SAR EVALUATION REPORT

FCC 47 CFR § 2.1093
IEEE Std 1528-2013

For
802.11abgn w/BT 4.0

Model: EDISON
FCC ID: 2AB8ZND1

Report Number: 14U17814-S1D
Issue Date: 8/27/2014

Prepared for
INTEL CORPORATION
2200 MISSION COLLEGE BOULEVARD
SANTA CLARA, CA 95052, U.S.A

Prepared by
UL Verification Services Inc.
47173 BENICIA STREET
FREMONT, CA 94538, U.S.A.
TEL: (510) 771-1000
FAX: (510) 661-0888

NVLAP LAB CODE 200065-0

REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
--	8/19/2014	Initial Issue	--
A	8/21/2014	Section 4.2 – corrected equipment list Appendix – Added SAR probe Calibration certificate.	Dave Weaver
B	8/23/2014	Added Bluetooth and simultaneous transmission results	Dave Weaver
C	8/25/2014	Section 7.2 – Corrected HT40 channel numbers	Dave Weaver
D	8/27/2014	Removed Hotspot references	Dave Weaver

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1. Attestation of Test Results

Applicant Name	INTEL CORPORATION			
Application Purpose	☒ Original Grant ☐ Class II Permissive Change			
FCC ID	2AB8ZND1			
DUT Description	802.11abgn w/BT 4.0			
Exposure Category	General Population/Uncontrolled Exposure (1g SAR limit: 1.6 W/kg)			
The highest reported SAR	RF Exposure Conditions	Equipment Class		
		Licensed	DTS	UNII
	Body	N/A	0.400W/kg	0.375W/kg
	Simultaneous transmission	N/A	0.400W/kg	
Applicable Standards	FCC 47 CFR § 2.1093 KDB publication IEEE Std 1528-2013			
Test Results	Pass			
Date tested	07/24/2014 – 08/23/2014			

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government (NIST Handbook 150, Annex A). This report is written to support regulatory compliance of the applicable standards stated above.

Approved & Released By:	Prepared By:
	
Dave Weaver Program Manager UL Verification Services Inc.	Coltyce Sanders Laboratory Engineer UL Verification Services Inc.

2. Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEEE STD 1528-2013, the following FCC Published RF exposure KDB procedures, and TCB workshop updates:

- 447498 D01 General RF Exposure Guidance v05r02
- 248227 D01 SAR Meas for 802 11abg v01r02
- 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r03
- 865664 D02 SAR Reporting v01r01
- 690783 D01 SAR Listings on Grants v01r03

3. Facilities and Accreditation

The test sites and measurement facilities used to collect data are located at

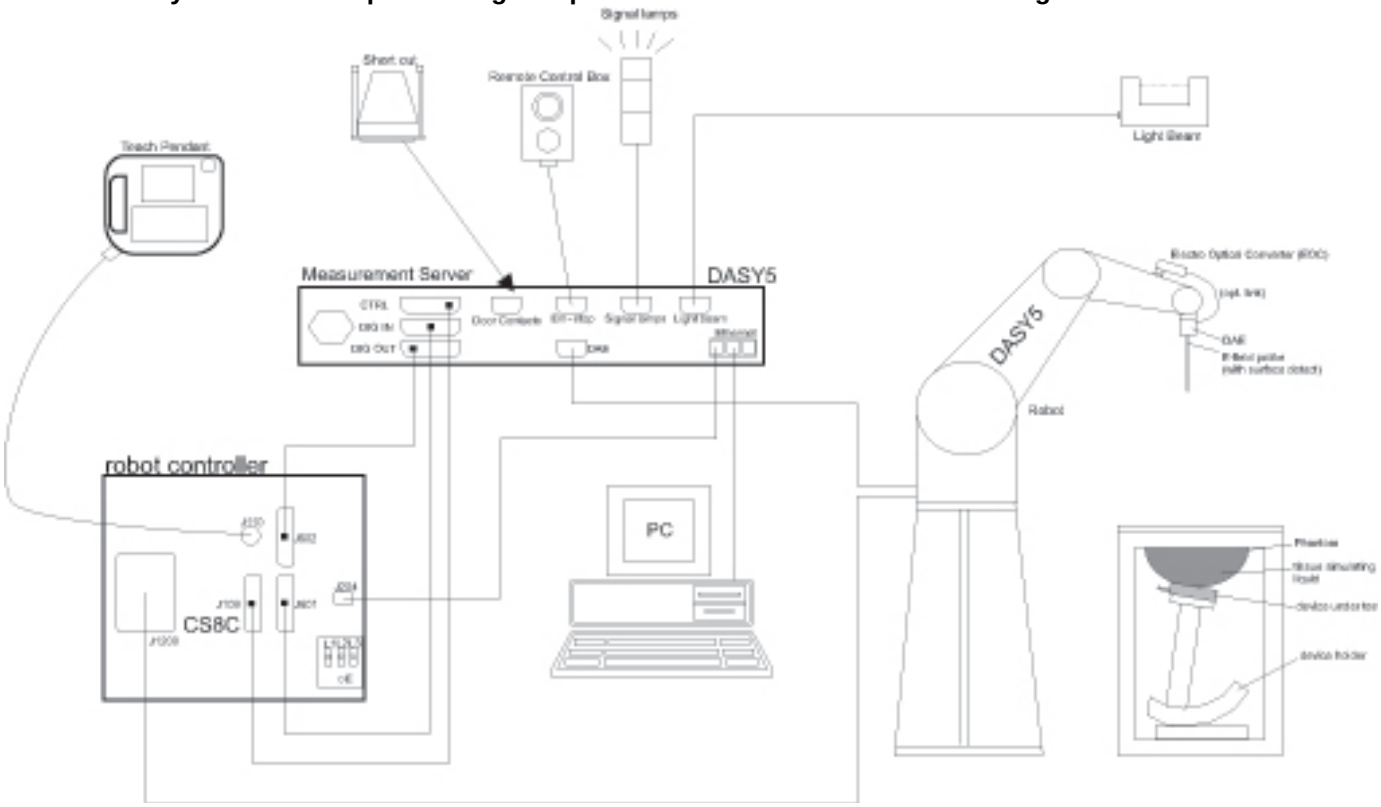
47173 Benicia Street	47266 Benicia Street
SAR Lab A	SAR Lab 1
SAR Lab B	SAR Lab 2
SAR Lab C	SAR Lab 3
SAR Lab D	SAR Lab 4
SAR Lab E	SAR Lab 5
SAR Lab F	
SAR Lab G	
SAR Lab H	

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://ts.nist.gov/standards/scopes/2000650.htm.

4. SAR Measurement System & Test Equipment

4.1. SAR Measurement System

The DASY5 system used for performing compliance tests consists of the following items:



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP or Win7 and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

4.2. Test Equipment

The measuring equipment used to perform the tests documented in this report has been calibrated in accordance with the manufacturers' recommendations, and is traceable to recognized national standards.

Dielectric Property Measurements

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Network Analyzer	Agilent	E5071B	MY42100131	2/21/2014
Dielectronic Probe kit	SPEAG	DAK-3.5	1087	10/16/2013
Dielectronic Probe kit	SPEAG	DAK-3.5 Short	SM DAK 200 BA	N/A
Thermometer	Control Company	4242	122529163	9/19/2013

System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
HP Signal Generator	HP	8665B	3546A00784	6/23/2015
Power Meter	HP	437B	3125U16345	6/16/2015
Power Meter	HP	437B	3125U09516	9/30/2014
Power Sensor	Agilent	8481A	2237A31744	10/2/2014
Power Sensor	Agilent	8481A	2349A36506	9/30/2014
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1808939	N/A
Bi-directional coupler	Werlatone, Inc.	C8060-102	2710	N/A
DC Power Supply	Sorensen Ametek	XT15-4	1319A02778	N/A
HP Signal Generator	HP	8665B	3438A00633	7/10/2015
Power Meter	HP	438A	3513U04320	10/2/2014
Power Sensor	Agilent	8481A	2702A66876	9/30/2014
Power Sensor	Agilent	8481A	3318A95392	9/30/2014
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1622052	N/A
Bi-directional coupler	Werlatone, Inc.	C8060-102	2711	N/A
DC Power Supply	HP	6296A	2841A-05955	N/A
E-Field Probe (SAR 3)	SPEAG	EX3DV4	3773	4/22/2015
E-Field Probe (SAR 5)	SPEAG	EX3DV4	3991	5/16/2015
Data Acquisition Electronics (SAR 3)	SPEAG	DAE4	1343	7/24/2014
Data Acquisition Electronics (SAR 5)	SPEAG	DAE4	1439	5/14/2015
Data Acquisition Electronics (SAR 3)	SPEAG	DAE4	1257	4/2/2015
System Validation Dipole	SPEAG	D2450V2	899	9/10/2014
System Validation Dipole	SPEAG	D5GHzV2	1138	11/19/2014
Thermometer (SAR Lab 3)	EXTECH	445703	CCS-237	6/3/2015
Thermometer (SAR Lab 5)	EXTECH	445703	CCS-239	6/3/2015

5. Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR 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.

6. Device Under Test (DUT) Information

6.1. DUT Description

Model: EDISON	
Device Dimension	Overall (Length x Width): 24.86 mm x 35.64 mm Overall Diagonal: 43.08 mm

6.2. Wireless Technologies

Wireless technologies	Frequency bands	Operating mode	Duty Cycle used for SAR testing
Wi-Fi	2.4 GHz	802.11b 802.11g 802.11n (HT20) 802.11n (HT40)	100%
	5 GHz	802.11a 802.11n (HT20) 802.11n (HT40)	100%
Bluetooth	2.4 GHz	Version 4.0 LE	32.25% (DH1), 66.68% (DH3), 77.52% (DH5)

6.3. Simultaneous Transmission

Bluetooth and 2.4 GHz WI-Fi cannot transmit simultaneously.

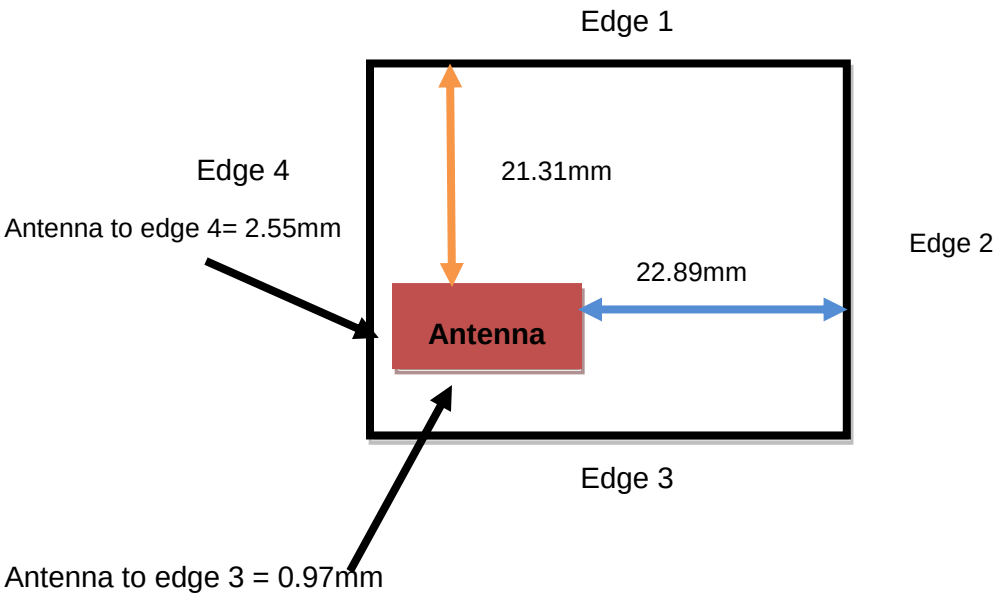
Bluetooth and 5 GHz WI-Fi can transmit simultaneously.

6.4. Maximum Output Power

Target powers are absolute maximums

		RF Output Power (dBm)
RF Air interface	Mode	Target
WiFi 2.4 GHz	802.11b	12.2
	802.11g	12.4
	802.11n HT20	12.3
	802.11n HT40	12.5
WiFi 5.2 GHz	802.11a	13.3
	802.11n HT20	13.7
	802.11n HT40	11.2
WiFi 5.3 GHz	802.11a	13.9
	802.11n HT20	14.2
	802.11n HT40	13.2
WiFi 5.5 GHz	802.11a	13.2
	802.11n HT20	14.2
	802.11n HT40	13.2
WiFi 5.8 GHz	802.11a	13.5
	802.11n HT20	14.1
	802.11n HT40	13.0
Bluetooth		5.4

6.5. Antenna Dimensions and Separation Distances



7. RF Exposure Conditions (Test Configurations)

Refer to Appendix “Antenna Locations and Separation Distances” for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

7.1. Body

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	1 mm	Yes	
Front	0 mm	Yes	
Edge 1 (Top)	21.31 mm	Yes	
Edge 2 (Right)	22.89 mm	Yes	
Edge 3 (Bottom)	0.97 mm	Yes	
Edge 4 (Left)	2.55 mm	Yes	

Bluetooth qualified for SAR test exclusion however testing was performed to reduce simultaneous transmission sum SAR values.

Conducted Output Power Measurements

7.2. Wi-Fi (2.4 GHz Band)

Required Test Channels per KDB 248227 D01

Mode	Band	GHz	Channel	"Default Test Channels"	
				802.11b	802.11g
802.11b/g	2.4 GHz	**2.412**	1#	√	∇
		2.437	6	√	∇
		2.462	11#	√	∇

Notes:
√ = "default test channels"
∇ = possible 802.11g channels with maximum average output ¼ dB ≥ the "default test channels"
= when output power is reduced for channel 1 and /or 11 to meet restricted band requirements the highest output channels closest to each of these channels should be tested.

Measured Results

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Avg Pwr (dBm)	SAR Test (Yes/No)
2.4 (DTS)	802.11b	1 Mbps	1	2412	12.0	Yes
			6	2437	12.1	
			11	2462	12.2	
	802.11g	6 Mbps	1	2412	12.3	Yes
			6	2437	12.4	
			11	2462	12.4	
	802.11n (HT20)	MCS0	1	2412	12.0	Yes
			6	2437	12.2	
			11	2462	12.3	
	802.11n (HT40)	MCS0	3	2422	12.5	Yes
			6	2437	12.5	
			9	2452	12.5	

7.3. Wi-Fi (5 GHz Bands)

Required Test Channels per KDB 248227 D01

Mode		Band	GHz	Channel	"Default Test Channels" 802.11a	
802.11a	UNII (15.407)	5.2 GHz	5.180	36	√	
			5.200	40		*
			2.220	44		*
			5.240	48	√	
		5.3 GHz	5.260	52	√	
			5.280	56		*
			5.300	60		*
			5.320	64	√	
		5.5 GHz	5.500	100		
			5.520	104	√	
			5.540	108		*
			5.560	112		*
			5.580	116	√	
			5.600	120		*
			5.620	124	√	
			5.640	128		*
			5.660	132		*
			5.680	136	√	
			5.700	140		*
	DTS (15.247)	5.8 GHz	5.745	149	√	
			5.765	153		*
			5.785	157	√	
			5.805	161		*
			5.825	165	√	

√ = "default test channels"

* = possible 802.11a channels with maximum average output > the "default test channels"

= when output power is reduced for channel 1 and /or 11 to meet restricted band requirements the highest output channels closest to each of these channels should be tested.

Measured Results

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Avg Pwr (dBm)	SAR Test (Yes/No)
5.2 (U-NII-1)	802.11a	6 Mbps	36	5180	13.0	Yes
			40	5200	13.3	
			48	5240	13.1	
	802.11n (HT20)	MCS0	36	5180	13.7	Yes
			40	5200	13.7	
			48	5240	13.7	
	802.11n (HT40)	MCS0	38	5190	11.2	No
			46	5230	11.2	
5.3 (U-NII-2A)	802.11a	6 Mbps	52	5260	13.7	Yes
			60	5300	13.8	
			64	5320	13.9	
	802.11n (HT20)	MCS0	52	5260	14.2	Yes
			60	5300	14.0	
			64	5320	13.9	
	802.11n (HT40)	MCS0	54	5270	12.7	No
			62	5310	13.2	
5.5 (U-NII-2C)	802.11a	6 Mbps	100	5500	13.1	Yes
			120	5600	12.9	
			140	5700	13.2	
	802.11n (HT20)	MCS0	100	5500	14.1	Yes
			120	5600	14.1	
			140	5700	14.2	
	802.11n (HT40)	MCS0	102	5510	13.2	No
			110	5550	13.1	
			134	5670	13.1	
5.8 (U-NII-3) (DTS)	802.11a	6 Mbps	149	5745	13.5	Yes
			157	5785	13.5	
			165	5825	13.5	
	802.11n (HT20)	MCS0	149	5745	14.0	Yes
			157	5785	14.0	
			161	5805	14.1	
	802.11n (HT40)	MCS0	151	5755	13.0	No
			159	5795	13.0	

7.4. Bluetooth

Band (GHz)	Mode	Ch #	Freq. (MHz)	Avg Pwr (dBm)
2.4	V3.0 + EDR, GFSK	0	2402	4.8
		39	2441	5.2
		78	2480	5.4
	V3.0 + EDR, π/4 DQPSK	0	2402	1.9
		39	2441	2.2
		78	2480	2.4
	V3.0 + EDR, 8-DPSK	0	2402	1.8
		39	2441	2.2
		78	2480	2.4
	V4.0 LE, GFSK	0	2402	-1.5
		19	2440	-1.5
		39	2480	-1.5

8. Dielectric Property Measurements

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within ± 2°C of the temperature when the tissue parameters are characterized.

The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use; or earlier if the dielectric parameters can become out of tolerance; for example, when the parameters are marginal at the beginning of the measurement series.

Tissue dielectric parameters were measured at the low, middle and high frequency of each operating frequency range of the test device.

8.1. Tissue Dielectric Parameters

FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

Target Frequency (MHz)	Head		Body	
	ε_r	σ (S/m)	ε_r	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5000	36.2	4.45	49.3	5.07
5100	36.1	4.55	49.1	5.18
5200	36.0	4.66	49.0	5.30
5300	35.9	4.76	48.9	5.42
5400	35.8	4.86	48.7	5.53
5500	35.6	4.96	48.6	5.65
5600	35.5	5.07	48.5	5.77
5700	35.4	5.17	48.3	5.88
5800	35.3	5.27	48.2	6.00

8.2. Dielectric Property Measurements Results

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within ± 2°C of the temperature when the tissue parameters are characterized.

The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use; or earlier if the dielectric parameters can become out of tolerance; for example, when the parameters are marginal at the beginning of the measurement series.

Tissue dielectric parameters were measured at the low, middle and high frequency of each operating frequency range of the test device.

SAR Lab 3

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
7/22/2014	Body 2450	e'	50.2100	Relative Permittivity (ε_r):	50.21	52.70	-4.72	5
		e"	14.5300	Conductivity (σ):	1.98	1.95	1.51	5
	Body 2410	e'	50.3800	Relative Permittivity (ε_r):	50.38	52.76	-4.51	5
		e"	14.3500	Conductivity (σ):	1.92	1.91	0.81	5
	Body 2475	e'	50.1000	Relative Permittivity (ε_r):	50.10	52.67	-4.88	5
		e"	14.6200	Conductivity (σ):	2.01	1.99	1.35	5
7/25/2014	Body 2450	e'	51.9100	Relative Permittivity (ε_r):	51.91	52.70	-1.50	5
		e"	13.8300	Conductivity (σ):	1.88	1.95	-3.38	5
	Body 2410	e'	52.0600	Relative Permittivity (ε_r):	52.06	52.76	-1.33	5
		e"	13.6400	Conductivity (σ):	1.83	1.91	-4.18	5
	Body 2475	e'	51.8200	Relative Permittivity (ε_r):	51.82	52.67	-1.61	5
		e"	13.9400	Conductivity (σ):	1.92	1.99	-3.36	5
7/28/2014	Body 2450	e'	50.5300	Relative Permittivity (ε_r):	50.53	52.70	-4.12	5
		e"	14.8500	Conductivity (σ):	2.02	1.95	3.74	5
	Body 2410	e'	50.7000	Relative Permittivity (ε_r):	50.70	52.76	-3.90	5
		e"	14.7000	Conductivity (σ):	1.97	1.91	3.27	5
	Body 2475	e'	50.4200	Relative Permittivity (ε_r):	50.42	52.67	-4.27	5
		e"	14.9600	Conductivity (σ):	2.06	1.99	3.71	5
7/31/2014	Body 2450	e'	51.8000	Relative Permittivity (ε_r):	51.80	52.70	-1.71	5
		e"	14.4100	Conductivity (σ):	1.96	1.95	0.67	5
	Body 2410	e'	51.9700	Relative Permittivity (ε_r):	51.97	52.76	-1.50	5
		e"	14.2500	Conductivity (σ):	1.91	1.91	0.11	5
	Body 2475	e'	51.6800	Relative Permittivity (ε_r):	51.68	52.67	-1.88	5
		e"	14.5100	Conductivity (σ):	2.00	1.99	0.59	5
7/23/2014	Body 5180	e'	47.9100	Relative Permittivity (ε_r):	47.91	49.05	-2.32	5
		e"	18.7800	Conductivity (σ):	5.41	5.27	2.61	5
	Body 5200	e'	47.8800	Relative Permittivity (ε_r):	47.88	49.02	-2.32	5
		e"	18.8100	Conductivity (σ):	5.44	5.29	2.72	5
	Body 5600	e'	47.2100	Relative Permittivity (ε_r):	47.21	48.48	-2.62	5
		e"	19.1500	Conductivity (σ):	5.96	5.76	3.50	5
	Body 5800	e'	46.8800	Relative Permittivity (ε_r):	46.88	48.20	-2.74	5
		e"	19.3500	Conductivity (σ):	6.24	6.00	4.01	5
	Body 5825	e'	46.8400	Relative Permittivity (ε_r):	46.84	48.20	-2.82	5
		e"	19.3800	Conductivity (σ):	6.28	6.00	4.62	5

SAR Lab 3 (continued)

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
7/31/2014	Body 5180	e'	47.1100	Relative Permittivity (ϵ_r):	47.11	49.05	-3.95	5
		e''	18.5600	Conductivity (σ):	5.35	5.27	1.41	5
	Body 5200	e'	47.0700	Relative Permittivity (ϵ_r):	47.07	49.02	-3.98	5
		e''	18.5900	Conductivity (σ):	5.38	5.29	1.52	5
	Body 5600	e'	46.3700	Relative Permittivity (ϵ_r):	46.37	48.48	-4.35	5
		e''	18.9100	Conductivity (σ):	5.89	5.76	2.21	5
	Body 5800	e'	46.0600	Relative Permittivity (ϵ_r):	46.06	48.20	-4.44	5
		e''	19.0800	Conductivity (σ):	6.15	6.00	2.55	5
	Body 5825	e'	46.0100	Relative Permittivity (ϵ_r):	46.01	48.20	-4.54	5
		e''	19.1000	Conductivity (σ):	6.19	6.00	3.10	5
8/8/2014	Body 2450	e'	51.5900	Relative Permittivity (ϵ_r):	51.59	52.70	-2.11	5
		e''	14.4300	Conductivity (σ):	1.97	1.95	0.81	5
	Body 2410	e'	51.7600	Relative Permittivity (ϵ_r):	51.76	52.76	-1.89	5
		e''	14.2500	Conductivity (σ):	1.91	1.91	0.11	5
	Body 2475	e'	51.5000	Relative Permittivity (ϵ_r):	51.50	52.67	-2.22	5
		e''	14.5500	Conductivity (σ):	2.00	1.99	0.87	5

SAR Lab 5

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
8/22/2014	Body 2450	e'	51.3100	Relative Permittivity (ϵ_r):	51.31	52.70	-2.64	5
		e''	14.9100	Conductivity (σ):	2.03	1.95	4.16	5
	Body 2410	e'	51.4300	Relative Permittivity (ϵ_r):	51.43	52.76	-2.52	5
		e''	14.7800	Conductivity (σ):	1.98	1.91	3.83	5
	Body 2475	e'	51.2400	Relative Permittivity (ϵ_r):	51.24	52.67	-2.71	5
		e''	14.9500	Conductivity (σ):	2.06	1.99	3.64	5

9. System Check

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device. The same SAR probe(s) and tissue-equivalent media combinations used with each specific SAR system for system verification must be used for device testing. When multiple probe calibration points are required to cover substantially large transmission bands, independent system verifications are required for each probe calibration point. A system verification must be performed before each series of SAR measurements using the same probe calibration point and tissue-equivalent medium. Additional system verification should be considered according to the conditions of the tissue-equivalent medium and measured tissue dielectric parameters, typically every three to four days when the liquid parameters are remeasured or sooner when marginal liquid parameters are used at the beginning of a series of measurements.

9.1. Reference Target SAR Values

The reference SAR values can be obtained from the calibration certificate of system validation dipoles

System Dipole	Serial No.	Cal. Date	Freq. (MHz)	Target SAR Values (W/kg)		
				1g/10g	Head	Body
D2450V2	899	9/10/2013	2450	1g	51.3	49.70
				10g	23.9	23.3
D5GHzV2	1138	11/19/2013	5200	1g	78.5	72.9
				10g	22.5	20.4
			5600	1g	82.7	78.3
				10g	23.5	21.7
			5800	1g	78.3	72.8
				10g	22.4	20.1

9.2. System Check Results

The 1-g and 10-g SAR measured with a reference dipole, using the required tissue-equivalent medium at the test frequency, must be within 10% of the manufacturer calibrated dipole SAR target.

SAR Lab 3

Date Tested	System Dipole		T.S. Liquid		Measured Results			Target (Ref. Value)	Delta ±10 %	Est./Zoom Ratio	Plot No.
	Type	Serial #			Area Scan	Zoom Scan	Normalize to 1 W				
7/22/2014	D2450V2	899	Body	1g	5.18	5.29	52.9	49.70	6.44	-2.12	
				10g	2.23	2.47	24.7	23.30	6.01		
7/25/2014	D2450V2	899	Body	1g	4.98	5.06	50.6	49.70	1.81	-1.61	
				10g	2.12	2.36	23.6	23.30	1.29		
7/28/2014	D2450V2	899	Body	1g	5.02	5.06	50.6	49.70	1.81	-0.80	
				10g	2.14	2.34	23.4	23.30	0.43		
7/31/2014	D2450V2	899	Body	1g	5.33	5.40	54.0	49.70	8.65	-1.31	1,2
				10g	2.26	2.51	25.1	23.30	7.73		
7/23/2014	D5GHzV2 (5200)	1138	Body	1g	7.02	7.13	71.3	72.90	-2.19	-1.57	
				10g	1.94	2.02	20.2	20.40	-0.98		
7/23/2014	D5GHzV2 (5600)	1138	Body	1g	7.79	8.18	81.8	78.30	4.47	-5.01	
				10g	2.10	2.27	22.7	21.70	4.61		
7/23/2014	D5GHzV2 (5800)	1138	Body	1g	6.43	7.12	71.2	72.80	-2.20	-10.73	
				10g	1.75	1.99	19.9	20.10	-1.00		
731/2014	D5GHzV2 (5200)	1138	Body	1g	7.41	7.53	75.3	72.90	3.29	-1.62	
				10g	2.06	2.14	21.4	20.40	4.90		
7/31/2014	D5GHzV2 (5600)	1138	Body	1g	7.71	8.24	82.4	78.30	5.24	-6.87	3,4
				10g	2.08	2.29	22.9	21.70	5.53		
7/31/2014	D5GHzV2 (5800)	1138	Body	1g	6.64	7.14	71.4	72.80	-1.92	-7.53	
				10g	1.80	1.99	19.9	20.10	-1.00		
8/8/2014	D2450V2	899	Body	1g	5.38	5.40	54.0	49.70	8.65	-0.37	
				10g	2.32	2.51	25.1	23.30	7.73		

SAR Lab 5

Date Tested	System Dipole		T.S. Liquid		Measured Results			Target (Ref. Value)	Delta ±10 %	Est./Zoom Ratio	Plot No.
	Type	Serial #			Area Scan	Zoom Scan	Normalize to 1 W				
8/22/2014	Body	899	Body	1g	4.70	4.70	47.0	49.70	-5.43	0.00	5, 6
				10g	2.040	2.160	21.6	23.30	-7.30		

10. Measured and Reported (Scaled) SAR Results

SAR Test Reduction criteria are as follows:

KDB 447498 D01 General RF Exposure Guidance:
Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:

- ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
- ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
- ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz

KDB 248227 D01 SAR Measurements Procedures for 802.11 a/b/g Transmitters v01r02 (pg.6):
Each channel should be tested at the lowest data rate in each a-b/g mode or 4.9 GHz channel BW configuration.
When the extrapolated maximum peak SAR for the maximum output channel is ≤ 1.6 W/kg and the 1-g averaged SAR is ≤ 0.8 W/kg, testing of other channels in the “default test channels” or “required test channels” configuration is optional.

April 2013 TCB Workshop Updates:
Apply usual 802.11 test exclusion considerations, but include 802.11ac SAR for highest 802.11a configuration in each frequency band and each exposure condition.

10.1. Wi-Fi (DTS Band)

Frequency Band	RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
2.4GHz	Body	802.11b 1 Mbps	5	Rear	11	2462	12.2	12.2	0.356	0.356	
				Front	11	2462	12.2	12.2	0.386	0.386	
				Edge 1	11	2462	12.2	12.2	0.066	0.066	
				Edge 2	11	2462	12.2	12.2	0.007	0.007	
				Edge 3	11	2462	12.2	12.2	0.155	0.155	
				Edge 4	11	2462	12.2	12.2	0.101	0.101	
2.4GHz	Body	802.11g 6 Mbps	5	Rear	6	2437	12.4	12.4	0.108	0.108	
				Front	6	2437	12.4	12.4	0.195	0.195	
				Edge 1	6	2437	12.4	12.4	0.044	0.044	
				Edge 2	6	2437	12.4	12.4	0.012	0.012	
				Edge 3	6	2437	12.4	12.4	0.072	0.072	
				Edge 4	6	2437	12.4	12.4	0.080	0.080	
2.4GHz	Body	802.11n 6 Mbps HT20	5	Rear	6	2437	12.2	12.2	0.400	0.400	1
				Front	6	2437	12.2	12.2	0.360	0.360	
				Edge 1	6	2437	12.2	12.2	0.089	0.089	
				Edge 2	6	2437	12.2	12.2	0.027	0.027	
				Edge 3	6	2437	12.2	12.2	0.291	0.291	
				Edge 4	6	2437	12.2	12.2	0.146	0.146	
2.4GHz	Body	802.11n MCS0 HT40	5	Rear	6	2437	12.5	12.5	0.394	0.394	
				Front	6	2437	12.5	12.5	0.382	0.382	
				Edge 1	6	2437	12.5	12.5	0.094	0.094	
				Edge 2	6	2437	12.5	12.5	0.013	0.013	
				Edge 3	6	2437	12.5	12.5	0.305	0.305	
				Edge 4	6	2437	12.5	12.5	0.145	0.145	

10.2. Wi-Fi (UNII Band)

Frequency Band	RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
5.2GHz	Body	802.11a 6 Mbps	5	Rear	40	5200	13.3	13.3	0.210	0.210	
				Front	40	5200	13.3	13.3	0.099	0.099	
				Edge 1	40	5200	13.3	13.3	0.021	0.021	
				Edge 2	40	5200	13.3	13.3	0.011	0.011	
				Edge 3	40	5200	13.3	13.3	0.066	0.066	
				Edge 4	40	5200	13.3	13.3	0.126	0.126	
		802.11n MCS0 HT20	5	Rear	40	5200	13.7	13.7	0.230	0.230	
				Front	40	5200	13.7	13.7	0.230	0.230	
				Edge 1	40	5200	13.7	13.7	0.022	0.022	
				Edge 2	40	5200	13.7	13.7	0.024	0.024	
				Edge 3	40	5200	13.7	13.7	0.158	0.158	
				Edge 4	40	5200	13.7	13.7	0.336	0.336	2
5.3GHz	Body	802.11a 6 Mbps	5	Rear	60	5300	13.9	13.9	0.210	0.210	
				Front	60	5300	13.9	13.9	0.074	0.074	
				Edge 1	60	5300	13.9	13.9	0.009	0.009	
				Edge 2	60	5300	13.9	13.9	0.003	0.003	
				Edge 3	60	5300	13.9	13.9	0.065	0.065	
				Edge 4	60	5300	13.9	13.9	0.145	0.145	
		802.11n MCS0 HT20	5	Rear	52	5260	14.2	14.2	0.220	0.220	
				Front	52	5260	14.2	14.2	0.222	0.222	
				Edge 1	52	5260	14.2	14.2	0.042	0.042	
				Edge 2	52	5260	14.2	14.2	0.025	0.025	
				Edge 3	52	5260	14.2	14.2	0.172	0.172	
				Edge 4	52	5260	14.2	14.2	0.299	0.299	3
5.6GHz	Body	802.11a 6 Mbps	5	Rear	140	5700	13.2	13.2	0.185	0.185	
				Front	140	5700	13.2	13.2	0.103	0.103	
				Edge 1	140	5700	13.2	13.2	0.030	0.030	
				Edge 2	140	5700	13.2	13.2	0.020	0.020	
				Edge 3	140	5700	13.2	13.2	0.129	0.129	
				Edge 4	140	5700	13.2	13.2	0.072	0.072	
		802.11n MCS0 HT20	5	Rear	140	5700	14.2	14.2	0.286	0.286	
				Front	140	5700	14.2	14.2	0.267	0.267	
				Edge 1	140	5700	14.2	14.2	0.064	0.064	
				Edge 2	140	5700	14.2	14.2	0.054	0.054	
				Edge 3	140	5700	14.2	14.2	0.352	0.352	
				Edge 4	140	5700	14.2	14.2	0.375	**0.375**	4
5.8GHz	Body	802.11a 6 Mbps	5	Rear	157	5785	13.5	13.5	0.189	0.189	
				Front	157	5785	13.5	13.5	0.174	0.174	
				Edge 1	157	5785	13.5	13.5	0.034	0.034	
				Edge 2	157	5785	13.5	13.5	0.022	0.022	
				Edge 3	157	5785	13.5	13.5	0.133	0.133	
				Edge 4	157	5785	13.5	13.5	0.062	0.062	
		802.11n MCS0 HT20	5	Rear	165	5825	14.1	14.1	0.233	0.233	
				Front	165	5825	14.1	14.1	0.276	0.276	
				Edge 1	165	5825	14.1	14.1	0.061	0.061	
				Edge 2	165	5825	14.1	14.1	0.073	0.073	
				Edge 3	165	5825	14.1	14.1	0.318	0.318	5
				Edge 4	165	5825	14.1	14.1	0.269	0.269	

10.3. Bluetooth

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Body	GFSK	5	Rear	78	2480	5.4	5.4	0.066	0.066	
			Front	78	2480	5.4	5.4	0.082	0.082	6
			Egde1	78	2480	5.4	5.4	0.009	0.009	
			Egde 2	78	2480	5.4	5.4	0.000	0.000	
			Egde 3	78	2480	5.4	5.4	0.044	0.044	
			Egde 4	78	2480	5.4	5.4	0.025	0.025	

11. SAR Measurement Variability

In accordance with published RF Exposure KDB procedure 865664 D01 SAR measurement 100 MHz to 6 GHz v01. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

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

11.1. The Highest Measured SAR Configuration in Each Frequency Band

Frequency Band (MHz)	Air Interface	Head (W/kg)	Body-worn (W/kg)	Repeated SAR (Yes/No)
2400	Wi-Fi 802.11b/g/n	N/A	0.400	No
5200	Wi-Fi 802.11a/n		0.336	No
5300	Wi-Fi 802.11a/n		0.299	No
5600	Wi-Fi 802.11a/n		0.375	No
5800	Wi-Fi 802.11a/n		0.318	No

11.2. RF energy coupling enhancement

For the highest *reported* SAR of each test configuration, the tip of the SAR probe is positioned at the peak SAR location of the zoom scan, at a distance of half the probe tip diameter, rounded to the nearest mm, from the phantom surface. The test device is initially positioned in direct contact with the phantom and subsequently moved away from the phantom in 5 mm increments. At least three repeated single-point SAR (not 1-g SAR) results should be measured for each device position, until the measured SAR is < 50% of that measured with the device in contact with the phantom.

The worst case conditions for the 2.4GHz and 5GHz bands were assessed.

Frequency Band	Original 1g SAR value (W/kg)	Distance (mm)	Maximum single point SAR reading	Change in value (%)
2.4GHz 802.11n rear	0.400	0	2.97	-
		5	0.81	-73
5.6GHz 802.11n edge 4	0.375	0	3.58	-
		5	0.82	-77

As the results at 5mm were less than 50% of the 0mm values further measurements were not required.

12. Simultaneous Transmission SAR Analysis

12.1. Sum of SAR for Wi-Fi UNII & Bluetooth

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario			∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			① Wi-Fi(DTS)	② Wi-Fi(UNII)	③ Bluetooth		
Body	Rear	①	0.356			0.356	No
		② + ③		0.286	0.066	0.352	No
	Front	①	0.386			0.386	No
		② + ③		0.276	0.082	0.358	No
	Edge 1	①	0.066			0.066	No
		② + ③		0.064	0.009	0.073	No
	Edge 2	①	0.008			0.008	No
		② + ③		0.073	0.000	0.073	No
	Edge 3	①	0.155			0.155	No
		② + ③		0.352	0.044	0.396	No
	Edge 4	①	0.101			0.101	No
		② + ③		0.375	0.025	0.400	No

13. Appendixes

Refer to separated files for the following appendixes.

13.1. Photos

13.2. System Performance Check Plots

13.3. Highest SAR Test Plots

13.4. Calibration Certificate for E-Field Probe EX3DV4 - SN 3991

13.5. Calibration Certificate for E-Field Probe EX3DV4 - SN 3773

13.6. Calibration Certificate for D2450V2 - SN 899

13.7. Calibration Certificate for D5GHzV2 - SN 1138

END OF REPORT