SAR Test Report

FOR:

Manufacturer: Honeywell International Inc.
Model Name: 70eL00
FCC ID: HD570EL00
IC ID: 1693B-70E3

Test Report #: SAR_Honey-095-12001_eL00_FCC_IC

Date of Report: 2013-05-20

FCC Listed #:
A2LA Accredited

IC Recognized #
3462B-1

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1. Assessment

The following device was evaluated against the limits for general population uncontrolled exposure specified in FCC 2.1093 and RSS 102, Issue 4 according to measurement procedures specified in FCC OET Bulletin 65, Supplement C (Edition 01-01), additional FCC regulation as listed in chapter 5, and IEEE 1528:2003 and no deviations were ascertained during the course of the tests performed.

Company	Description	Model #
Honeywell International Inc.	Dolphin 70e Black Enterprise Digital Assistant (EDA)	eL00

Responsible for Testing Laboratory:

Date	Section	Name	Signature
2013-05-20	Compliance	Franz Engert (Compliance Manager)	Digitally signed by Franz Engert DN: cn=Franz Engert, c=US, o=CETECOM, ou=Complience, email=franz.engert@cetecom.com Date: 2013.05.21 15:09:16 -07'00'

Responsible for the Report:

Date	Section	Name	Signature
2013-05-20	Compliance	Zack Gray (Project Engineer)	2013.05.20 18:06:58 -07'00'

The test results of this test report relate exclusively to the test item specified in Section 3.
CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM Inc. USA.

2. Administrative Data

2.1. Identification of the Testing Laboratory Issuing the SAR Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Address:	411 Dixon Landing Road Milpitas, CA 95035 U.S.A.
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Test Lab Manager:	Sajay Jose
Responsible Project Leader:	Zack Gray

2.2. Identification of the Client

Applicant's Name:	Honeywell International Inc
Street Address:	700 Visions Drive
City/Zip Code	Skaneateles Falls, NY 13153
Country	USA
Contact Person:	Michael Robinson
Phone No.	315-554-6387
Fax:	315-554-6393
e-mail:	michael.robinson3@honeywell.com

2.3. Identification of the Manufacturer

Same as above client.

3. Equipment under Test (EUT)

3.1. General Specification of the Equipment under Test

Product Type:	Portable
Prototype/Production:	Pre-Production
RF Exposure Environment:	General / Uncontrolled
Dimensions:	w/ Extended Battery: 133mm x 73mm x 24mm w/ Standard Battery: 133mm x 73mm x 17mm
Exposure Conditions:	Held next to the ear Body-worn accessory
Marketing Name:	Dolphin 70e Black
Model No:	70EL00
FCC ID:	HD570EL00
IC ID:	1693B-70E3
Antenna Type:	WLAN/Bluetooth Antenna: Internal Gain: 0.7 dbi - 2.4GHz; 3.1 dbi - 5 GHz
Operating Voltage Range:	Vmin: 3.3V/ Vnom: 3.6V/ Vmax: 4.3V
Operating Temperature Range:	–30°C ~ +70°C
Supported Radios:	Bluetooth v2.1 + EDR 802.11 a/b/g/n, HT20 GPS receiver
Dates of Testing:	1/30/2013 – 4/18/2013

3.2. Technical Specification of Supported Radios

Technology	Duty Cycle	Type(s) of Modulation	Band	Transmit Frequency Range (MHz)	Measured Maximum Conducted Output Power (dBm)
Bluetooth	46%	GFSK, π/4 DQPSK, 8DPSK	N/A	2402 – 2480	1.5
802.11 b/g/n	100%	BPSK, QPSK, 16-QAM, 64-QAM	N/A	2412 – 2462	16.92
802.11 a/n	100%	BPSK, QPSK, 16-QAM, 64-QAM	Sub-Band 1	5180 – 5240	15.01
			Sub-Band 2	5260 – 5320	14.81
			Sub-Band 3	5500 – 5700	14.46
			Sub-Band 4	5745 – 5825	14.01

3.3. Identification of the Equipment Under Test (EUT)

EUT #	Serial Number	Model Number	HW Version	SW Version	Comments
1	12359J003B	eLGN	3	40.00	Radiated sample
2	12359J0003	eLGN	3	40.00	Radiated sample
3	12359J003C	eLGN	3	40.00	Radiated sample
4	12359J0015	eLGN	3	40.00	Conducted sample
5	12357J0010	eLG0	3	40.00	No NFC Radiated sample
6	12357J0014	eLG0	3	40.00	No NFC Radiated sample
7	12357J0009	eLG0	3	40.00	No NFC Radiated sample
8	12357J007D	eL00	3	40.00	WLAN only Radiated sample
9	12357J0081	eL00	3	40.00	WLAN only Radiated sample

3.4. Identification of Accessory equipment

AE #	Type	Manufacturer	Model	Comments
1	Holster	Honeywell International Inc.	6000-Holster	Provides approx. 10-15mm separation, Identified as Holster A in Test Results Will not be marketed with EUT, but tests using this accessory can be considered worst case.
2	Holster	Honeywell International Inc.	Holster-1	Provides approx. 20mm separation, identified as Holster #4 in Test Plots
3	6.179 Whr Lithium Ion Battery	Honeywell International Inc.	N/A	Standard Battery
4	12.358 Whr Lithium Ion Battery	Honeywell International Inc.	N/A	Extended Battery

3.5. Maximum SAR values

Band	Exposure Condition	Measured 1g SAR	Maximum Extrapolated 1g SAR[1]
WLAN	Head	0.095	0.174
	Body-worn Accessory	0.111	0.204

NOTES:

1. Measured 1g SAR extrapolated to manufacturer stated output power upper tolerance limit.

4. Subject of Investigation

The objective of the measurements done by CETECOM Inc. was the dosimetric assessment of the EUT described in section 3. The tests were performed in configurations for devices operated next to a person's body. The examinations were carried out with the dosimetric assessment system DASY52 described in Section 6.

4.1. The IEEE Standard C95.1 , FCC Exposure Criteria, and IC Exposure Criteria

The FCC limits are set by CFR 47 FCC rule parts 1.1307 and 2.1093. The IC limits are set by RSS 102, Issue 4. The limits are derived from the recommendations in IEEE C95.1-1999 (ANSI/IEEE C95.1-1999), "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz."

4.2. SAR Limit

In this report the comparison between the exposure limits and the SAR data is made using the spatial peak SAR.

Having in mind a worst case consideration, the SAR limit is valid for uncontrolled environment and portable transmitters. The SAR values have to be averaged over a mass of 1g (SAR_{1g}) and/or 10g (SAR_{10g}) with the shape of a cube.

Standard	Exposure Condition	Average SAR (W/kg)	Mass Average (g)
OET Bulletin 65C	Partial-Body	1.6	1
RSS 102, Issue 4	Localized Head and Trunk	1.6	1

5. Measurement Procedure

The Federal Communications Commission (FCC) requires routine dosimetric assessment of mobile telecom-communications devices, either by laboratory measurement techniques or by computational modeling, prior to equipment authorization or use. In 2001 the Commission's Office of Engineering and Technology has released Edition 01-01 of Supplement C to OET Bulletin 65. This revised edition, which replaces Edition 97-01, provides additional guidance and information for evaluating compliance of mobile and portable devices with FCC limits for human exposure to radiofrequency emissions. The following KDB Publications have also been used:

447498 D01 V05 – Mobile and portable device RF Exposure Procedures
648474 D04 v01 – SAR Handsets Multi Xmiter and Ant
865664 D01 v01 – SAR Measurement Requirements for 100 MHz to 6 GHz
248227 D01 V01R02 – SAR Measurement Procedures for 802.11 a/b/g Transmitters
865664 D02 v01 – SAR Reporting

The Industry Canada (IC) measurement procedure follows RSS-102, Issue 4, March 2010. IC follows many of the same procedures as the FCC regarding EUT specific technologies and form factors. The above FCC KDBs are applied to the IC SAR measurements.

5.1. General Requirements

SAR evaluation was performed in a laboratory with an environment which avoids influence on SAR measurements by ambient EM sources and any reflection from the environment itself. The ambient temperature was in the range of 20°C to 26°C and 30-70% humidity. Simulating liquid temperature did not deviate more than +/- 2°C throughout SAR evaluation.

5.2. Body-worn and Other Configurations

Phantom Requirements
For body-worn and other configurations a flat phantom shall be used which is comprised of material with electrical properties similar to the corresponding tissues.

Test Position
The body-worn configurations shall be tested with the supplied accessories (belt-clips, holsters, etc.) attached to the device in normal use configuration. Devices with a headset output shall be tested with a connected headset.

Test to be Performed
For purpose of determining test requirements, accessories may be divided into two categories: those that do not contain metallic components and those that do. For multiple accessories that do not contain metallic components, the device may be tested only with that accessory which provides the closest spacing to the body. For multiple accessories that contain metallic components, the device must be tested

with each accessory that contains a unique metallic component. If multiple accessories share an identical metallic component, only the accessory that provides the closest spacing to the body must be tested. If the manufacturer provides none body-worn accessories a separation distance of 1.5 cm between the back of the device and the flat phantom is recommended. Other separation distances may be used, but they shall not exceed 2.5 cm. In these cases, the device may use body-worn accessories that provide a separation distance greater than that tested for the device provided however that the accessory contains no metallic components.

For devices with retractable antenna the SAR test shall be performed with the antenna fully extended and fully retracted. Other factors that may affect the exposure shall also be tested. For example, optional antennas or optional battery packs which may significantly change the volume, lengths, flip open/closed, etc. of the device, or any other accessories which might have the potential to considerably increase the peak spatial-average SAR value.

5.3. Procedure for assessing the peak spatial-average SAR

Step 1: Power reference measurement:

Prior to the SAR test, a local SAR measurement should be taken at a user-selected spatial reference point to monitor power variations during testing.

Step 2: Area scan

The measurement procedures for evaluating SAR associated with wireless handsets typically start with a coarse measurement grid in order to determine the approximate location of the local peak SAR values. This is referred to as the "area scan" procedure. The SAR distribution is scanned along the inside surface of typically half of the head of the phantom but at least larger than the areas projected (normal to the phantom's surface) by the handset and antenna. An example grid is given in Figure 4. The distance between the measured points and phantom surface should be less than 8 mm, and should remain constant (variation less than ± 1 mm) during the entire scan in order to determine the locations of the local peak SAR with sufficient precision. The distance between the measurement points should enable the detection of the location of local maximum with an accuracy of better than half the linear dimension of the tissue cube after interpolation. The resolution can also be tested using the functions in Annex E (see E.5.2). The approximate locations of the peak SARs should be determined from area scan. Since a given amplitude local peak with steep gradients may produce lower spatial-average SAR than slightly lower amplitude peaks with less steep gradients, it is necessary to evaluate the other peaks as well. However, since the spatial gradients of local SAR peaks are a function of wavelength inside the tissue simulating liquid and incident magnetic field strength, it is not necessary to evaluate peaks that are less than –2dB of the local maximum. Two-dimensional spline algorithms [Press, et al, 1996], [Brishoual, 2001] are typically used to determine the peaks and gradients within the scanned area. If the peak is closer than one-half of the linear dimension of the 1 g or 10 g tissue cube to the scan border, the measurement area should be enlarged if possible, e.g., by tilting the probe or the phantom (see Figure 5).

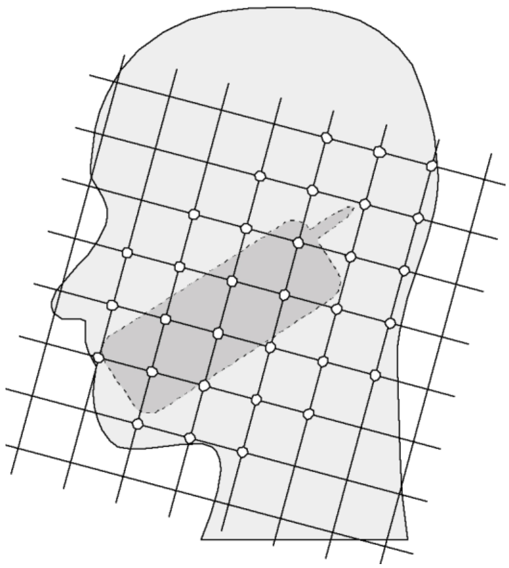

Figure 4 – Example of an area scan including the position of the handset. The scanned area (white dots) should be larger than the area projected by the handset and antenna.

Step 3: Zoom scan

In order to assess the peak spatial SAR values averaged over a 1 g and 10 g cube, fine resolution volume scans, called "zoom scans", are performed at the peak SAR locations determined during the “area scan.” The zoom scan volume should have at least 1.5 times the linear dimension of either a 1 g or a 10 g tissue cube for whichever peak spatial-average SAR is being evaluated. The peak local SAR locations that were determined in the area scan (interpolated value) should be on the centerline of the zoom scans. The centerline is the line that is normal to the surface and in the center of the volume scan. If this is not possible, the zoom scan can be shifted but not by more than half the dimension of the 1 g or a 10 g tissue cube.

The maximum spatial-average SAR is determined by a numerical analysis of the SAR values obtained in the volume of the zoom scan, whereby interpolation (between measured points) and extrapolation (between surface and closest measured points) routines should be applied. A 3-D-spline algorithm [Press, et al, 1996], [Kreyszig, 1983], [Brishoual, 2001] can be used for interpolation and a trapezoidal algorithm for the integration (averaging). Scan resolutions of larger than 2 mm can be used provided the uncertainty is evaluated according to E (see E.5).

In some areas of the phantom, such as the jaw and upper head region, the angle of the probe with respect to the line normal to the surface might become large, e.g., at angles larger than ± 30º (see Figure 5), which may increase the boundary effect to an unacceptable level. In these cases, a change in the orientation of the probe and/or the phantom is recommended during the zoom scan so that the angle between the probe housing tube and the line normal to the surface is significantly reduced (<30º).

Step 4: Power reference measurement

The local SAR should be measured at exactly the same location as in Step 1. The absolute value of the measurement drift (the difference between the SAR measured in Step 4 and Step 1) should be recorded in the uncertainty budget. It is recommended that the drift be kept within ± 5%. If this is not possible, even with repeat testing, additional information may be used to demonstrate the power stability during the test. Power reference measurements can be taken after each zoom scan, if more than one zoom scan is needed. However, the drift should always be referred to the initial state with fully charged battery.

5.4. Determination of the largest peak spatial-average SAR

In order to determine the largest value of the peak spatial-average SAR of a handset, all device positions, configurations and operational modes should be tested for each frequency band according to steps 1 to 3 below.

Step 1: The tests of 6.4 should be conducted at the channel that is closest to the center of the transmit frequency band (*fc*) for:

a) all device positions (cheek and tilt, for both left and right sides of the SAM phantom,

b) all configurations for each device position in (a), e.g. antenna extended and retracted, and

c) all operational modes for each device position in (a) and configuration in (b) in each frequency band, e.g. analog and digital.

If more than three frequencies need to be tested, (i.e., Nc > 3), then all frequencies, configurations and modes must be tested for all of the above positions.

Step 2: For the condition providing highest spatial peak SAR determined in Step 1 conduct all tests of 6.4 at all other test frequencies, e.g. lowest and highest frequencies. In addition, for all other conditions (device position, configuration and operational mode) where the spatial peak SAR value determined in Step 1 is within 3dB of the applicable SAR limit, it is recommended that all other test frequencies should be tested as well[1].

Step 3: Examine all data to determine the largest value of the peak spatial-average SAR found in Steps 1 to 2.

6. The Measurement System

6.1. Robot system specification

The SAR measurement system being used is the SPEAG DASY52 system, which consists of a Stäubli TX90XL 6-axis robot arm and CS8c controller, SPEAG SAR Probe, Data Acquisition Electronics, and SAM Twin Phantom. The robot is used to articulate the probe to programmed positions inside the phantom to obtain the SAR readings from the EUT.

The system is controlled remotely from a PC, which contains the software to control the robot and data acquisition equipment. The software also displays the data obtained from test scans.

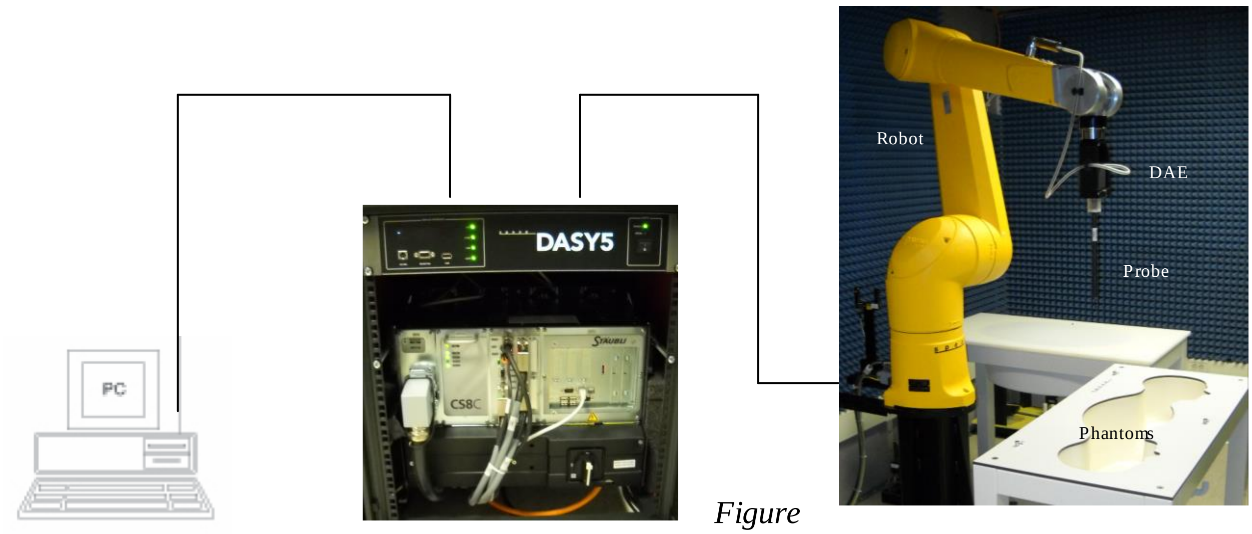

Figure 5: Schematic diagram of the SAR measurement system

In operation, the system first does an area (2D) scan at a fixed depth within the liquid from the inside wall of the phantom. When the maximum SAR point has been found, the system will then carry out a 3D scan centered at that point to determine volume averaged SAR level.

6.2. Isotropic E-Field Probe for Dosimetric Measurements

The probes are constructed using three orthogonal dipole sensors arranged on an interlocking, triangular prism core. The probes have built-in shielding against static charges and are contained within a PEEK cylindrical enclosure material at the tip. Probe calibration is described in the probe's calibration certificate.

6.3. Data Acquisition Electronics

The DAE contains a signal amplifier, multiplexer, 16bit A/D converter and control logic. It uses an optical link for communication with the DASY5 system. The DAE has a dynamic range of -100 to 300 mV. It also contains a two step probe touch detector for mechanical surface detection and emergency robot stop.

6.4. Phantoms

The Twin SAM V4.0 Phantom is designed to specifications defined in IEEE 1528, and IEC 62209-1. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region.

Additionally, the Oval Flat ELI V4.0 Phantom is designed to specification defined in IEEE 1528, and IEC 62209-2. It enables the dosimetric evaluation of body mounted usage.

6.5. Interpolation and Extrapolation schemes

The interpolation, extrapolation and maximum search routines are all based on the modifed Quadratic Shepard's method. The interpolation scheme combines a least-square fitted function method and a weighted average method which are the two basic types of computational interpolation and approximation. The routines construct a once-continuously differentiable function that interpolates the measurement values.

7. Uncertainty Assessment

Measurement uncertainty values were evaluated for SAR measurements performed by Cetecom Inc. The uncertainty values for components specified in *FCC Supplement C (01-01) to OET Bulletin 65 (97-01)* were evaluated according to the procedures of *IEEE 1528-200X December 29, 2002, NIST 1297 1994 edition and ISO Guide to the Expression of Uncertainty in Measurements (GUM)*.

7.1. Measurement Uncertainty Budget

a	*b*	*c*	*d*	*e = f(d,k)*	*f*	*g = c x f / e*	*k*
Uncertainty Component	**Sec.**	**Tol. (± %)**	**Prob. Dist.**	**Div.**	c_i **(1-g)**	**1-g** u_i **(±%)**	v_i
Measurement System							
Probe Calibration	E2.1	5.5	N	1	1	5.5	∞
Axial Isotropy	E2.2	4.7	R	√3	0.7	1.9	∞
Hemispherical Isotropy	E2.2	9.6	R	√3	0.7	3.9	∞
Boundary Effect	E2.3	1.0	R	√3	1	0.6	∞
Linearity	E2.4	4.7	R	√3	1	2.7	∞
System Detection Limits	E2.5	1.0	R	√3	1	0.6	∞
Readout Electronics	E2.6	0.3	N	1	1	0.3	∞
Response Time	E2.7	0.8	R	√3	1	0.5	∞
Integration Time	E2.8	2.6	R	√3	1	1.5	∞
RF Ambient Noise	E6.1	3.0	R	√3	1	1.7	∞
RF Ambient Reflections	E6.1	3.0	R	√3	1	1.7	∞
Probe Positioner Mechanical Tolerance	E6.2	0.4	R	√3	1	0.2	∞
Probe Positioning with respect to Phantom Shell	E6.3	2.9	R	√3	1	1.7	∞
Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	E5.2	1.0	R	√3	1	0.6	∞
Test sample Related							
Test Sample Positioning	E4.2	2.9	N	1	1	2.9	*145*
Device Holder Uncertainty	E4.1	3.6	N	1	1	3.6	*5*
Output Power Variation - SAR drift measurement	6.6.2	5.0	R	√3	1	2.9	∞
Phantom and Tissue Parameters							
Phantom Uncertainty (shape and thickness tolerances)	E3.1	4.0	R	√3	1	2.3	∞
Liquid Conductivity Target - tolerance	E3.2	5.0	R	√3	0.7	1.8	∞
Liquid Conductivity - measurement uncertainty	E3.3	2.5	N	1	0.7	1.6	∞
Liquid Permittivity Target tolerance	E3.2	5.0	R	√3	0.6	1.7	∞
Liquid Permittivity - measurement uncertainty	E3.3	2.5	N	1	0.6	1.5	∞
Combined Standard Uncertainty			RSS			**± 10.7%**	
Expanded Uncertainty (95% CONFIDENCE INTERVAL)			*k*= 2.00705			**± 21.4%**	

8. Test results summary

8.1. Conducted Average Output Power

Measurement uncertainty for conducted measurements is ±0.5dB

Bluetooth

Average power measured using an average power meter.

Channel	Frequency [MHz]	Average Power [dBm]		
		GFSK	π/4 DQPSK	8-DPSK
0	**2402**	1.1	-3.9	-3.9
39	**2441**	0.8	-4.2	-4.2
78	**2480**	1.5	-3.5	-3.5

WLAN 2.4 GHz

Average power measured using an average power meter.

Channel	Frequency [MHz]	Average Power [dBm]		
		802.11b, 1 Mbps	802.11g, 6 Mbps	802.11n, HT20, 6.5 Mbps
1	**2412**	16.59	14.95	14.86
6	**2437**	16.82	15.14	15.02
11	**2462**	16.92	15.32	15.22
Upper Tolerance [dBm]		19	18	18

WLAN UNII

Average power measured using an average power meter.

Channel	Frequency [MHz]	Average Power [dBm]	
		802.11a, 6 Mbps	802.11n, HT20, 6.5 Mbps
36	**5180**	15.01	14.89
40	**5200**	14.93	14.83
44	**5220**	14.94	14.81
48	**5240**	14.93	14.81
52	**5260**	14.81	14.68
56	**5280**	14.73	14.58
60	**5300**	14.76	14.63
64	**5320**	14.72	14.52
100	**5500**	14.46	14.31
104	**5520**	14.36	14.12
108	**5540**	14.23	14.12
112	**5560**	14.14	14.04
116	**5580**	14.08	13.96
120	**5600**	13.94	13.78
124	**5620**	13.93	13.72
128	**5640**	13.92	13.76
132	**5660**	13.94	13.81
136	**5680**	13.91	13.82
140	**5700**	14.01	13.82
149	**5745**	13.99	13.79
153	**5765**	14.01	13.81
157	**5785**	13.98	13.87
161	**5805**	13.94	13.81
165	**5825**	13.81	13.67
Upper Tolerance [dBm]		17	17

8.2. Stand-Alone SAR Evaluation Exclusion

Antenna	Operation Mode	SAR Evaluation Exclusion Reason
WLAN	802.11g 802.11n HT20	According to KDB 248227, 802.11g and/or 802.11n HT20 is not required when the maximum average output power is < ¼ dB higher than that measured on the corresponding 802.11b channels.
Bluetooth	GFSK π/4 DQPSK 8DPSK	According to KDB 447498, SAR evaluation can be excluded if the following equation is satisfied: [(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] $\cdot[\sqrt{f_{(GHz)}}] \leq 3.0$ The maximum average output power is 7.08 mW. SAR evaluation is excluded when the minimum separation distance is at least 5mm.

8.3. Test Positions and Configurations

Exposure Condition	Distance	Position	Positioning Photo (Appendix B)
Head SAR	0 mm	Left Touch	Photo 3
		Left 15° Tilt	Photo 4
		Right Touch	Photo 5
		Right 15° Tilt	Photo 6
Body-Worn SAR	0 mm	Front of EUT in Holster A (Extended Battery)	Photo 7
		Front of EUT in Holster A (Standard Battery)	Photo 8
		Front of EUT in Holster-1 (Extended Battery)	Photo 9
		Front of EUT in Holster-1 (Standard Battery)	Photo 10
		Back of EUT in Holster A (Extended Battery)	Photo 11
		Back of EUT in Holster A (Standard Battery)	Photo 12
		Back of EUT in Holster-1 (Extended Battery)	Photo 13
		Back of EUT in Holster-1 (Standard Battery)	Photo 14

Three different models were tested. The units are identical aside from the following differences:

-eLGN contains all identified radios and full testing was performed on this unit.
-eLG0 contains all identified radios other than NFC. Spot checks were performed on this unit for the worst-case configurations in all bands.
-eL00 contains only WLAN and Bluetooth radios. Spot checks were performed on this unit for the worst-case configurations in the WLAN bands only.

Body worn accessory SAR testing was initially applied with a Holster labeled in this report as 'Holster-A', providing a distance to body of approx 10-15mm. To reach SAR compliance in certain critical device to body positions (back side towards body, thinner of 2 optional batteries/battery covers) Holster-A was replaced by 'Holster-1' keeping a greater distance to body of approx 20mm,but having an identical metallic spring clip incorporated, at the same position. Since Holster-A with smaller distance to body comprises the more conservative case, re-test of some less critical configurations has been skipped and results overtaken. Full body-worn testing was performed with Holster-1 on the PCS and cellular bands with the highest SAR values (CDMA BC1, GSM 850), with spot checks on the worst case configurations being done in all other bands. Only Holster-1 is being marketed with the EUT.

The device can be equipped with a standard battery and with a higher capacity extended battery, both using different battery covers. Photos 1 and 2 demonstrate the different thickness of the battery covers, and that the standard battery/cover comprises the worst case for the back side to body position, providing less antenna - body distance. Due to its location on the backside and the unchanged position of the antennas it is assumed that the battery options do not have critical impact on the front side to body configuration, nor to head use positions. Consequently, the backside of the device equipped with the thinner standard battery was tested in all bands for body worn accessory.

WLAN is tested with 100% duty cycle. According to SPEAG user manual section 27.2, CW can be assumed which results in crest factor 1.

High and low channels are evaluated for the worst case positions for each band and exposure condition regardless of the SAR value on the middle channel, according to guidance in Industry Canada Notice 2012-DRS1203. FCC only requires high and low channels be evaluated when the SAR value on the middle channel is more than 3 dB below the limit.

8.4. SAR Results for Head

WLAN 802.11b

Operation Mode	Model	Channel	Frequency (MHz)	Position	SAR 1g (W/kg)	Measured Burst Average Power [dBm]	Upper Tolerance [dBm]	Extrapolated SAR 1g (W/kg)	Results (Appendix A)
DSSS with CCK, 1 Mbit/s	ELGN	6	2437	Right Touch	0.037	16.82	19	0.061	Plot 1[1]
				Right 15° Tilt	0.037	16.82	19	0.061	Plot 2[1]
				Left Touch	0.067	16.82	19	0.111	Plot 3[1]
				Left 15° Tilt	0.062	16.82	19	0.102	Plot 4[1]
	ELGN	1	2412	Left Touch	0.055	16.59	19	0.096	Plot 5[1]
	ELGN	11	2462	Left Touch	0.086	16.92	19	0.139	Plot 6[1]
	EL00	11	2462	Left Touch	0.043	16.92	19	0.069	Plot 7[1]

NOTE:
[1]Area scan based 1-g SAR estimation is used in the indicated plots in accordance with KDB 447498 for configurations which had an estimated SAR value much less than 0.8 W/kg.

WLAN 802.11a

Operation Mode	Model	Channel	Frequency (MHz)	Position	SAR 1g (W/kg)	Measured Burst Average Power [dBm]	Upper Tolerance [dBm]	Extrapolated SAR 1g (W/kg)	Results (Appendix A)
BPSK, 6 Mbit/s	ELGN	36	5180	Right Touch	0.043	15.01	17	0.067	Plot 8[1]
				Right 15° Tilt	0.044	15.01	17	0.07	Plot 9[1]
				Left Touch	0.059	15.01	17	0.093	Plot 10[1]
				Left 15° Tilt	0.056	15.01	17	0.089	Plot 11[1]
	ELGN	48	5240	Left Touch	0.075	14.93	17	0.121	Plot 12[1]
	EL00	48	5240	Left Touch	0.066	14.93	17	0.107	Plot 13[1]
	ELGN	52	5260	Right Touch	0.061	14.81	17	0.101	Plot 14[1]
				Right 15° Tilt	0.074	14.81	17	0.123	Plot 15[1]
				Left Touch	0.078	14.81	17	0.129	Plot 16[1]
				Left 15° Tilt	0.077	14.81	17	0.127	Plot 17[1]
	ELGN	60	5300	Left Touch	0.097	14.76	17	0.163	Plot 18[1]
	EL00	60	5300	Left Touch	0.076	14.76	17	0.128	Plot 19[1]
	ELGN	104	5520	Right Touch	0.102	14.36	17	0.187	Plot 20[1]
				Right 15° Tilt	0.112	14.36	17	0.206	Plot 21[1]
				Left Touch	0.12	14.36	17	0.22	Plot 22[1]
				Left 15° Tilt	0.124	14.36	17	0.228	Plot 23[1]
	ELGN	116	5580	Left 15° Tilt	0.099	14.08	17	0.194	Plot 24[1]
	ELGN	140	5700	Left 15° Tilt	0.056	14.01	17	0.111	Plot 25[1]
	EL00	104	5520	Left 15° Tilt	0.095	14.36	17	0.174	Plot 26[1]
	ELGN	149	5745	Right Touch	0.049	13.99	17	0.098	Plot 27[1]
				Right 15° Tilt	0.047	13.99	17	0.094	Plot 28[1]
				Left Touch	0.079	13.99	17	0.158	Plot 29[1]
				Left 15° Tilt	0.036	13.99	17	0.071	Plot 30[1]
	ELGN	161	5805	Left Touch	0.059	13.94	17	0.12	Plot 31[1]
	EL00	149	5745	Left Touch	0.052	13.99	17	0.103	Plot 32[1]

NOTE:
[1]Area scan based 1-g SAR estimation is used in the indicated plots in accordance with KDB 447498 for configurations which had an estimated SAR value much less than 0.8 W/kg.

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8.5. SAR Results for Body-Worn

802.11b

Operation Mode	Model / Battery Option	Channel	Frequency (MHz)	Position	SAR 1g (W/kg)	Measured Burst Average Power [dBm]	Upper Tolerance [dBm]	Extrapolated SAR 1g (W/kg)	Results (Appendix A)
DSSS with CCK, 1 Mbit/s	ELGN / Extended	6	2437	EUT Front in Holster A, 0mm	0.048	16.82	19	0.079	Plot 33[1]
				EUT Back in Holster A, 0mm	0.051	16.82	19	0.084	Plot 34[1]
		1	2412	EUT Back in Holster A, 0mm	0.042	16.59	19	0.073	Plot 35[1]
		11	2462	EUT Back in Holster A, 0mm	0.069	16.92	19	0.111	Plot 36[1]
	EL00 / Extended	6	2437	EUT Back in Holster A, 0mm	0.051	16.82	19	0.084	Plot 37[1]
	ELGN / Standard	6	2437	EUT Back in Holster-1, 0mm	0.033	16.82	19	0.054	Plot 38
	EL00 / Standard	6	2437	EUT Back in Holster-1, 0mm	0.025	16.82	19	0.041	Plot 39

NOTE:
[1]Area scan based 1-g SAR estimation is used in the indicated plots in accordance with KDB 447498 for configurations which had an estimated SAR value much less than 0.8 W/kg.

802.11a

Operation Mode	Model / Battery Option	Channel	Frequency (MHz)	Position	SAR 1g (W/kg)	Measured Burst Average Power [dBm]	Upper Tolerance [dBm]	Extrapolated SAR 1g (W/kg)	Results (Appendix A)
BPSK, 6 Mbit/s	ELGN / Extended	36	5180	EUT Front in Holster A, 0mm	0.018	15.01	17	0.028	Plot 40[1]
				EUT Back in Holster A, 0mm	0.063	15.01	17	0.10	Plot 41[1]
		48	5240	EUT Back in Holster A, 0mm	0.069	14.93	17	0.111	Plot 42[1]
		52	5260	EUT Front in Holster A, 0mm	0.033	14.81	17	0.053	Plot 43[1]
				EUT Back in Holster A, 0mm	0.071	14.81	17	0.117	Plot 44[1]
		60	5300	EUT Back in Holster A, 0mm	0.087	14.76	17	0.145	Plot 45[1]
		104	5520	EUT Front in Holster A, 0mm	0.044	14.36	17	0.081	Plot 46[1]
				EUT Back in Holster A, 0mm	0.097	14.36	17	0.178	Plot 47[1]
		116	5580	EUT Back in Holster A, 0mm	0.085	14.08	17	0.167	Plot 48[1]
		140	5700	EUT Back in Holster A, 0mm	0.049	14.01	17	0.097	Plot 49[1]
		149	5745	EUT Front in Holster A, 0mm	0.030	13.99	17	0.058	Plot 50[1]
				EUT Back in Holster A, 0mm	0.048	13.99	17	0.096	Plot 51[1]
		161	5805	EUT Back in Holster A, 0mm	0.046	13.94	17	0.091	Plot 52[1]
	ELG0[2] / Extended	104	5520	EUT Back in Holster A, 0mm	0.111	14.36	17	0.204	Plot 53

NOTE:
[1] Area scan based 1-g SAR estimation is used in the indicated plots in accordance with KDB 447498 for configurations which had an estimated SAR value much less than 0.8 W/kg.
[2] Plot from model ELG0 is shown for zoom scan.

802.11a (continued)

Operation Mode	Model / Battery Option	Channel	Frequency (MHz)	Position	SAR 1g (W/kg)	Measured Burst Average Power [dBm]	Upper Tolerance [dBm]	Extrapolated SAR 1g (W/kg)	Results (Appendix A)
BPSK, 6 Mbit/s	EL00 / Extended	48	5240	EUT Back in Holster A, 0mm	0.08	14.93	17	0.129	Plot 54[1]
		60	5300	EUT Back in Holster A, 0mm	0.086	14.76	17	0.142	Plot 55[1]
		104	5520	EUT Back in Holster A, 0mm	0.101	14.36	17	0.186	Plot 56[1]
		149	5745	EUT Back in Holster A, 0mm	0.041	13.99	17	0.082	Plot 57[1]
	ELGN / Standard	48	5240	EUT Back in Holster-1, 0mm	0.112	14.93	17	0.18	Plot 58[1]
		60	5300	EUT Back in Holster-1, 0mm	0.105	14.76	17	0.176	Plot 59[1]
		104	5520	EUT Back in Holster-1, 0mm	0.108	14.36	17	0.198	Plot 60[1]
		149	5745	EUT Back in Holster-1, 0mm	0.061	13.99	17	0.122	Plot 61[1]
	ELG0[2] / Standard	104	5520	EUT Back in Holster-1, 0mm	0.125	14.36	17	0.23	Plot 62
	EL00 / Standard	104	5520	EUT Back in Holster-1, 0mm	0.111	14.36	17	0.204	Plot 63[1]

NOTE:
[1]Area scan based 1-g SAR estimation is used in the indicated plots in accordance with KDB 447498 for configurations which had an estimated SAR value much less than 0.8 W/kg.
[2] Plot from model ELG0 is shown for zoom scan.

8.6. Dipole verification

Prior to formal testing at each frequency a system verification was performed in accordance with IEEE 1528. The 1 Watt reference SAR value is taken from the SPEAG dipole calibration report as required by FCC KDB 450824 D01. All of the testing described in this report was performed within 24 hours of the system verification. The following results were obtained:

Date	Liquid Type	Frequency (MHz)	CW input at dipole feed (Watts)	1g Zoom Scan SAR (W/kg)[1]	1 Watt reference SAR value (W/kg)	Difference reference SAR value to normalized SAR	1g Area Scan[2] SAR (W / kg)	Difference between Area Scan and Zoom Scan SAR	Results (Appendix A)
2013/01/30	HSL	2450	1	53.5	52.8	1.3%	53.6	0%	Plot 64
2013/01/31	HSL	5200	0.1	79.7	80.3	-0.8%	78.4	-1.6%	Plot 65
2013/02/01	HSL	5800	0.1	78.7	78.9	-0.3%	76.5	-2.8%	Plot 66
2013/02/04	HSL	5200	0.1	75.9	80.3	-5.5%	73.7	-2.9%	Plot 67
2013/02/04	HSL	5800	0.1	78.5	78.9	-0.5%	76.4	-2.7%	Plot 68
2013/02/04	MSL	2450	1	53	50.9	4.1%	52	-1.9%	Plot 69
2013/04/18	MSL	2450	1	47.8	50.9	-6.1%	N/A[3]		Plot 70
2013/02/11	MSL	5200	0.1	70.0	73.7	-5.0%	68.1	-2.7%	Plot 71
2013/02/11	MSL	5800	0.1	77.0	74.3	3.6%	78.3	1.7%	Plot 72
2013/04/16	MSL	5200	0.1	69.4	73.7	-5.8%	69.6	0%	Plot 73
2013/04/16	MSL	5800	0.1	67.9	74.3	-8.6%	67.5	0%	Plot 74

NOTE:

1. Measured 1g SAR normalized to 1 W.
2. Fast SAR algorithm using polynomial fit as described in KDB 447498 used.
3. Area scan SAR value only applicable to tests which utilize area scan based 1-g SAR estimation. According to KDB 447498, the verification area scan and zoom scan must be within 3% of each other when area scan based 1-g SAR estimation is used.

References

1. [IEEE 1999] IEEE Std C95.1-1999: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz, Inst. of Electrical and Electronics Engineers, Inc., December 1998.

2. [IEEE 2003] 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. Inst. of Electrical and Electronics Engineers, Inc., December 2003.

3. [NIST 1994] NIST: Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results, Technical Note 1297 (TN1297), United States Department of Commerce Technology Administration, National Institute of Standards and Technology, September 1994.

4. [FCC 2001] Federal Communications Commission: Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields, Supplement C (Edition 01-01) to OET Bulletin 65 (Edition 97-01), FCC, June 2001.

5. [IC 2010] RSS-102: Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands), Industry Canada, Issue 4, March 2010.

6. [IC 2012] Notice 2012-DRS1203: RE: APPLICABILITY OF LATEST FCC RF EXPOSURE KDB PROCEDURES (PUBLICATION DATE: OCTOBER 24, 2012) AND OTHER PROCEDURES, Industry Canada, December 2012

9. Report History

Date	Report Name	Changes to report	Report prepared by
2013-05-20	**SAR_HONEY_095-12001_eL00_FCC_IC**	**First Version**	**Z. Gray**