/n-20)

Equipment Type	Transceiver	
Frequency of Operation	2412-2462MHz	5180-5240MHz 5260-5320MHz 5500-5640MHz 5745-5825MHz
Type of Modulation	DSSS, OFDM	OFDM
Bandwidth & Channel spacing	20MHz & 5MHz	20MHz & 20MHz
Antenna Gain	2.4G: -11.5dBi	5G: -11.5dBi

*EUT cannot operate in the frequency range from 5660 to 5700MHz

GSM

Equipment Type	Transceiver
Frequency of Operation	[Up Link] PCS: 1850 – 1910MHz [Down Link] PCS: 1930 – 1990MHz
Type of Modulation	GMSK
Antenna Gain	-3.93dBi
Power Class	Class 1 (Power control level:0)
Multislot class	Class 12
Dual Transfer Mode Class	Class B

[Additional model]

EUT (SHW-M410K) has a variant model: SHW-M410S

Difference between two models is only software version name to identify each model.

Basic		Additional	
Model	SHW-M410K	Model	SHW-M410S
HW version	REV 0.7	HW version	REV 0.7
SW version	M410K.002	SW version	M410S.000

SECTION 3 : Test standard information

3.1 Test Specification

Title : **Supplement C (Edition 01-01) to OET Bulletin 65 (Edition 97-01):**

Supplement C (Edition 01-01) - Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions
OET Bulletin 65 (Edition 97-01) - Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields

: **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 Supplement C

In additions;

KDB447498D01(v04):	Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies
KDB941225D01(v02):	SAR Measurement Procedures for 3G Devices
KDB941225D02(v02v01):	3GPP R6 HSPA and R7 HSPA+ SAR Guidance
KDB941225D03(v01):	Recommended SAR Test Reduction Procedures for GSM/GPRS/EDGE
KDB941225D04(v01):	Evaluating SAR for GSM/(E)GPRS Dual Transfer Mode
KDB94122506(v01):	SAR test procedures for devices incorporating SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities (Hot Spot SAR)
KDB248227(rev.1.2):	SAR Measurement Procedures for 802.11a//b/g Transmitters
KDB865664:	SAR Measurement Requirements for 3 to 6 GHz

Reference

[1]ANSI, ANSI/IEEE C95.1-1992: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz, The Institute of Electrical and Electronics Engineers, Inc., New York, NY 10017, 1992.
[2]SPEAG uncertainty document (AN 15-7/AN19-17) for DASY 5 System from SPEAG (Shimid & Partner Engineering AG).

3.2 Procedure

Transmitter	WWAN	WLAN	Bluetooth
Test Procedure	FCC OET BULLETIN 65, SUPPLEMENT C	FCC OET BULLETIN 65, SUPPLEMENT C	Exemption (Power < 12mW)
	SAR	SAR	
Category	FCC47CFR 2.1093	FCC47CFR 2.1093	FCC47CFR 2.1093
Note: UL Japan, Inc. 's SAR Work Procedures 13-EM-W0429 and 13-EM-W0430			

Bluetooth mode is excluded from SAR test since power was 1/2 *60/$f_{[GHz]}$[mW].

3.3 Exposure limit

(A) Limits for Occupational/Controlled Exposure (W/kg)

Spatial Average (averaged over the whole body)	Spatial Peak (averaged over any 1g of tissue)	Spatial Peak (hands/wrists/feet/ankles averaged over 10g)
0.4	8.0	20.0

(B) Limits for General population/Uncontrolled Exposure (W/kg)

Spatial Average (averaged over the whole body	Spatial Peak (averaged over any 1g of tissue)	Spatial Peak (hands/wrists/feet/ankles averaged over 10g)
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.

NOTE:GENERAL POPULATION/UNCONTROLLED EXPOSURE
SPATIAL PEAK(averaged over any 1g of tissue) LIMIT
1.6 W/kg

3.4 Test Location

*Shielded room for SAR testings
UL Japan, Inc. Head Office EMC Lab. *NVLAP Lab. code: 200572-0
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8116 Facsimile : +81 596 24 8124

SECTION 4 : Test result

4.1 Stand-alone SAR result

No.	Capable Tx configrations		Head SAR	Body-worn SAR	Body SAR (HotSpot)	Note
1	WWAN	GSM/GPRS 1900 MHz	Yes	Exemption*1	Yes	-
2	WLAN	WLAN 2.4G	Yes	Exemption*1	Yes	With VOIP
3		WLAN 5G	Yes	Yes	- *2	With VOIP
4	Bluetooth	Bluetooth BDR/EDR	Exemption*3			-

Note
*1 It is not necessary to test Body-worn SAR if the test separation distance(10mm) for hotspot mode is more conservative than Body-worn test(15mm),according to KDB 941225 D06 Hotspot SAR procedure.
*2 WLAN 5GHz has not a mobile hotspot function.
*3 Bluetooth power is 1/2 *60/$f_{[GHz]}$[mW].

Mode	1g Head SAR [W/kg]	1g Body-worn SAR [W/kg]	1g BodySAR [W/kg]
PCS1900	0.273	Exemption	0.531
WLAN 11b/g/n(2.4G)	0.187	Exemption	0.052
WLAN 11a/n(5G) 15.407	0.143	0.032	-
WLAN 11a/n(5G) 15.247	0.123	0.019	-
Bluetooth	Exemption		

4.2 Simultaneous transmission SAR result

<Simultaneous Procedure>
This EUT has the unlicensed transmitter such asWLAN (802.11a/b/g/n) & Bluetooth devices besides licensed transmitter WWAN (GSM), and the following simultaneous transmission is possible.

No.	Capable Tx configrations		Head SAR	Body SAR (HotSpot)	Note
5	WWAN+WLAN	GSM + WLAN2.4G	Yes	-	-
6		GPRS + WLAN2.4G	Yes	Yes	-
7		GSM + WLAN5G	Not supported by soft wear		
8		GPRS + WLAN 5G			
9	WWAN+Bluetooth		Exemption		
10	WLAN+Bluetooth				

<WWAN + WLAN >
Simultaneous transmitter evaluation based on the KDB648474. Refer to the Section 8.

Step1.	WWAN antenna is >5cm from Wireless LAN antenna
Step2.	WLAN power > 2Pref (=60/$f_{[GHz]}$).
Step3.	Stand-alone SAR for WLAN
Step4.	Simultaneous transmission is possible (WWAN + WLAN)
Step5.	∑1g SAR (WWAN + WLAN) < 1.6W/kg Head: 0.460W/kg Body:0.564W/kg
Step6.	No simultaneous transmission.

<WWAN + Bluetooth >
Simultaneous transmitter evaluation based on the KDB648474.

Step1.	WWAN antenna is >5cm from Bluetooth antenna
Step2.	Bluetooth power < Pref (=1/2 *60/$f_{[GHz]}$). Refer to the FCC 15.247 test report
Step3.	No stand-alone SAR for Bluetooth
Step4.	No simultaneous transmission SAR

<WLAN + Bluetooth >
Simultaneous transmitter evaluation based on the KDB648474.

Step1.	WLAN antenna is >5cm from Bluetooth antenna
Step2.	Bluetooth power < Pref (=1/2 *60/$f_{[GHz]}$). Refer to the FCC 15.247 test report
Step3.	No stand-alone SAR for Bluetooth
Step4.	No simultaneous transmission SAR

SECTION 5 : Description of the operating mode

5.1 SAR testing operating modes

The operating mode for SAR testing was decided by the output power

5.2 Output power operating modes

Band	Duty cycle or Multislot class(GSM)	Test Frequency	Mode
PCS1900	Multislot class 12	1850.2MHz(512ch) 1880.0MHz(661ch) 1909.8MHz(810ch)	GSM GPRS (CS-1)
WWAN			
The communication link was set up with the Wireless Communications Test Set (Agilent). The EUT was command to operate at maximum transmit power. PCS1900 :PCL 0 (GPRS class)			

Mode	Duty cycle	Frequency Band	Test Frequency	Modulation
IEEE802.11b	100%	2412-2462MHz	2412MHz (1ch) 2437MHz(6ch) 2462MHz(11ch)	DSSS (DBPSK.DQPSK.CCK)
IEEE802.11g	100%	2412-2462MHz	2412MHz (1ch) 2437MHz(6ch) 2462MHz(11ch)	OFDM (BPSK.QPSK.16QAM,64QAM)
IEEE802.11n20 (2.4G)	100%	2412-2462MHz	2412MHz (1ch) 2437MHz(6ch) 2462MHz(11ch)	
IEEE802.11a	100%	5180-5320MHz	All channel	
	100%	5500-5640MHz	All channel	
	100%	5745-5825 MHz	All channel	
IEEE802.11n20 (5G)	100%	5180-5320MHz	All channel	
	100%	5500-5640MHz	All channel	
	100%	5745-5825 MHz	All channel	
WLAN				
*Power of the EUT was set by the software as follows; Power setting: 11b 18dBm, 11g 17dBm, 11n(2.4G) 15dBm 11a 12dBm, 11n(5G) 11dBm Software/version: M410K.002 *This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.				

5.3 WWAN Output power measurement results

[GSM]
*Connection Type > AUTO
*Power control leve >0(PCS1900)

[GPRS]
*Connection Type > Type B
*Power control level > 0(PCS1900)
*Coding Scheme > CS-1

SAR measurement for GSM

1) PCS1900

1.The GPRS 2up mode was maximum time-based average power. The other slots SAR is not required for other mode because the maximum average output power for other mode is less than 1/4dB higher than that measured GPRS 2up mode.

PCS1900 SAR Power

Mode		CF (Crest Factor)	Ch	Frequency [MHz]	Time-based AVG				Slotted-AVG		
					Reading [dBm] Time-AVG	Atten. [dB]	Cable Loss [dB]	Result [dBm] Time-AVG	Reading [dBm] slotted AVG	Atten. +Cable Loss [dB]	Result [dBm] Slotted AVG
GSM	1slot	8.3	512	1850.2	6.11	9.99	3.63	19.73	15.34	13.62	28.96
			661	1880.0	6.05	9.99	3.62	19.66	15.31	13.61	28.92
			810	1909.8	6.21	9.99	3.62	19.82	15.35	13.61	28.96
GPRS (CS1)	1slot	8.3	512	1850.2	5.87	9.99	3.63	19.49	15.33	13.62	28.95
			661	1880.0	5.77	9.99	3.62	19.38	15.30	13.61	28.91
			810	1909.8	5.73	9.99	3.62	19.34	15.35	13.61	28.96
	2slots	4.2	512	1850.2	8.07	9.99	3.63	21.69	14.37	13.62	27.99
			661	1880.0	7.98	9.99	3.62	21.59	14.41	13.61	28.02
			810	1909.8	7.85	9.99	3.62	21.46	14.44	13.61	28.05
	3slots	2.8	512	1850.2	7.41	9.99	3.63	21.03	12.15	13.62	25.77
			661	1880.0	7.42	9.99	3.62	21.03	12.12	13.61	25.73
			810	1909.8	7.40	9.99	3.62	21.01	12.14	13.61	25.75
	4slots	2.1	512	1850.2	7.40	9.99	3.63	21.02	10.71	13.62	24.33
			661	1880.0	7.57	9.99	3.62	21.18	10.94	13.61	24.55
			810	1909.8	7.52	9.99	3.62	21.13	11.00	13.61	24.61

Time based AVG Results = P/M Reading + Atten.Loss + Cable Loss
Slotted AVG Results = Agilent Reading + Cable Loss
:Maximum time based AVG power mode

5.4 WLAN Output power measurement results

Decision of SAR test channel

The operating mode for SAR testing was decided by the output power
The average output power for 802.11a was measured on all channels in each frequency band.

Mode		GHz	Channel	"Default Test Channel"			
				FCC 15.247		UNII	
				802.11b	802.11g		
802.11 b/g/n20		2.412	1	√	Δ		
		2.437	6	√	Δ		
		2.462	11	√	Δ		
802.11a/n20	UNII	5.18	36			√	
		5.20	40				*
		5.22	44				*
		5.24	48			√	
		5.26	52			√	
		5.28	56				*
		5.30	60				*
		5.32	64			√	
		5.50	100				*
		5.52	104			√	
		5.54	108				*
		5.56	112				*
		5.58	116			√	
		5.60	120				*
		5.62	124			√	
		5.64	128				*
	Operation is impossible.	5.66	132				*
		5.68	136			√	
		5.70	140				*
	UNII or FCC 15.247	5.745	149	√		√	
		5.765	153		*		*
		5.785	157	√			*
		5.805	161		*	√	
	FCC 15.247	5.825	165	√			

√ = "default test channels"
* = Possible 802.11a channels with maximum average output > the "default test channels"
Δ = Possible 802.11g channels with maximum average output ¼ dB ≥ the "default test channels"

1) WLAN (11b/g/n(2.4G))
Test mode : 11b 1Mbps
Channel : 11ch
Crest factor : 1

Note:
1.The 11b mode was maximum average power. The 11g/n SAR is not required for other mode because the maximum average output power for other mode is less than 1/4dB higher than that measured 11b mode.
2.The other channels are measured if the SAR result at max. AVG power channel will be above 0.8W/kg

[IEEE802.11b] Rate Check

Rate	Freq.	P/M Reading [dBm]		Cable Loss	Atten.	Result [dBm]		Result [mW]	
[Mbps]	[MHz]	PK	AVG	[dB]	[dB]	PK	AVG	PK	AVG
1.0	2437	6.89	4.11	1.34	9.99	18.22	15.44	66.37	34.99
2.0	2437	6.86	4.08	1.34	9.99	18.19	15.41	65.92	34.75
5.5	2437	6.77	4.09	1.34	9.99	18.10	15.42	64.57	34.83
11.0	2437	6.67	3.73	1.34	9.99	18.00	15.06	63.10	32.06

IEEE802.11b 1Mbps

Ch	Frequency	P/M Reading [dBm]		Cable Loss	Atten.	Result [dBm]		Result [mW]	
	[MHz]	PK	AVG	[dB]	[dB]	PK	AVG	PK	AVG
1	2412	6.70	4.04	1.34	9.99	18.03	15.37	63.53	34.43
6	2437	6.89	4.11	1.34	9.99	18.22	15.44	66.37	34.99
11	2462	6.89	4.18	1.34	9.99	18.22	15.51	66.37	35.56

:Worst datarate for 11bmode
:SAR testing channel

[IEEE802.11g] Rate Check

Rate	Frequency	P/M Reading [dBm]		Cable Loss	Atten.	Result [dBm]		Result [mW]	
[Mbps]	[MHz]	PK	AVG	[dB]	[dB]	PK	AVG	PK	AVG
6.0	2437	11.77	2.64	1.34	9.99	23.10	13.97	204.17	24.95
9.0	2437	11.25	2.61	1.34	9.99	22.58	13.94	181.13	24.77
12.0	2437	10.95	2.60	1.34	9.99	22.28	13.93	169.04	24.72
18.0	2437	10.85	2.62	1.34	9.99	22.18	13.95	165.20	24.83
24.0	2437	10.74	2.59	1.34	9.99	22.07	13.92	161.06	24.66
36.0	2437	11.41	2.61	1.34	9.99	22.74	13.94	187.93	24.77
48.0	2437	11.05	2.43	1.34	9.99	22.38	13.76	172.98	23.77
54.0	2437	11.03	2.34	1.34	9.99	22.36	13.67	172.19	23.28

IEEE802.11g 6Mbps

Ch	Frequency	P/M Reading [dBm]		Cable Loss	Atten.	Result [dBm]		Result [mW]	
	[MHz]	PK	AVG	[dB]	[dB]	PK	AVG	PK	AVG
1	2412	11.37	2.80	1.34	9.99	22.70	14.13	186.21	25.88
6	2437	11.77	2.64	1.34	9.99	23.10	13.97	204.17	24.95
11	2462	12.03	2.94	1.34	9.99	23.36	14.27	216.77	26.73

[IEEE802.11n20] Rate Check

Rate	Frequency	P/M Reading [dBm]		Cable Loss	Atten.	Result [dBm]		Result [mW]	
	[MHz]	PK	AVG	[dB]	[dB]	PK	AVG	PK	AVG
MCS0	2437	10.54	0.98	1.34	9.99	21.87	12.31	153.82	17.02
MCS1	2437	10.11	0.62	1.34	9.99	21.44	11.95	139.32	15.67
MCS2	2437	10.23	0.58	1.34	9.99	21.56	11.91	143.22	15.52
MCS3	2437	10.26	0.64	1.34	9.99	21.59	11.97	144.21	15.74
MCS4	2437	10.05	0.47	1.34	9.99	21.38	11.80	137.40	15.14
MCS5	2437	10.16	0.36	1.34	9.99	21.49	11.69	140.93	14.76
MCS6	2437	10.02	0.37	1.34	9.99	21.35	11.70	136.46	14.79
MCS7	2437	10.08	0.21	1.34	9.99	21.41	11.54	138.36	14.26

IEEE802.11n20 MCS0

Ch	Frequency	P/M Reading [dBm]		Cable Loss	Atten.	Result [dBm]		Result [mW]	
	[MHz]	PK	AVG	[dB]	[dB]	PK	AVG	PK	AVG
1	2412	10.19	0.94	1.34	9.99	21.52	12.27	141.91	16.87
6	2437	10.54	0.98	1.34	9.99	21.87	12.31	153.82	17.02
11	2462	10.88	0.99	1.34	9.99	22.21	12.32	166.34	17.06

:Worst datarate for 11n mode

Sample Calculation:

Result = Reading + Cable Loss + Attenuator

2) WLAN (11a/n(5180-5240MHz))
Test mode : 11a 6Mbps
Channel : 5240MHz,5260MHz
Crest factor : 1

Note:
1.The 11a mode was maximum average power. The 11n SAR is not required for other mode because the maximum average output power for other mode is less than 1/4dB higher than that measured 11a mode.
2.The other channels are measured if the SAR result at max. AVG power channel will be above 0.8W/kg

Rate [Mbps]	Freq. [MHz]	P/M Reading [dBm] AVG	Cable Loss [dB]	Atten. [dB]	Result [dBm] AVG	Result [mW] AVG
6.0	5240	0.66	1.86	10.03	12.55	17.99
9.0	5240	0.47	1.86	10.03	12.36	17.22
12.0	5240	0.52	1.86	10.03	12.41	17.42
18.0	5240	0.45	1.86	10.03	12.34	17.14
24.0	5240	0.43	1.86	10.03	12.32	17.06
36.0	5240	0.41	1.86	10.03	12.30	16.98
48.0	5240	0.33	1.86	10.03	12.22	16.67
54.0	5240	0.29	1.86	10.03	12.18	16.52

[IEEE802.11a 5180-5240MHz band] 6Mbps

Ch	Freq. [MHz]	P/M Reading [dBm] AVG	Cable Loss [dB]	Atten. [dB]	Result [dBm] AVG	Result [mW] AVG
36	5180	0.52	1.85	10.03	12.40	17.38
40	5200	0.56	1.85	10.03	12.44	17.54
44	5220	0.59	1.86	10.03	12.48	17.70
48	5240	0.66	1.86	10.03	12.55	17.99

Sample Calculation: Result = Reading + Cable Loss + Attenuator
: Worst data rate
: SAR testing channel

[IEEE802.11a 5260-5320MHz band] Rate Check

Rate	Freq.	P/M Reading [dBm]	Cable Loss	Atten.	Result	
					[dBm]	[mW]
[Mbps]	[MHz]	AVG	[dB]	[dB]	AVG	AVG
6.0	5260	0.66	1.87	10.03	12.56	18.03
9.0	5260	0.61	1.87	10.03	12.51	17.82
12.0	5260	0.31	1.87	10.03	12.21	16.63
18.0	5260	0.30	1.87	10.03	12.20	16.60
24.0	5260	0.28	1.87	10.03	12.18	16.52
36.0	5260	0.20	1.87	10.03	12.10	16.22
48.0	5260	0.13	1.87	10.03	12.03	15.96
54.0	5260	0.90	1.87	10.03	12.80	19.05

[IEEE802.11a 5260-5320MHz band] 6Mbps

Ch	Freq.	P/M Reading [dBm]	Cable Loss	Atten.	Result	
					[dBm]	[mW]
	[MHz]	AVG	[dB]	[dB]	AVG	AVG
52	5260	0.66	1.87	10.03	12.56	18.03
56	5280	0.51	1.87	10.03	12.41	17.42
60	5300	0.46	1.87	10.03	12.36	17.22
64	5320	0.44	1.88	10.03	12.35	17.18

Sample Calculation: Result = Reading + Cable Loss + Attenuator

: Worst data rate

: SAR testing channel

[IEEE802.11n-20 5180-5240MHz band] Rate Check

Rate [Mbps]	Freq. [MHz]	P/M Reading [dBm] AVG	Cable Loss [dB]	Atten. [dB]	Result [dBm] AVG	Result [mW] AVG
MCS0	5240	-0.59	1.86	10.03	11.30	13.49
MCS1	5240	-0.72	1.86	10.03	11.17	13.09
MCS2	5240	-0.73	1.86	10.03	11.16	13.06
MCS3	5240	-0.85	1.86	10.03	11.04	12.71
MCS4	5240	-0.83	1.86	10.03	11.06	12.76
MCS5	5240	-1.09	1.86	10.03	10.80	12.02
MCS6	5240	-1.06	1.86	10.03	10.83	12.11
MCS7	5240	-1.10	1.86	10.03	10.79	11.99

: Worst data rate

[IEEE802.11n-20 5180-5240MHz band] MCS0

Ch	Freq. [MHz]	P/M Reading [dBm] AVG	Cable Loss [dB]	Atten. [dB]	Result [dBm] AVG	Result [mW] AVG
36	5180	-0.71	1.85	10.03	11.17	13.09
40	5200	-0.77	1.85	10.03	11.11	12.91
44	5220	-0.66	1.86	10.03	11.23	13.27
48	5240	-0.59	1.86	10.03	11.30	13.49

[IEEE802.11n-20 5260-5320MHz band] Rate Check

Rate [Mbps]	Freq. [MHz]	P/M Reading [dBm] AVG	Cable Loss [dB]	Atten. [dB]	Result [dBm] AVG	Result [mW] AVG
MCS0	5260	-0.64	1.87	10.03	11.26	13.37
MCS1	5260	-0.78	1.87	10.03	11.12	12.94
MCS2	5260	-0.81	1.87	10.03	11.09	12.85
MCS3	5260	-0.90	1.87	10.03	11.00	12.59
MCS4	5260	-1.03	1.87	10.03	10.87	12.22
MCS5	5260	-1.08	1.87	10.03	10.82	12.08
MCS6	5260	-1.08	1.87	10.03	10.82	12.08
MCS7	5260	-1.09	1.87	10.03	10.81	12.05

: Worst data rate

[IEEE802.11n-20 5260-5320MHz band] MCS0

Ch	Freq. [MHz]	P/M Reading [dBm] AVG	Cable Loss [dB]	Atten. [dB]	Result [dBm] AVG	Result [mW] AVG
52	5260	-0.64	1.87	10.03	11.26	13.37
56	5280	-0.60	1.87	10.03	11.30	13.49
60	5300	-0.77	1.87	10.03	11.13	12.97
64	5320	-0.76	1.88	10.03	11.15	13.03

Sample Calculation: Result = Reading + Cable Loss + Attenuator

3) WLAN (11a/n(5500-5640MHz):
Test mode : 11a 6Mbps
Channel : 5560MHz
Crest factor : 1

Note:
1.The 11a mode was maximum average power. The 11n SAR is not required for other mode because the maximum average output power for other mode is less than 1/4dB higher than that measured 11a mode.
2.The other channels are measured if the SAR result at max. AVG power channel will be above 0.8W/kg

[IEEE802.11a 5500-5640MHz band] Rate Check

Rate [Mbps]	Freq. [MHz]	P/M Reading [dBm] AVG	Cable Loss [dB]	Atten. [dB]	Result [dBm] AVG	Result [mW] AVG
6.0	5580	0.37	1.93	10.03	12.33	17.10
9.0	5580	0.32	1.93	10.03	12.28	16.90
12.0	5580	0.27	1.93	10.03	12.23	16.71
18.0	5580	0.27	1.93	10.03	12.23	16.71
24.0	5580	0.19	1.93	10.03	12.15	16.41
36.0	5580	0.23	1.93	10.03	12.19	16.56
48.0	5580	0.17	1.93	10.03	12.13	16.33
54.0	5580	0.12	1.93	10.03	12.08	16.14

: Worst data rate

[IEEE802.11a 5500-5640MHz band] 6Mbps

Ch	Freq. [MHz]	P/M Reading [dBm] AVG	Cable Loss [dB]	Atten. [dB]	Result [dBm] AVG	Result [mW] AVG
100	5500	0.28	1.91	10.02	12.21	16.63
104	5520	0.34	1.92	10.02	12.28	16.90
108	5540	0.28	1.92	10.02	12.22	16.67
112	5560	0.42	1.92	10.03	12.37	17.26
116	5580	0.37	1.93	10.03	12.33	17.10
120	5600	0.24	1.93	10.03	12.20	16.60
124	5620	0.31	1.94	10.03	12.28	16.90
128	5640	0.39	1.94	10.03	12.36	17.22
132	5660	Operation is impossible.				
136	5680					
140	5700					

Sample Calculation: Result = Reading + Cable Loss + Attenuator

SAR testing channel

[IEEE802.11n-20 5500-5640MHz band] Rate Check

Rate [Mbps]	Freq. [MHz]	P/M Reading [dBm] AVG	Cable Loss [dB]	Atten. [dB]	Result [dBm] AVG	Result [mW] AVG
MCS0	5580	-0.85	1.93	10.03	11.11	12.91
MCS1	5580	-0.91	1.93	10.03	11.05	12.74
MCS2	5580	-0.90	1.93	10.03	11.06	12.76
MCS3	5580	-0.93	1.93	10.03	11.03	12.68
MCS4	5580	-1.03	1.93	10.03	10.93	12.39
MCS5	5580	-1.07	1.93	10.03	10.89	12.27
MCS6	5580	-1.12	1.93	10.03	10.84	12.13
MCS7	5580	-1.13	1.93	10.03	10.83	12.11

: Worst data rate

[IEEE802.11n-20 5500-5640MHz band] MCS0

Ch	Freq. [MHz]	P/M Reading [dBm] AVG	Cable Loss [dB]	Atten. [dB]	Result [dBm] AVG	Result [mW] AVG
100	5500	-0.82	1.91	10.02	11.11	12.91
104	5520	-0.84	1.92	10.02	11.10	12.88
108	5540	-0.82	1.92	10.02	11.12	12.94
112	5560	-0.87	1.92	10.03	11.08	12.82
116	5580	-0.85	1.93	10.03	11.11	12.91
120	5600	-0.81	1.93	10.03	11.15	13.03
124	5620	-0.76	1.94	10.03	11.21	13.21
128	5640	-0.77	1.94	10.03	11.20	13.18
132	5660	Operation is impossible.				
136	5680					
140	5700					

Sample Calculation: Result = Reading + Cable Loss + Attenuator

4) WLAN (11a/n(5745-5825MHz):
Test mode : 11a 6Mbps
Channel : 5825MHz
Crest factor : 1

Note:
1.The 11a mode was maximum average power. The 11n SAR is not required for other mode because the maximum average output power for other mode is less than 1/4dB higher than that measured 11a mode.
2.The other channels are measured if the SAR result at max. AVG power channel will be above 0.8W/kg

[IEEE802.11a 5745-5825MHz band] Rate Check

Rate	Freq.	P/M Reading [dBm]	Cable Loss	Atten.	Result	
					[dBm]	[mW]
[Mbps]	[MHz]	AVG	[dB]	[dB]	AVG	AVG
6.0	5785.0	0.21	1.97	10.04	12.22	16.67
9.0	5785.0	0.13	1.97	10.04	12.14	16.37
12.0	5785.0	0.07	1.97	10.04	12.08	16.14
18.0	5785.0	0.03	1.97	10.04	12.04	16.00
24.0	5785.0	0.04	1.97	10.04	12.05	16.03
36.0	5785.0	-0.01	1.97	10.04	12.00	15.85
48.0	5785.0	-0.10	1.97	10.04	11.91	15.52
54.0	5785.0	-0.13	1.97	10.04	11.88	15.42

[IEEE802.11a 5745-5825MHz band] 6Mbps

Ch	Freq.	P/M Reading [dBm]	Cable Loss	Atten.	Result	
					[dBm]	[mW]
	[MHz]	AVG	[dB]	[dB]	AVG	AVG
149	5745.0	0.16	1.96	10.03	12.15	16.41
153	5765.0	0.17	1.97	10.03	12.17	16.48
157	5785.0	0.21	1.97	10.04	12.22	16.67
161	5805.0	0.16	1.97	10.04	12.17	16.48
165	5825.0	0.27	1.98	10.04	12.29	16.94

Sample Calculation: Result = Reading + Cable Loss + Attenuator
: Worst data rate
: SAR testing channel

Rate [Mbps]	Freq. [MHz]	P/M Reading [dBm] AVG	Cable Loss [dB]	Atten. [dB]	Result [dBm] AVG	Result [mW] AVG
MCS0	5785.0	-0.97	1.97	10.04	11.04	12.71
MCS1	5785.0	-0.99	1.97	10.04	11.02	12.65
MCS2	5785.0	-1.12	1.97	10.04	10.89	12.27
MCS3	5785.0	-1.13	1.97	10.04	10.88	12.25
MCS4	5785.0	-1.15	1.97	10.04	10.86	12.19
MCS5	5785.0	-1.40	1.97	10.04	10.61	11.51
MCS6	5785.0	-1.37	1.97	10.04	10.64	11.59
MCS7	5785.0	-1.50	1.97	10.04	10.51	11.25

: Worst data rate

[IEEE802.11n-20 5745-5825MHz band] MCS0

Ch	Freq. [MHz]	P/M Reading [dBm] AVG	Cable Loss [dB]	Atten. [dB]	Result [dBm] AVG	Result [mW] AVG
149	5745.0	-1.09	1.96	10.03	10.90	12.30
153	5765.0	-0.92	1.97	10.03	11.08	12.82
157	5785.0	-0.97	1.97	10.04	11.04	12.71
161	5805.0	-1.10	1.97	10.04	10.91	12.33
165	5825.0	-1.02	1.98	10.04	11.00	12.59

Sample Calculation: Result = Reading + Cable Loss + Attenuator

5.5 Confirmation before SAR testing

Correlation of Output Power between EMC and SAR tests

It was checked that the antenna port power was correlated within 0~+5% (FCC requirements)
SAR power is equal to DATA of EMC test based on the following reason.

- EMC and SAR tests are performed with the same test sample such as serial number under the same condition.
- EMC and SAR tests are performed at the same laboratory.

5.6 Confirmation after SAR testing

It was checked that the power drift [W] is within +/-5%.The verification of power drift during the SAR test is that DASY5 system calculates the power drift by measureing the e-filed at the same location at beginning and the end of the scan measurement for each test position.

DASY5 system calucation Power drift value[dB] =20log(Ea)/(Eb)
Before SAR testing : Eb[V/m]
After SAR testing : Ea[V/m]

Limit of power drift[W] =+/-5%
X[dB]=10log[P]=10log(1.05/1)=10log(1.05)-10log(1)=0.212dB

from E-filed relations with power.
p=E^2/η=E^2/
Therefore, The correlation of power and the E-filed
XdB=10log(P)=10log(E)^2=20log(E)

Therefore,
The calculated power drift of DASY5 System must be the less than +/-0.212dB.

SECTION6 : Description of the Head/Body setup

6.1 Test position for Head setup

i)Procedure for SAR testing

The EUT was tested in accordance with FCC OET Bulletin 65 Supplement C: 2001-01 and IEEE 1528: 2003 for both the "Cheek/Touch" and "Ear/Tilt" positions at the left and right sides of the SAM phantom head region. The FCC KDB 648474 D01 was also incorporated.

ii)Test mode

PCS1900	**Voice mode (GSM)**
WLAN	**VOIP mode (11b)**

Note: WWAN(PCS1900) has not a VOIP function.

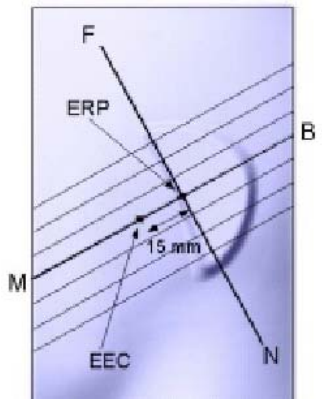
iii)Test position

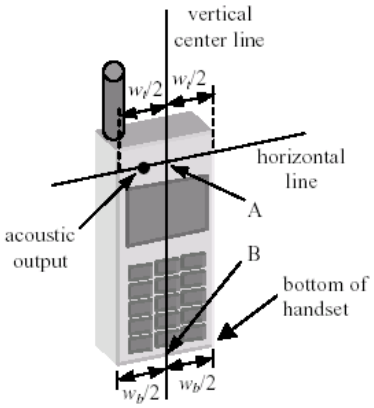
(1) Left cheek
(2) Left tilt
(3) Right cheek
(4) Right tilt

Initial ear position

A handset should be initially positioned with the earpiece region pressed against the ear spacer of a head phantom.

The device should be positioned parallel to the "N-F" line defined along the base of the ear spacer that contains the "ear reference point". The "test device reference point" is aligned to the "ear reference point" on the head phantom and the "vertical centerline" is aligned to the "phantom reference plane".





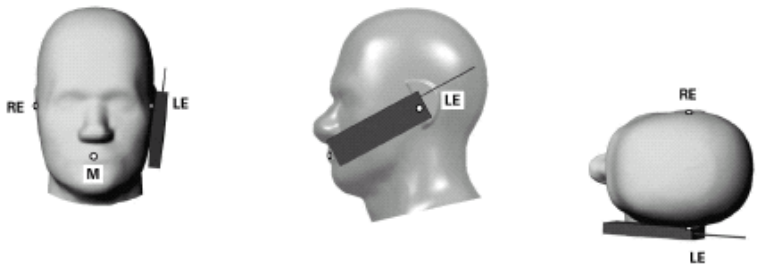
Cheek position

The device is brought toward the mouth of the head phantom by pivoting against the "ear reference point" or along the "N-F" line.

This test position is established:

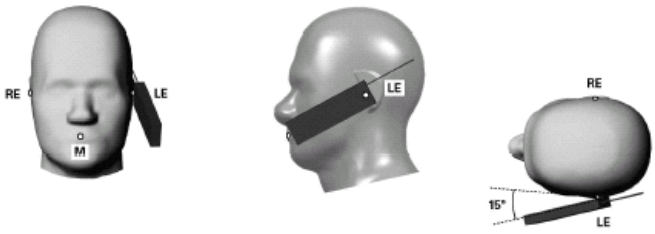
i) When any point on the display, keypad or mouthpiece portions of the handset is in contact with the phantom.

ii) (or) When any portion of a foldout, sliding or similar keypad cover opened to its intended self-adjusting normal use position is in contact with the cheek or mouth of the phantom.



Tilt position

If the earpiece of the handset is not in full contact with the phantom's ear spacer and the peak SAR location for the "Cheek/Touch" position is located at the ear spacer region or corresponds to the earpiece region of the handset, the device should be returned to the "initial ear position" by rotating it away from the mouth until the earpiece is in full contact with the ear spacer. Otherwise the handset should be moved away from the cheek perpendicular to the line passes through both "ear reference points" for approximate 2-3 cm. While it is in this position, the handset is tilted away from the mouth with respect to the "test device reference point" by 15°. After the tilt, it is then moved back toward the head perpendicular to the line passes through both "ear reference points" until the device touches the phantom or the ear spacer. If the antenna touches the head first, the positioning process should be repeated with a tilt angle less than 15° so that the device and its antenna would touch the phantom simultaneously.



<Antenna position>

The antennas use for WWAN and WLAN are both separate in a single fixed position. The antennas are integral part of the device.

6.2 Description of the Body setup (Hotspot mode) for 2.4GHz

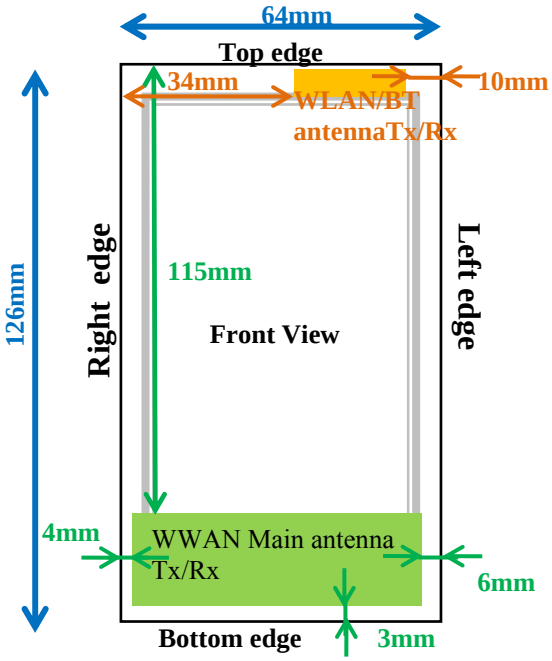
i)Procedure for SAR testing

-The tested distance were performed according to the KDB941225 D06 v01 (SAR Evaluation Procedures for portable Devices with Wireless Router Capabilities)
Device dimensions (HxWxD):126mm*64mm

ii)Test mode

PCS1900	**Mobile hotspot** **Data transmission mode (GPRS)**
WLAN 2.4GHz	**Mobile hotspot** **Data transmission mode (11b)**

Note: WLAN 5GHz has not a mobile hotspot function.



Position	WWAN	WLAN (2.4GHz)
Front	Tested	Tested
Rear	Tested	Tested
Left edge	Tested	Tested
Right edge	Tested	Not required
Top edge	Not required	Tested
Bottom edge	Tested	Not required

NOTE: Test position is required to the edge within 2.5cm from antenna according to the KDB 941225 D06.

(1) Front (10mm) :
The measurement separated 10mm distance between the front face of EUT and flat section of Phantom.
(2) Rear (10mm) :
The measurement separated 10mm distance between the rear face of EUT and flat section of Phantom.
(3) Left edge (10mm) :
The measurement separated 10mm distance between the left edge of EUT and flat section of Phantom.
(4) Right edge (10mm) :
The measurement separated 10mm distance between the right edge of EUT and flat section of Phantom.
(5) Top edge (10mm) :
The measurement separated 10mm distance between the top edge of EUT and flat section of Phantom.
(6) Bottom edge (10mm) :
The measurement separated 10mm distance between the bottom edge of EUT and flat section of Phantom.

<Antenna position>
The antennas use for WWAN and WLAN are both separate in a single fixed position. The antennas are integral part of the device.

6.3 Description of the Body-worn setup for 5GHz

i)Procedure for SAR testing
The EUT was tested in accordance with FCC OET Bulletin 65 Supplement C: 2001-01.Test performed at 15 mm from a flat section of the SAM phantom body region.

ii)Test mode

WLAN 5GHz	**VOIP mode (11a)**

According to KDB 941225 D06 Hotspot SAR procedure, test Body-worn for WWAN & WLAN2.4GHz not necessary since the test separation distance (10mm) for hotspot mode is more conservative than Body-worn test(15mm).

ii)Test position
(1) Rear (15mm) :
The measurement separated 15mm distance between the rear face of EUT and flat section of SAM Twin Phantom.
The tests were performed in the EUT with the earphone. (Refer to the Appendix1)

<Antenna position>
The antennas use for WWAN and WLAN are both separate in a single fixed position. The antennas are integral part of the device.

SECTION 7 : Test surrounding

7.1 Measurement uncertainty

<WWAN 300M-3GHz >

Error Description	Uncertainty value ± %	Probability distribution	divisor	(ci) 1g	Standard Uncertainty (1g)	vi or veff
Measurement System						
Probe calibration	±5.5	Normal	1	1	±5.5	∞
Axial isotropy of the probe	±4.7	Rectangular	√3	0.7	±1.9	∞
Spherical isotropy of the probe	±9.6	Rectangular	√3	0.7	±3.9	∞
Boundary effects	±1.0	Rectangular	√3	1	±0.6	∞
Probe linearity	±4.7	Rectangular	√3	1	±2.7	∞
Detection limit	±1.0	Rectangular	√3	1	±0.6	∞
Readout electronics	±0.3	Normal	1	1	±0.3	∞
Response time	±0.8	Rectangular	√3	1	±0.5	∞
Integration time	±2.6	Rectangular	√3	1	±1.5	∞
RF ambient Noise	±3.0	Rectangular	√3	1	±1.7	∞
RF ambient Reflections	±3.0	Rectangular	√3	1	±1.7	∞
Probe Positioner	±0.4	Rectangular	√3	1	±0.2	∞
Probe positioning	±2.9	Rectangular	√3	1	±1.7	∞
Max.SAR Eval.	±1.0	Rectangular	√3	1	±0.6	∞
Test Sample Related						
Device positioning	±2.9	Normal	1	1	±2.9	8
Device holder uncertainty	±3.6	Normal	1	1	±3.6	8
Power drift	±5.0	Rectangular	√3	1	±2.9	∞
Phantom and Setup						
Phantom uncertainty	±4.0	Rectangular	√3	1	±2.3	∞
Liquid conductivity (target)	±5.0	Rectangular	√3	0.64	±1.8	∞
Liquid conductivity (meas.)	+2.9	Rectangular	1	0.64	±1.9	∞
Liquid permittivity (target)	±5.0	Rectangular	√3	0.6	±1.7	∞
Liquid permittivity (meas.)	-3.2	Rectangular	1	0.6	±1.9	∞
Combined Standard Uncertainty					**±10.824**	
Expanded Uncertainty (k=2)					**±21.7**	

<WLAN 300M-3GHz>

Error Description	Uncertainty value ± %	Probability distribution	divisor	(ci) 1g	Standard Uncertainty (1g)	vi or veff
Measurement System						
Probe calibration	±5.5	Normal	1	1	±5.5	∞
Axial isotropy of the probe	±4.7	Rectangular	√3	0.7	±1.9	∞
Spherical isotropy of the probe	±9.6	Rectangular	√3	0.7	±3.9	∞
Boundary effects	±1.0	Rectangular	√3	1	±0.6	∞
Probe linearity	±4.7	Rectangular	√3	1	±2.7	∞
Detection limit	±1.0	Rectangular	√3	1	±0.6	∞
Readout electronics	±0.3	Normal	1	1	±0.3	∞
Response time	±0.8	Rectangular	√3	1	±0.5	∞
Integration time	±2.6	Rectangular	√3	1	±1.5	∞
RF ambient Noise	±3.0	Rectangular	√3	1	±1.7	∞
RF ambient Reflections	±3.0	Rectangular	√3	1	±1.7	∞
Probe Positioner	±0.4	Rectangular	√3	1	±0.2	∞
Probe positioning	±2.9	Rectangular	√3	1	±1.7	∞
Max.SAR Eval.	±1.0	Rectangular	√3	1	±0.6	∞
Test Sample Related						
Device positioning	±2.9	Normal	1	1	±2.9	7
Device holder uncertainty	±3.6	Normal	1	1	±3.6	7
Power drift	±5.0	Rectangular	√3	1	±2.9	∞
Phantom and Setup						
Phantom uncertainty	±4.0	Rectangular	√3	1	±2.3	∞
Liquid conductivity (target)	±5.0	Rectangular	√3	0.64	±1.8	∞
Liquid conductivity (meas.)	+4.6	Rectangular	1	0.64	±3.1	∞
Liquid permittivity (target)	±5.0	Rectangular	√3	0.6	±1.7	∞
Liquid permittivity (meas.)	-4.8	Rectangular	1	0.6	±2.9	∞
Combined Standard Uncertainty					**±11.312**	
Expanded Uncertainty (k=2)					**±22.6**	

<WLAN 3-6GHz>

Error Description	Uncertainty value ± %	Probability distribution	divisor	(ci) 1g	Standard Uncertainty (1g)	vi or veff
Measurement System						
Probe calibration	±6.55	Normal	1	1	±6.55	∞
Axial isotropy of the probe	±4.7	Rectangular	√3	0.7	±1.9	∞
Spherical isotropy of the probe	±9.6	Rectangular	√3	0.7	±3.9	∞
Boundary effects	±2.0	Rectangular	√3	1	±1.2	∞
Probe linearity	±4.7	Rectangular	√3	1	±2.7	∞
Detection limit	±1.0	Rectangular	√3	1	±0.6	∞
Readout electronics	±0.3	Normal	1	1	±0.3	∞
Response time	±0.8	Rectangular	√3	1	±0.5	∞
Integration time	±2.6	Rectangular	√3	1	±1.5	∞
RF ambient Noise	±3.0	Rectangular	√3	1	±1.7	∞
RF ambient Reflections	±3.0	Rectangular	√3	1	±1.7	∞
Probe Positioner	±0.8	Rectangular	√3	1	±0.5	∞
Probe positioning	±9.9	Rectangular	√3	1	±5.7	∞
Max.SAR Eval.	±4.0	Rectangular	√3	1	±2.3	∞
Test Sample Related						
Device positioning	±2.9	Normal	1	1	±2.9	16
Device holder uncertainty	±3.6	Normal	1	1	±3.6	4
Power drift	±5.0	Rectangular	√3	1	±2.9	∞
Phantom and Setup						
Phantom uncertainty	±4.0	Rectangular	√3	1	±2.3	∞
Liquid conductivity (target)	±5.0	Rectangular	√3	0.64	±1.8	∞
Liquid conductivity (meas.)	+4.7	Rectangular	1	0.64	±3.0	∞
Liquid permittivity (target)	±5.0	Rectangular	√3	0.6	±1.7	∞
Liquid permittivity (meas.)	-3.1	Rectangular	1	0.6	±1.9	∞
Combined Standard Uncertainty					**±13.078**	
Expanded Uncertainty (k=2)					**±26.2**	

SECTION 8 : Measurement results

8.1 PCS1900 MHz HEAD SAR

(1)Method of measurement

Step1. The searching for the worst position
The test was performed in middle channel.

Note:
1)The other channel was not required since middle channel SAR value is less than 0.8W/kg.

(2)Simulated Tissue Liquid Parameter confirmation

The dielectric parameters were checked prior to assessment using the HP85070D dielectric probe kit.
The dielectric parameters measurement is reported in each correspondent section.

DIELECTRIC PARAMETERS MEASUREMENT RESULTS										
Date	Ambient Temp. [deg.c]	Relative Humidity [%]	Liquid type	Liquid Temp. [deg.c]	Measured Frequency [MHz]	Parameters	Target Value*1	Measured	Deviation [%]	Limit [%]
22-Nov	24	35	HSL 1800	23.5	1880	εr	40.0	38.7	-3.2	+/-5
						σ [mho/m]	1.40	1.44	2.9	+/-5

εr: Relative Permittivity / σ : Coductivity
*1 The Target value is a parameter defined in FCC OET65.

(3)Result of HEAD SAR

HEAD SAR MEASUREMENT RESULTS							
Frequency		Modulation	Phantom Section	EUT Set-up Conditions			SAR(1g) [W/kg]
Channel	[MHz]			Antenna	Position	Separation [mm]	Maximum value of multi-peak
Step.1 Position searching							
661	1880.0	GSM	Left	Fixed	Cheek	0	**0.273**
661	1880.0	GSM	Left	Fixed	Tilt	0	**0.088**
661	1880.0	GSM	Right	Fixed	Cheek	0	**0.177**
661	1880.0	GSM	Right	Fixed	Tilt	0	**0.077**

8.2 PCS1900MHz Body SAR (Hotspot)

(1)Method of measurement

<Body (Hotspot mode)/Body-worn>

Step1. The searching for the worst position

The test was performed in mode of the maximum output power.

Note:

1)The power of other mode was lower than GPRS 2up mode.

2)The other channel was not required since middle channel SAR value is less than 0.8W/kg.

(2)Simulated Tissue Liquid Parameter confirmation

The dielectric parameters were checked prior to assessment using the HP85070D dielectric probe kit.

The dielectric parameters measurement is reported in each correspondent section.

DIELECTRIC PARAMETERS MEASUREMENT RESULTS										
Date	Ambient Temp. [deg.c]	Relative Humidity [%]	Liquid type	Liquid Temp. [deg.c]	Measured Frequency [MHz]	Parameters	Target Value*1	Measured	Deviation [%]	Limit [%]
28-Nov	24.0	40	MSL 1800	23.5	1880	εr	53.3	52.0	-2.4	+/-5
						σ [mho/m]	1.52	1.55	2.0	+/-5

εr: Relative Permittivity / σ : Coductivity

*1 The Target value is a parameter defined in FCC OET65.

(3)Result of Body / Body-worn SAR

BODY SAR MEASUREMENT RESULTS							
Frequency		Modulation	Phantom Section	EUT Set-up Conditions			SAR(1g) [W/kg]
Channel	[MHz]			Antenna	Position	Separation [mm]	Maximum value of multi-peak
Step.1 Position searching							
661	1880	GPRS 2slots	Flat	Fixed	Front	10	**0.401**
661	1880	GPRS 2slots	Flat	Fixed	Rear	10	**0.531**
661	1880	GPRS 2slots	Flat	Fixed	Left edge	10	**0.056**
661	1880	GPRS 2slots	Flat	Fixed	Right edge	10	**0.131**
661	1880	GPRS 2slots	Flat	Fixed	Bottom edge	10	**0.332**

8.3 WLAN 2.4G Head SAR

(1)Method of measurement

Step1. The searching for the worst position
The test was performed in middle channel.

Note:

1) The SAR is not required for 11g/n mode because the maximum average output power for 11g/n mode is less than 1/4dB higher than that measured 11b mode.
2) The other channel was not required since maximum average output power channel SAR value is less than 0.8W/kg.

(2)Simulated Tissue Liquid Parameter confirmation

The dielectric parameters were checked prior to assessment using the HP85070D dielectric probe kit.
The dielectric parameters measurement is reported in each correspondent section.

DIELECTRIC PARAMETERS MEASUREMENT RESULTS										
Date	Ambient Temp. [deg.c]	Relative Humidity [%]	Liquid type	Liquid Temp. [deg.c]	Measured Frequency [MHz]	Parameters	Target Value*1	Measured	Deviation [%]	Limit [%]
26-Nov	24	43	HSL 2450	23.8	2450	εr	39.2	37.3	-4.8	+/-5
						σ [mho/m]	1.80	1.86	3.3	+/-5

εr: Relative Permittivity / σ : Coductivity
*1 The Target value is a parameter defined in FCC OET65.

(3)Result of HEAD SAR

HEAD SAR MEASUREMENT RESULTS							
Frequency		Modulation	Phantom Section	EUT Set-up Conditions			SAR(1g) [W/kg]
Channel	[MHz]			Antenna	Position	Separation [mm]	Maximum value of multi-peak
Step.1 Position searching							
11	2462	11b 1Mbps	Left	Fixed	Cheek	0	**0.187**
11	2462	11b 1Mbps	Left	Fixed	Tilt	0	**0.144**
11	2462	11b 1Mbps	Right	Fixed	Cheek	0	**0.106**
11	2462	11b 1Mbps	Right	Fixed	Tilt	0	**0.105**

8.4 WLAN 2.4G Body SAR(Hotspot)

(1)Method of measurement

Step1. The searching for the worst position

The test was performed in mode of the maximum average output power

Note:

1)The BODY SAR is not required for 11b/n mode because the maximum average output power for 11b/n mode is less than 1/4dB higher than that measured 11g mode.

2)The other channel was not required since maximum average output power channel SAR value is less than 0.8W/kg.

(2)Simulated Tissue Liquid Parameter confirmation

The dielectric parameters were checked prior to assessment using the HP85070D dielectric probe kit.

The dielectric parameters measurement is reported in each correspondent section.

DIELECTRIC PARAMETERS MEASUREMENT RESULTS										
Date	Ambient Temp. [deg.c]	Relative Humidity [%]	Liquid type	Liquid Temp. [deg.c]	Measured Frequency [MHz]	Parameters	Target Value*1	Measured	Deviation [%]	Limit [%]
28-Nov	24	40	MSL 2450	23.5	2450	εr	52.7	50.5	-4.2	+/-5
						σ [mho/m]	1.95	2.04	4.6	+/-5

εr: Relative Permittivity / σ : Coductivity

*1 The Target value is a parameter defined in FCC OET65.

3)Result of Body SAR

BODY SAR MEASUREMENT RESULTS							
Frequency		Modulation	Phantom Section	EUT Set-up Conditions			SAR(1g) [W/kg]
Channel	[MHz]			Antenna	Position	Separation [mm]	Maximum value of multi-peak
Step.1 Position searching							
11	2462	11b 1Mbps	Flat	Fixed	Front	10	**0.046**
11	2462	11b 1Mbps	Flat	Fixed	Rear	10	**0.033**
11	2462	11b 1Mbps	Flat	Fixed	Left edge	10	**0.021**
11	2462	11b 1Mbps	Flat	Fixed	Top edge	10	**0.052**

8.5 WLAN 5G HEAD SAR

(1)Method of measurement

Step1. The searching for the worst position
The test was performed in middle channel.

Note:

1) The SAR is not required for 11n mode because the maximum average output power for 11n mode is less than 1/4dB higher than that measured 11a mode.
2) For 5180-5320MHz and 5500-5700MHz band, the other channel was not required since maximum average output power channel SAR value is less than 0.4W/kg.
3) For 5745-5825MHz band, the other channel was not required since maximum average output power channel SAR value is less than 0.8W/kg.

(2)Simulated Tissue Liquid Parameter confirmation

The dielectric parameters were checked prior to assessment using the HP85070D dielectric probe kit.
The dielectric parameters measurement is reported in each correspondent section.

DIELECTRIC PARAMETERS MEASUREMENT RESULTS

Date	Ambient Temp. [deg.c]	Relative Humidity [%]	Liquid type	Liquid Temp. [deg.c]	Measured Frequency [MHz]	Parameters	Target Value*1	Measured	Deviation [%]	Limit [%]
25-Nov	24.0	35	HSL 3-6GHz	23.5	5200	εr	36.0	35.2	-2.2	+/-5
						σ [mho/m]	4.66	4.77	2.4	+/-5
25-Nov	24.0	35	HSL 3-6GHz	23.5	5300	εr	35.9	35.1	-2.2	+/-5
						σ [mho/m]	4.76	4.88	2.5	+/-5
25-Nov	24.0	35	HSL 3-6GHz	23.5	5500	εr	35.6	34.7	-2.5	+/-5
						σ [mho/m]	4.96	5.10	2.8	+/-5
25-Nov	24.0	35	HSL 3-6GHz	23.5	5600	εr	35.5	34.5	-2.8	+/-5
						σ [mho/m]	5.07	5.22	3.0	+/-5
25-Nov	24.0	35	HSL 3-6GHz	23.5	5700	εr	35.4	34.4	-2.8	+/-5
						σ [mho/m]	5.17	5.33	3.1	+/-5
25-Nov	24.0	35	HSL 3-6GHz	23.5	5800	εr	35.3	34.2	-3.1	+/-5
						σ [mho/m]	5.27	5.44	3.2	+/-5

εr: Relative Permittivity / σ : Coductivity

*1 The Target value is a parameter defined in FCC OET65.

(3)Result of HEAD SAR

HEAD SAR MEASUREMENT RESULTS (5180-5320MHz)							
Frequency		Modulation	Phantom Section	EUT Set-up Conditions			SAR(1g) [W/kg]
Channel	[MHz]			Antenna	Position	Separation [mm]	Maximum value of multi-peak
Step.1 Position searching							
52	5260	11a 6Mbps	Left	Fixed	Cheek	0	**0.075**
52	5260	11a 6Mbps	Left	Fixed	Tilt	0	**0.086**
52	5260	11a 6Mbps	Right	Fixed	Cheek	0	**0.038**
52	5260	11a 6Mbps	Right	Fixed	Tilt	0	**0.054**
Reference data (5200MHz band)							
48	5240	11a 6Mbps	Left	Fixed	Tilt	0	**0.088**

HEAD SAR MEASUREMENT RESULTS (5500-5640MHz)							
Frequency		Modulation	Phantom Section	EUT Set-up Conditions			SAR(1g) [W/kg]
Channel	[MHz]			Antenna	Position	Separation [mm]	Maximum value of multi-peak
Step.1 Position searching							
112	5560	11a 6Mbps	Left	Fixed	Cheek	0	**0.138**
112	5560	11a 6Mbps	Left	Fixed	Tilt	0	**0.143**
112	5560	11a 6Mbps	Right	Fixed	Cheek	0	**0.051**
112	5560	11a 6Mbps	Right	Fixed	Tilt	0	**0.097**

HEAD SAR MEASUREMENT RESULTS (5745-5825MHz)							
Frequency		Modulation	Phantom Section	EUT Set-up Conditions			SAR(1g) [W/kg]
Channel	[MHz]			Antenna	Position	Separation [mm]	Maximum value of multi-peak
Step.1 Position searching							
165	5825	11a 6Mbps	Left	Fixed	Cheek	0	**0.114**
165	5825	11a 6Mbps	Left	Fixed	Tilt	0	**0.123**
165	5825	11a 6Mbps	Right	Fixed	Cheek	0	**0.058**
165	5825	11a 6Mbps	Right	Fixed	Tilt	0	**0.048**

8.6 WLAN 5GHz Body-worn SAR

(1)Method of measurement

Step1. The changing to channel

Note:
1)The Body-worn SAR is not required for 11n mode because the maximum average output power for 11n mode is less than 1/4dB higher than that measured 11a mode.
2)For 5180-5320MHz band & 5500-5700MHz band, the other channel was not required since maximum average output power channel SAR value is less than 0.4W/kg.
3) For 5745-5825MHz band, the other channel was not required since maximum average output power channel SAR value is less than 0.8W/kg.

(2)Simulated Tissue Liquid Parameter confirmation

The dielectric parameters were checked prior to assessment using the HP85070D dielectric probe kit.
The dielectric parameters measurement is reported in each correspondent section.

DIELECTRIC PARAMETERS MEASUREMENT RESULTS

Date	Ambient Temp. [deg.c]	Relative Humidity [%]	Liquid type	Liquid Temp. [deg.c]	Measured Frequency [MHz]	Parameters	Target Value*1	Measured	Deviation [%]	Limit [%]
25-Nov	24.5	35	MSL 3-6GHz	23.5	5200	εr	49.0	48.5	-1.0	+/-5
						σ [mho/m]	5.30	5.36	1.1	+/-5
25-Nov	24.5	35	MSL 3-6GHz	23.5	5300	εr	48.9	48.3	-1.2	+/-5
						σ [mho/m]	5.42	5.52	1.8	+/-5
25-Nov	24.5	35	MSL 3-6GHz	23.5	5500	εr	48.6	47.9	-1.4	+/-5
						σ [mho/m]	5.65	5.81	2.8	+/-5
25-Nov	24.5	35	MSL 3-6GHz	23.5	5600	εr	48.5	47.6	-1.9	+/-5
						σ [mho/m]	5.77	5.94	2.9	+/-5
25-Nov	24.5	35	MSL 3-6GHz	23.5	5700	εr	48.3	47.5	-1.7	+/-5
						σ [mho/m]	5.88	6.08	3.4	+/-5
25-Nov	24.5	35	MSL 3-6GHz	23.5	5800	εr	48.2	47.4	-1.7	+/-5
						σ [mho/m]	6.00	6.28	4.7	+/-5

εr: Relative Permittivity / σ : Coductivity
*1 The Target value is a parameter defined in FCC OET65.

3)Result of Body SAR

BODY SAR MEASUREMENT RESULTS(5180-5320MHz)							
Frequency		Modulation	Phantom Section	EUT Set-up Conditions			SAR(1g) [W/kg]
Channel	[MHz]			Antenna	Position	Separation [mm]	Maximum value of multi-peak
52	5260	11a 6Mbps	Flat	Fixed	Rear	15	**0.026**
Reference data (5200MHz band)							
48	5240	11a 6Mbps	Flat	Fixed	Rear	15	**0.028**

BODY SAR MEASUREMENT RESULTS(5500-5640MHz)							
Frequency		Modulation	Phantom Section	EUT Set-up Conditions			SAR(1g) [W/kg]
Channel	[MHz]			Antenna	Position	Separation [mm]	Maximum value of multi-peak
112	5560	11a 6Mbps	Flat	Fixed	Rear	15	**0.032**

BODY SAR MEASUREMENT RESULTS(5745-5825MHz)							
Frequency		Modulation	Phantom Section	EUT Set-up Conditions			SAR(1g) [W/kg]
Channel	[MHz]			Antenna	Position	Separation [mm]	Maximum value of multi-peak
165	5825	11a 6Mbps	Flat	Fixed	Rear	15	**0.019**

8.7 Simultaneous transmission evaluation for HEAD

This device cannot perform the simultaneous transmission for WLAN 5GHz.

Result of SUM ΣSAR1g

SUM ΣSAR1g (PCS1900 +WLAN(2.4G))				
Position	Separation [mm]	Stand alone worst SAR(1g) [W/kg]		SUM SAR(1g)[W/kg]
		PCS1900 Band	WLAN 2.4G	WWAN + WLAN(2.4G)
Left cheek	0	0.273	0.187	0.460

: Highest SUM ΣSAR1g Head simultaneous transmission

8.8 Simultaneous transmission evaluation for Body

This device cannot perform the simultaneous transmission for WLAN 5GHz.

Result of SUM ΣSAR1g

SUM ΣSAR1g (PCS1900+WLAN(2.4G))				
Position	Separation [mm]	Stand alone SAR(1g) [W/kg]		SUM SAR(1g)[W/kg]
		PCS1900 Band	WLAN 2.4G	WWAN + WLAN(2.4G)
Front	10	0.401	0.046	0.447
Rear	10	0.531	0.033	0.564
Left edge	10	0.056	0.021	0.077
Right edge	10	0.131	-*1	-
Top edge	10	-*1	0.052	-
Bottom edge	10	0.332	-*1	-

: Highest SUM ΣSAR1g Body simultaneous transmission

*1 This position is not required in WLAN SAR mode since distance from antenna is over 2.5cm.

SECTION 9 Test instruments

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MPM-08	Power Meter	Anritsu	ML2495A	6K00003338	Power measurement	2011/09/13 * 12
MPSE-11	Power sensor	Anritsu	MA2411B	011737	Power measurement	2011/09/13 * 12
MAT-22	Attenuator(10dB) 1-18GHz	Orient Microwave	BX10-0476-00	-	Power measurement	2011/03/14 * 12
MCC-137	Microwave cable	HUBER+SUHNER	SUCOFLEX 102	37954/2	Power measurement	2011/10/28 * 12
MOS-14	Thermo-Hygrometer	Custom	CTH-201	-	Power measurement	2011/02/23 * 12
MPM-08	Power Meter	Anritsu	ML2495A	6K00003338	Power measurement	2011/09/13 * 12
MPM-01	Power Meter	Agilent	E4417A	GB41290639	SAR	2011/02/01 * 12
MPSE-01	Power Sensor	Agilent	E9300B	US40010300	SAR	2011/01/28 * 12
MPSE-03	Power sensor	Agilent	E9327A	US40440576	SAR	2011/02/02 * 12
MAT-15	Attenuator(30dB)	Agilent	8498A	US40010300	SAR	2011/02/16 * 12
MSG-10	Signal Generator	Agilent	N5181A	MY47421098	SAR	2011/09/22 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	MY39500780	SAR	2011/03/10 * 12
MHDC-12	Dual Directional Coupler	Hewlett Packard	772D	2839A0016	SAR	Pre Check
MNA-01	Network Analyzer	Agilent/HP	E8358A	US41080381	SAR	2011/08/22 * 12
MDPK-01	Dielectric probe kit	Agilent	85070D	702	SAR	2010/10/25 * 36
MNCK-01	Type N Calibration Kit	Agilent	85032F	MY41495257	SAR	2011/08/12 * 12
MRENT-82	Dosimetric E-Field Probe	Schmid&Partner Engineering AG	EX3DV4	3540	SAR	2011/07/21* 12
MDAE-01	Data Acquisition Electronics	Schmid&Partner Engineering AG	DAE4	509	SAR	2011/07/20 * 12
COTS-MSAR-03	Dasy5	Schmid&Partner Engineering AG	DASY52.6.1.408	-	SAR	-
COTS-MSAR-02	S-Parameter Network Analyzer	Agilent	-	-	SAR	-
MDA-06	Dipole Antenna	Schmid&Partner Engineering AG	D1800V2	2d040	SAR	2010/12/09 * 12
MDA-07	Dipole Antenna	Schmid&Partner Engineering AG	D2450V2	713	SAR	2010/09/13 * 36
MDA-08	Dipole Antenna	Schmid&Partner Engineering AG	D5GHzV2	1020	SAR	2011/08/23 * 12
MPF-02	2mmOval Flat Phantom ERI 4.0	Schmid&Partner Engineering AG	QD VA 001B (ERI4.0)	1045	SAR	2011/04/01 * 12
MPSAM-02	SAM Phantom	Schmid&Partner Engineering AG	SAM Twin Phantom V4.0	1333	SAR	Pre Check
MDH-01	Device holder	Schmid&Partner Engineering AG	Mounting device for transmitter	-	SAR	Pre Check
MOS-26	Thermo-Hygrometer	CUSTOM	CTH-201	A08Q29	SAR	2011/05/26 * 12
MOS-10	Digtal thermometer	HANNA	Checktemp-2	MOS-10	SAR	2011/08/22 * 12
MBM-13	Barometer	Sunoh	SBR121	837	SAR	2011/03/14 * 36
HSL/MSL1800				Daily check Target value ± 5%		
HSL/MSL2450				Daily check Target value ± 5%		
HSL/MSL3-6G				Daily check Target value ± 5%		
SAR room				Daily check Ambient Noise<0.012W/kg		

The expiration date of the calibration is the end of the expired month.
As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.