NORTHWEST EMC

Intel Corporation

SKL21-SDS

SAR Evaluation Report # INTE5597

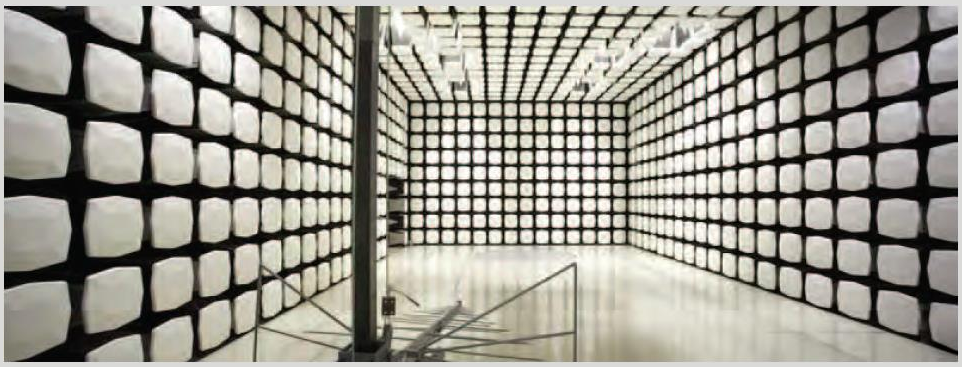
Including Conducted Output Power Measurements

Evaluated to the following SAR specification:

FCC 2.1093:2015

FCC 15.247:2015

WLAN Radio



NVLAP Lab Code: 200630-0

CERTIFICATE OF TEST

NORTHWEST EMC 2015-07-22

Last Date of Test: July 13, 2015
Intel Corporation
Model: SKL21-SDS

WLAN Radio

Applicable Standard

Test Description	Specification	Test Method	Pass/Fail
SAR Evaluation	FCC 2.1093:2015 FCC 15.247:2015	IEEE Std 1528:2013 FCC KDB 447498 D01 v05r02 FCC KDB 248227 D01 V02r01 FCC KDB 616217 D04 v01r01 FCC KDB 865664 D01 v01r03 FCC KDB 865664 D02 v01r01	Pass

Highest SAR Values:

Frequency Bands (GHz)	Body (W/kg) 1g	Limit (W/kg) 1g	Exposure Environment
2.4	1.09	1.6	General Population
5.2	0.93		
5.3	0.72		
5.6	0.60		
5.8	0.76		

Deviations From Test Standards

None

Approved By:

Don Facteau, IT Manager

REVISION HISTORY

NORTHWEST EMC
REV 2014.10.14

Revision Number	Description	Date	Page Number
00	None		

ACCREDITATIONS AND AUTHORIZATIONS

NORTHWEST EMC
REV 2015.2.19

United States

FCC - Designated by the FCC as a Telecommunications Certification Body (TCB). Certification chambers, Open Area Test Sites, and conducted measurement facilities are listed with the FCC.

A2LA - Accredited by A2LA to ISO / IEC 17065 as a product certifier. This allows Northwest EMC to certify transmitters to FCC and IC specifications.

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

IC - Recognized by Industry Canada as a Certification Body (CB). Certification chambers and Open Area Test Sites are filed with IC.

European Union

European Commission – Validated by the European Commission as a Conformity Assessment Body (CAB) under the EMC directive and as a Notified Body under the R&TTE Directive.

Australia/New Zealand

ACMA - Recognized by ACMA as a CAB for the acceptance of test data.

Korea

MSIP / RRA - Recognized by KCC's RRA as a CAB for the acceptance of test data.

Japan

VCCI - Associate Member of the VCCI. Conducted and radiated measurement facilities are registered.

Taiwan

BSMI – Recognized by BSMI as a CAB for the acceptance of test data.

NCC - Recognized by NCC as a CAB for the acceptance of test data.

Singapore

IDA – Recognized by IDA as a CAB for the acceptance of test data.

Israel

MOC – Recognized by MOC as a CAB for the acceptance of test data.

Hong Kong

OFCA – Recognized by OFCA as a CAB for the acceptance of test data.

Vietnam

MIC – Recognized by MIC as a CAB for the acceptance of test data.

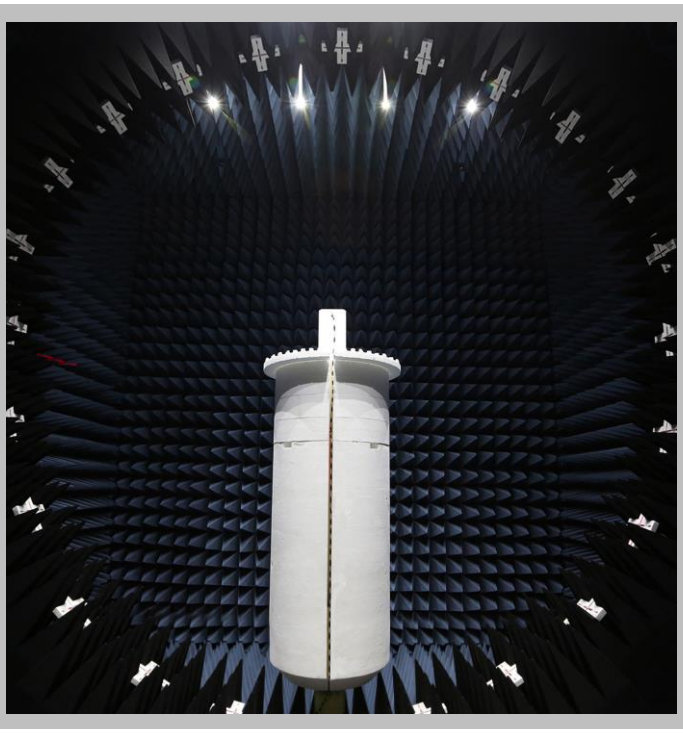
SCOPE

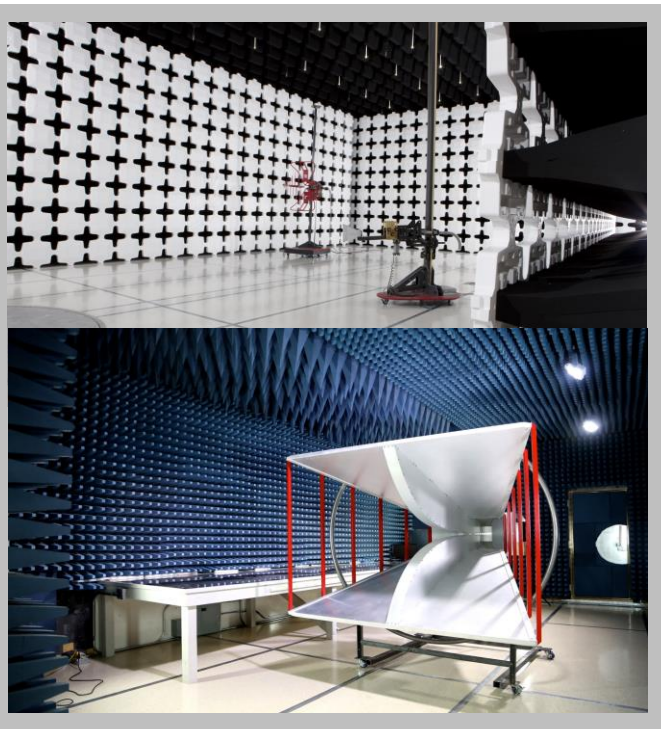
For details on the Scopes of our Accreditations, please visit:
http://www.nwemc.com/accreditations/
http://gsi.nist.gov/global/docs/cabs/designations.html

FACILITIES

REV 2015.2.19

California	Minnesota	New York	Oregon	Texas	Washington
Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-08, MN10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	Labs EV01-12 22975 NW Evergreen Pkwy Hillsboro, OR 97124 (503) 844-4066	Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Labs NC01-05 19201 120th Ave NE Bothell, WA 9801 (425)984-6600
NVLAP					
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200761-0	NVLAP Lab Code: 200630-0	NVLAP Lab Code:201049-0	NVLAP Lab Code: 200629-0
Industry Canada					
2834B-1, 2834B-3	2834E-1	N/A	2834D-1, 2834D-*2*	2834G-1	2834F-1
BSMI					
SL2-IN-E-1154R	SL2-IN-E-1152R	N/A	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI					
A-0029	A-0109	N/A	A-0108	A-0201	A-0110
Recognized Phase I CAB for ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA					
US0158	US0175	N/A	US0017	US0191	US0157





PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Intel Corporation
Address:	5200 NE Elam Young Pkwy
City, State, Zip:	Hillsboro, OR 97124
Test Requested By:	Mike Lowe
Model:	SKL21-SDS
First Date of Test:	June 22, 2015
Last Date of Test:	July 13, 2015
Receipt Date of Samples:	June 11, 2015
Equipment Design Stage:	Production
Equipment Condition:	No Damage

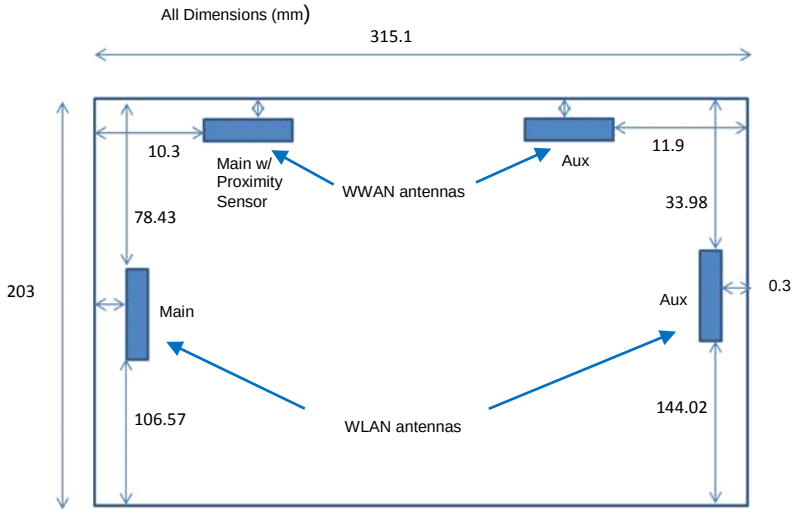
Information Provided by the Party Requesting the Test

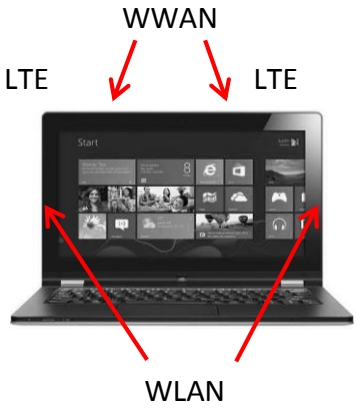
Functional Description of the EUT (Equipment Under Test):

The EUT is the Model SKL21-SDS 2-in-1 computer containing a NFC radio. Previously certified WWAN (FCC ID: RYQ-NF2) and WLAN / Bluetooth (FCC ID: PD97265NG) modular radios are installed. The WLAN radio is the subject of this SAR evaluation.

The WLAN radio is an 802.11abgnac 2x2 MIMO. The 2.4 and 5 GHz band use 20 & 40 MHz channel bandwidths for Chain A or B, and A+B combinations. The 5 GHz bands also support 802.11 ac for 20, 40, and 80 MHz channel bandwidths for Chain A or B, and A+B combinations.

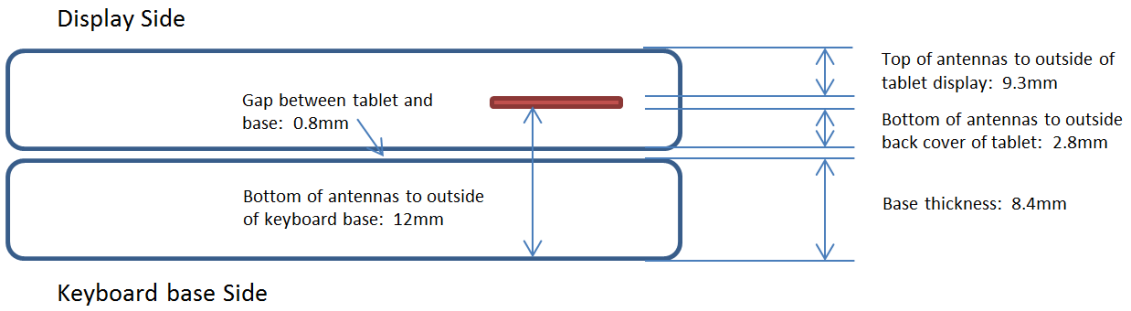
The WLAN antennas are monopole antennas that are integral to the computer. The main antenna has a peak gain of 1.5 dBi in the 2.4 GHz band and 4.0 dBi in the 5 GHz band. The auxiliary antenna has a peak gain of 3.0 dBi in the 2.4 GHz band and 3.5 dBi in the 5 GHz band.

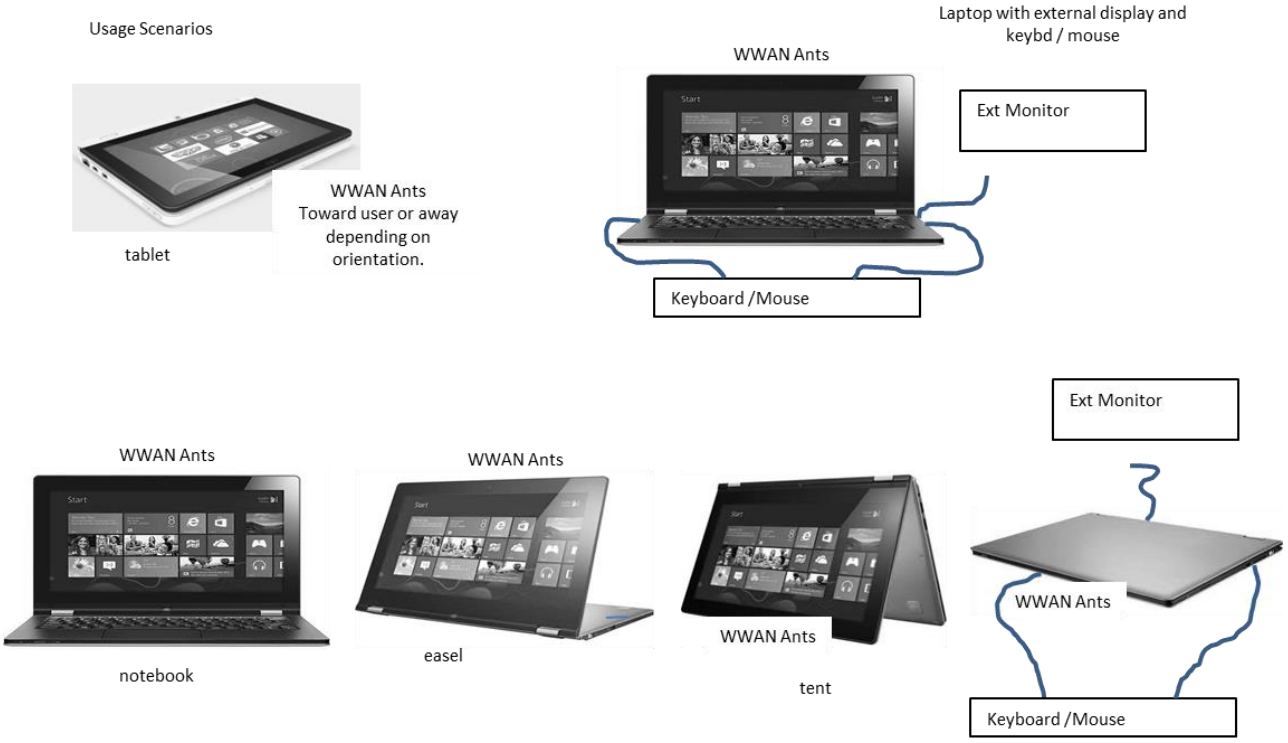




Tablet Mode

Antenna Placement for Z Stack-up





Testing Requirements

Testing Locations

After a review of the usage scenarios displayed above, the following positions were tested for the WLAN radio: right edge, left edge, and back side adjacent to the antennas. Each of these positions was tested with the keyboard folded under the display ("thick tablet mode") or removed from the display ("tablet" or "tent" mode).

The diagonal screen size is greater than 20cm (7.9) inches therefore KDB 941225 is not applicable; instead, KDB 616217 is applicable.

There is no usage model for operation near the head. There are no authorized accessories to wear the device on the body. When used in "tablet mode", only the tablet configurations anticipated by KDB 616217 are applicable. Testing was done with a 0 cm spacing to the phantom.

KDB 447498 D01 General RF Exposure Guidance v05r02 is the FCC's starting point for RF exposure policy. Section 4.3.1, Item #1 provides the SAR test exclusion thresholds for test separation distances ≤ 50mm:

> [(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] * [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where
>
> - f(GHz) is the RF channel transmit frequency in GHz
> - Power and distance are rounded to the nearest mW and mm before calculation
> - The result is rounded to one decimal place for comparison
> - 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below
>
> The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm according to 5) in section 4.1 is applied to determine SAR test exclusion.

Using the formula above, sides or edges with greater than 10 mm (0.4 inches) separation from the Main antenna are excluded from stand-alone SAR testing. Sides or edges with greater than 13 mm (0.5 inches) separation from the Aux antenna are excluded from stand-alone SAR testing.

Maximum Rated Conducted Output Power (mW)	Duty Cycle	Exclusion Threshold	Transmit Frequency (GHz)	Minimum Test Separation (mm)	Minimum Test Separation (inches)	Antenna
16	1	3	2.45	8	0.33	Main
13	1	3	5.2	10	0.38	Main
13	1	3	5.3	10	0.38	Main
11	1	3	5.6	9	0.35	Main
11	1	3	5.8	9	0.35	Main
22	1	3	2.45	12	0.46	Aux
10	1	3	5.2	8	0.30	Aux
10	1	3	5.3	8	0.30	Aux
16	1	3	5.6	13	0.49	Aux
16	1	3	5.8	13	0.49	Aux

The WLAN MAIN antenna is closest to the left side of the display. The WLAN AUX antenna is closest to the right side of the display. The back side of the display can be used next to the torso. Since they are all closer than 12 mm to the antennas, the left and right edges as well as the back side adjacent to the antennas were tested. Each of these positions was tested with the keyboard folded under the display ("thick tablet mode") or removed from the display ("tablet" or "tent mode"). Please see the discussion above regarding usage scenarios.

The bottom edge has greater than 50 mm separation from the antenna and is excluded from SAR testing. The front surface of the tablet is excluded from SAR testing per Section 4.3 of KDB 616217 D04 v01r01.

The highest output power of the Bluetooth radio is equal to 3 mW. Using the formula above, the exclusion threshold is 0.9; therefore it is excluded from stand-alone SAR testing.

Simultaneous Transmission

MIMO measurements for the WLAN are contained in this SAR report. A discussion of the simultaneous transmission of the other co-located radios is found in the SAR report for the WWAN radio.

MIMO Evaluation

The FCC's Guidance for SAR testing of 802.11 a/b/g device is found in KDB 248227. It states:

> "Unless the antennas are spatially separated and SAR distributions do not overlap, when antennas transmit simultaneously in the same frequency band and within the frequency range covered by a single SAR probe calibration point, SAR is generally measured with all applicable antennas transmitting simultaneously at maximum output power in a single SAR measurement."

MIMO SAR evaluations were conducted in the 2.4 and 5 GHz bands to show that with a 30 cm antenna spacing, there were no overlapping SAR regions. The zoom scans of each hot spot were centered on the individual antennas.

Testing Objective:

To demonstrate compliance with the SAR requirements of FCC 2.1093

Scope

The stand-alone SAR evaluation documented in this report is for the 802.11abgnac portion of the EUT.

CONFIGURATIONS

NORTHWEST EMC 2014-12-10

Configuration INTE5597- 1

Software/Firmware Running during test	
Description	**Version**
Windows 10 Pro Technical Review	Beta
DRTU	1.7.5-1078

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Tablet w/Base	Intel Corporation	SKL21-SDS	Tablet: IASY515S0018, Base: IASY514B0073

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Monitor	Samsung	S22C300H	Z6S5HCLF400052R
Optical Mouse	Microsoft	1113	None
AC/DC Adapter (Tablet/Base)	Delta Electronics	ADP-45GE AA	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
HDMI to mDP	Unknown	2.9m	No	Tablet	Monitor
USB (Mouse)	No	1.8m	Yes	Mouse	Tablet/Base
AC Power	No	0.4m	No	AC/DC Adapter (Tablet/Base)	AC Mains
DC Power	No	1.8m	Yes	Tablet w/Base	AC/DC Adapter (Tablet/Base)

CONFIGURATIONS

NORTHWEST EMC 2014-12-10

Configuration INTE5597- 2

Software/Firmware Running during test	
Description	**Version**
Windows 10 Pro Technical Review	Beta
DRTU	1.7.5-1078

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Tablet	Intel Corporation	SKL21-SDS	IASY515S0018

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Monitor	Samsung	S22C300H	Z6S5HCLF400052R
Optical Mouse	Microsoft	1113	None
AC/DC Adapter (Tablet/Base)	Delta Electronics	ADP-45GE AA	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
HDMI to mDP	Unknown	2.9m	No	Tablet	Monitor
USB (Mouse)	No	1.8m	Yes	Mouse	Tablet/Base
AC Power	No	0.4m	No	AC/DC Adapter (Tablet/Base)	AC Mains
DC Power	No	1.8m	Yes	Tablet w/Base	AC/DC Adapter (Tablet/Base)

CONFIGURATIONS

NORTHWEST EMC 2014-12-10

Configuration INTE5597- 3

Software/Firmware Running during test	
Description	**Version**
Windows 10 Pro Technical Review	Beta
DRTU	1.7.5-1078

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Tablet w/Base	Intel Corporation	SKL21-SDS	Tablet: IASY515S0018, Base: IASY514B0073

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Monitor	Samsung	S22C300H	Z6S5HCLF400052R
Optical Mouse	Microsoft	1113	None
AC/DC Adapter (Tablet/Base)	Delta Electronics	ADP-45GE AA	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
HDMI to mDP	Unknown	2.9m	No	Tablet	Monitor
USB (Mouse)	No	1.8m	Yes	Mouse	Tablet/Base
AC Power	No	0.4m	No	AC/DC Adapter (Tablet/Base)	AC Mains
DC Power	No	1.8m	Yes	Tablet w/Base	AC/DC Adapter (Tablet/Base)

CONFIGURATIONS

NORTHWEST EMC 2014-12-10

Configuration INTE5597- 4

Software/Firmware Running during test	
Description	**Version**
Windows 10 Pro Technical Review	Beta
DRTU	1.7.5-1078

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Tablet	Intel Corporation	SKL21-SDS	IASY515S0018

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AC/DC Adapter (Tablet/Base)	Delta Electronics	ADP-45GE AA	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
AC Power	No	0.4m	No	AC/DC Adapter (Tablet/Base)	AC Mains
DC Power	No	1.8m	Yes	Tablet w/Base	AC/DC Adapter (Tablet/Base)

Configuration INTE5597- 5

Software/Firmware Running during test	
Description	**Version**
Windows 10 Pro Technical Review	Beta
DRTU	1.7.5-1078

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Tablet w/Base	Intel Corporation	SKL21-SDS	Tablet: IASY515S0018, Base: IASY514B0073

MODIFICATIONS

NORTHWEST EMC
2014-12-10

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	6/22/2015	SAR Evaluation	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
2	7/13/2015	SAR Evaluation	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

TISSUE – EQUIVALENT LIQUID DESCRIPTION

Characterization of tissue-equivalent liquid dielectric properties

Per IEEE 1528: 2003, Section 5.2.2, the permittivity and conductivity of the tissue material should be measured at least within 24 hours of any full-compliance test. The measured values must be within +/- 5% of the target values. The temperature variation in the liquid during SAR measurements must be within +/- 2 degrees C of that recorded when the dielectric properties were measured.

The dielectric parameters of the tissue-equivalent liquids were measured within 24 hours of the start of testing using the SPEAG DAKS:200 dielectric assessment kit. The dielectric measurements were made across the frequency range of the liquid. The attached data sheets show that the dielectric parameters of the liquid were within the required 5% tolerances.

Target values of dielectric parameters

Per KDB 865664 D01 v01r01, Appendix A.1:

"The head tissue dielectric parameters recommended by IEEE Std 1528-2003 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in a human head. Other head and body tissue parameters that have not been specified in 1528 are derived from tissue dielectric parameters computed from the 4-Cole-Cole equations described above and extrapolated according to the head parameters specified in 1528."

Target Frequency	Head		Body	
(MHz)	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
5800	35.3	5.27	48.2	6.00

(ε_r = relative permittivity, σ = conductivity and ρ = 1000 kg/m^3)

TISSUE – EQUIVALENT LIQUID DESCRIPTION

Composition of Ingredients for Liquid Tissue Phantoms

Northwest EMC uses tissue-equivalent liquids prepared by SPEAG and confirmed by them to be within +/- 5% from the target values. Their recipes for below 3.0 GHz are based upon the following formulations as found in IEEE 1528: 2003, Annex C :

"The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation."

Ingredients (% by weight)	**Frequency (MHz)**									
	450		835		915		1900		2450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7
Dielectric Constant	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.8	52.5
Conductivity (S/m)	0.85	0.83	0.91	0.95	1.0	1.07	1.42	1.45	1.88	1.78

Salt: 99^{+}% Pure Sodium Chloride Sugar: 98^{+}% Pure Sucrose
Water: De-ionized, 16 MΩ^{+} resistivity HEC: Hydroxyethyl Cellulose
DGBE: 99^{+}% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]
Triton X-100 (ultra pure): Polyethylene glycol mono [4-(1,1, 3, 3-tetramethylbutyl)phenyl]ether

Above 3.0 GHz, the SPEAG formulations for the body are based upon IEC 62209-2:2010, Table E.1:

Frequency (MHz)	**4 000**	**5 000**	**5 200**	**5 800**	**6 000**
Recipe source number	4	4	1	1	4
Ingredients (% by weight)					
Deionised water	56	56	65,53	65,53	56
Tween					
Oxidised mineral oil	44	44			44
Diethylenglycol monohexylether			17,24	17,24	
Triton X-100			17,24	17,24	
Diacetin					
DGBE					
NaCl					
Additives and salt					

TISSUE – EQUIVALENT LIQUID

NORTHWEST EMC
WSTE.2013.09.09

Date:	06/18/2015	Temperature:	24°C
Tissue:	Body, MSL501, 5800MHz	Liquid Temperature:	22°C
Tested By:	Luke Richardson	Relative Humidity:	40%
Job Site:	EV08	Bar. Pressure:	1015 mb

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2015 FCC 2.1093:2015	FCC KDB 248227 D01 V02r01 FCC KDB 447498 D01 v05r02 FCC KDB 616217 D04 v01r01 FCC KDB 865664 D01 v01r03 FCC KDB 865664 D02 v01r01 IEEE Std 1528:2013

RESULTS

	Actual Values		Target Values		Deviation (%)	
Frequency (MHz)	Relative Permittivity	Conductivity	Relative Permittivity	Conductivity	Relative Permittivity	Conductivity
5800	47.91	5.782	48.2	6.0	0.6	3.63

Frequency (MHz)	Relative Permittivity	Conductivity
5000	47.86	4.86
5025	47.83	4.898
5050	47.8	4.92
5100	47.81	4.949
5125	47.8	4.98
5175	47.78	5.055
5200	47.67	5.136
5250	47.76	5.26
5275	47.87	5.212
5325	48.05	5.289
5350	47.94	5.362
5400	48.16	5.364
5425	48.07	5.389
5475	47.83	5.389
5500	47.61	5.435
5550	47.38	5.478
5575	47.27	5.526
5625	47.15	5.647
5650	47.25	5.747
5700	47.37	5.896
5725	47.5	5.896
5775	47.67	5.849
5800	47.91	5.782
5850	47.74	5.785
5875	47.58	5.757
5925	47.09	5.781
5950	46.93	5.872
5975	46.68	5.961

TISSUE – EQUIVALENT LIQUID

Date:	06/22/2015	Temperature:	24°C
Tissue:	Body, MSL501, 5800MHz	Liquid Temperature:	22°C
Tested By:	Luke Richardson	Relative Humidity:	40%
Job Site:	EV08	Bar. Pressure:	1015 mb

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2015 FCC 2.1093:2015	FCC KDB 248227 D01 V02r01 FCC KDB 447498 D01 v05r02 FCC KDB 616217 D04 v01r01 FCC KDB 865664 D01 v01r03 FCC KDB 865664 D02 v01r01 IEEE Std 1528:2013

RESULTS

	Actual Values		Target Values		Deviation (%)	
Frequency (MHz)	Relative Permittivity	Conductivity	Relative Permittivity	Conductivity	Relative Permittivity	Conductivity
5800	48.27	5.889	48.2	6.0	-0.15	1.85

Frequency (MHz)	Relative Permittivity	Conductivity
5000	47.64	4.891
5025	47.48	4.932
5050	47.46	4.933
5100	47.35	4.988
5125	47.34	5.017
5175	47.4	5.111
5200	47.45	5.223
5250	47.62	5.277
5275	47.67	5.322
5325	48.16	5.398
5350	48.15	5.426
5400	48	5.464
5425	47.94	5.428
5475	47.51	5.46
5500	47.43	5.479
5550	47.08	5.548
5575	46.87	5.618
5625	46.82	5.787
5650	46.94	5.86
5700	47.17	6.074
5725	47.65	6.073
5775	48.16	5.977
5800	48.27	5.889
5850	48.09	5.788
5875	47.95	5.737
5925	47.47	5.874
5950	47.06	5.932
5975	46.64	5.991

TISSUE – EQUIVALENT LIQUID

Date:	06/24/2015	Temperature:	24°C
Tissue:	Body, MSL501, 5800MHz	Liquid Temperature:	22°C
Tested By:	Luke Richardson	Relative Humidity:	40%
Job Site:	EV08	Bar. Pressure:	1015 mb

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2015 FCC 2.1093:2015	FCC KDB 248227 D01 V02r01 FCC KDB 447498 D01 v05r02 FCC KDB 616217 D04 v01r01 FCC KDB 865664 D01 v01r03 FCC KDB 865664 D02 v01r01 IEEE Std 1528:2013

RESULTS

	Actual Values		Target Values		Deviation (%)	
Frequency (MHz)	Relative Permittivity	Conductivity	Relative Permittivity	Conductivity	Relative Permittivity	Conductivity
5800	46.97	5.965	48.2	6.0	2.55	0.58

Frequency (MHz)	Relative Permittivity	Conductivity
5000	47.58	4.981
5025	47.62	5.038
5050	47.52	5.069
5100	47.53	5.109
5125	47.53	5.126
5175	47.44	5.194
5200	47.47	5.266
5250	47.46	5.385
5275	47.26	5.381
5325	47.61	5.459
5350	47.45	5.485
5400	47.55	5.583
5425	47.42	5.553
5475	47.32	5.608
5500	47.18	5.625
5550	46.92	5.66
5575	46.81	5.694
5625	46.77	5.806
5650	46.72	5.841
5700	46.67	6.018
5725	46.83	6.004
5775	47.11	5.932
5800	46.97	5.965
5850	46.87	5.966
5875	46.84	6.031
5925	46.49	6.06
5950	46.37	6.136
5975	46.06	6.134

TISSUE – EQUIVALENT LIQUID

Date:	06/26/2015	Temperature:	24°C
Tissue:	Body, MSL501, 5800MHz	Liquid Temperature:	22°C
Tested By:	Luke Richardson	Relative Humidity:	40%
Job Site:	EV08	Bar. Pressure:	1015 mb

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2015 FCC 2.1093:2015	FCC KDB 248227 D01 V02r01 FCC KDB 447498 D01 v05r02 FCC KDB 616217 D04 v01r01 FCC KDB 865664 D01 v01r03 FCC KDB 865664 D02 v01r01 IEEE Std 1528:2013

RESULTS

	Actual Values		Target Values		Deviation (%)	
Frequency (MHz)	Relative Permittivity	Conductivity	Relative Permittivity	Conductivity	Relative Permittivity	Conductivity
5800	46.83	5.949	48.2	6.0	2.84	0.85

Frequency (MHz)	Relative Permittivity	Conductivity
5000	47.58	4.839
5025	47.65	4.885
5050	47.59	4.919
5100	47.59	4.979
5125	47.52	5.015
5175	47.46	5.045
5200	47.33	5.138
5250	47.32	5.255
5275	47.51	5.283
5325	47.32	5.391
5350	47.41	5.433
5400	47.37	5.474
5425	47.3	5.478
5475	47.26	5.493
5500	47.13	5.549
5550	47.02	5.569
5575	46.9	5.602
5625	46.68	5.706
5650	46.65	5.797
5700	46.56	5.898
5725	46.7	5.925
5775	46.8	5.841
5800	46.83	5.949
5850	46.77	5.932
5875	46.5	5.881
5925	46.36	5.999
5950	46.05	6
5975	46.04	6.054

TISSUE – EQUIVALENT LIQUID

Date:	06/29/2015	Temperature:	24°C
Tissue:	Body, MSL501, 5800MHz	Liquid Temperature:	22°C
Tested By:	Luke Richardson	Relative Humidity:	40%
Job Site:	EV08	Bar. Pressure:	1015 mb

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2015 FCC 2.1093:2015	FCC KDB 248227 D01 V02r01 FCC KDB 447498 D01 v05r02 FCC KDB 616217 D04 v01r01 FCC KDB 865664 D01 v01r03 FCC KDB 865664 D02 v01r01 IEEE Std 1528:2013

RESULTS

	Actual Values		Target Values		Deviation (%)	
Frequency (MHz)	Relative Permittivity	Conductivity	Relative Permittivity	Conductivity	Relative Permittivity	Conductivity
5800	46.42	6.105	48.2	6.0	3.69	-1.75

Frequency (MHz)	Relative Permittivity	Conductivity
5000	47.27	5.055
5025	47.3	5.108
5050	47.28	5.155
5100	47.12	5.193
5125	47.03	5.211
5175	46.98	5.288
5200	46.87	5.376
5250	46.91	5.426
5275	46.87	5.496
5325	46.98	5.589
5350	46.84	5.673
5400	46.96	5.608
5425	46.89	5.668
5475	46.79	5.732
5500	46.69	5.746
5550	46.46	5.752
5575	46.35	5.791
5625	46.23	5.889
5650	46.19	5.972
5700	46.02	6.153
5725	46.21	6.127
5775	46.36	6.061
5800	46.42	6.105
5850	46.29	6.136
5875	46.12	6.106
5925	45.86	6.178
5950	45.54	6.192
5975	45.51	6.231

TISSUE – EQUIVALENT LIQUID

Date:	06/30/2015	Temperature:	24°C
Tissue:	Body, MSL501, 5800MHz	Liquid Temperature:	22°C
Tested By:	Luke Richardson	Relative Humidity:	40%
Job Site:	EV08	Bar. Pressure:	1015 mb

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2015 FCC 2.1093:2015	FCC KDB 248227 D01 V02r01 FCC KDB 447498 D01 v05r02 FCC KDB 616217 D04 v01r01 FCC KDB 865664 D01 v01r03 FCC KDB 865664 D02 v01r01 IEEE Std 1528:2013

RESULTS

	Actual Values		Target Values		Deviation (%)	
Frequency (MHz)	Relative Permittivity	Conductivity	Relative Permittivity	Conductivity	Relative Permittivity	Conductivity
5800	46.81	5.813	48.2	6.0	2.88	3.12

Frequency (MHz)	Relative Permittivity	Conductivity
5000	47.57	4.892
5025	47.39	4.927
5050	47.45	4.974
5100	47.37	4.994
5125	47.38	5.029
5175	47.26	5.067
5200	47.24	5.15
5250	47.1	5.256
5275	47.22	5.279
5325	47.24	5.324
5350	47.01	5.393
5400	47.28	5.434
5425	47.13	5.435
5475	47.05	5.458
5500	47.02	5.499
5550	46.77	5.546
5575	46.73	5.554
5625	46.59	5.677
5650	46.59	5.741
5700	46.58	5.889
5725	46.74	5.866
5775	46.87	5.842
5800	46.81	5.813
5850	46.76	5.807
5875	46.78	5.868
5925	46.29	5.924
5950	46.14	5.945
5975	46.01	5.991

TISSUE – EQUIVALENT LIQUID

Date:	07/01/2015	Temperature:	24°C
Tissue:	Body, MSL2450, 2450MHz	Liquid Temperature:	22°C
Tested By:	Luke Richardson	Relative Humidity:	40%
Job Site:	EV08	Bar. Pressure:	1015 mb

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2015 FCC 2.1093:2015	FCC KDB 248227 D01 V02r01 FCC KDB 447498 D01 v05r02 FCC KDB 616217 D04 v01r01 FCC KDB 865664 D01 v01r03 FCC KDB 865664 D02 v01r01 IEEE Std 1528:2013

RESULTS

	Actual Values		Target Values		Deviation (%)	
Frequency (MHz)	Relative Permittivity	Conductivity	Relative Permittivity	Conductivity	Relative Permittivity	Conductivity
2450	50.89	1.946	52.7	1.95	3.43	0.21

Frequency (MHz)	Relative Permittivity	Conductivity
2000	52.47	1.362
2050	52.34	1.425
2125	52.16	1.523
2200	51.97	1.622
2275	51.71	1.712
2350	51.35	1.807
2425	50.99	1.909
2450	50.89	1.946
2500	50.72	2.024
2575	50.46	2.135
2650	50.19	2.251
2725	49.76	2.324
2800	49.41	2.426
2875	49.04	2.531
2950	48.75	2.638
3025	48.4	2.739
3100	48.11	2.861
3175	47.87	2.961
3250	47.59	3.063
3325	47.27	3.16
3400	46.92	3.261
3475	46.61	3.352
3550	46.33	3.458
3625	46.07	3.572
3700	45.8	3.688
3775	45.56	3.798
3850	45.33	3.889
3925	45.07	3.974
3975	44.84	4.047

TISSUE – EQUIVALENT LIQUID

NORTHWEST EMC
WSTE.2013.09.09

Date:	07/06/2015	Temperature:	24°C
Tissue:	Body, MSL2450, 2450MHz	Liquid Temperature:	22°C
Tested By:	Luke Richardson	Relative Humidity:	40%
Job Site:	EV08	Bar. Pressure:	1015 mb

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2015 FCC 2.1093:2015	FCC KDB 248227 D01 V02r01 FCC KDB 447498 D01 v05r02 FCC KDB 616217 D04 v01r01 FCC KDB 865664 D01 v01r03 FCC KDB 865664 D02 v01r01 IEEE Std 1528:2013

RESULTS

	Actual Values		Target Values		Deviation (%)	
Frequency (MHz)	Relative Permittivity	Conductivity	Relative Permittivity	Conductivity	Relative Permittivity	Conductivity
2450	51.08	2.022	52.7	1.95	3.07	-3.69

Frequency (MHz)	Relative Permittivity	Conductivity
2000	53.02	1.464
2025	52.91	1.496
2050	52.83	1.529
2100	52.65	1.587
2125	52.51	1.62
2175	52.3	1.688
2200	52.16	1.717
2250	51.91	1.777
2275	51.82	1.802
2325	51.58	1.864
2350	51.49	1.895
2400	51.29	1.959
2425	51.18	1.991
2450	51.08	2.022
2475	50.98	2.055
2500	50.9	2.089
2550	50.72	2.14
2575	50.58	2.172
2625	50.4	2.237
2650	50.3	2.271
2700	50.15	2.332
2725	50.07	2.363
2775	49.85	2.438
2800	49.78	2.471
2850	49.58	2.538
2875	49.48	2.577
2925	49.35	2.642
2950	49.25	2.673
2975	49.16	2.707

TISSUE – EQUIVALENT LIQUID

NORTHWEST EMC
WSTE.2013.09.09

Date:	07/07/2015	Temperature:	24°C
Tissue:	Body, MSL501, 5800MHz	Liquid Temperature:	22°C
Tested By:	Luke Richardson	Relative Humidity:	40%
Job Site:	EV08	Bar. Pressure:	1015 mb

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2015 FCC 2.1093:2015	FCC KDB 248227 D01 V02r01 FCC KDB 447498 D01 v05r02 FCC KDB 616217 D04 v01r01 FCC KDB 865664 D01 v01r03 FCC KDB 865664 D02 v01r01 IEEE Std 1528:2013

RESULTS

	Actual Values		Target Values		Deviation (%)	
Frequency (MHz)	Relative Permittivity	Conductivity	Relative Permittivity	Conductivity	Relative Permittivity	Conductivity
5800	46.34	6.103	48.2	6.0	3.86	-1.72

Frequency (MHz)	Relative Permittivity	Conductivity
4500	47.97	4.456
4550	47.9	4.511
4625	47.78	4.605
4700	47.67	4.697
4775	47.56	4.785
4850	47.48	4.851
4925	47.28	4.96
5000	47.19	5.1
5075	47.16	5.204
5150	47.13	5.236
5225	46.79	5.393
5300	46.83	5.567
5375	46.92	5.693
5450	46.8	5.721
5525	46.65	5.758
5600	46.28	5.862
5675	45.95	6.108
5750	46.1	6.151
5800	46.34	6.103
5825	46.15	6.11
5900	45.91	6.155
5975	45.49	6.328
6050	45.36	6.484
6125	45.45	6.601
6200	45.36	6.695
6275	45.2	6.828
6350	44.95	7
6425	45.06	7.187
6475	44.97	7.211

TISSUE – EQUIVALENT LIQUID

NORTHWEST EMC
WSTE.2013.09.09

Date:	07/09/2015	Temperature:	24°C
Tissue:	Body, MSL501, 5800MHz	Liquid Temperature:	22°C
Tested By:	Luke Richardson	Relative Humidity:	40%
Job Site:	EV08	Bar. Pressure:	1015 mb

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2015 FCC 2.1093:2015	FCC KDB 248227 D01 V02r01 FCC KDB 447498 D01 v05r02 FCC KDB 616217 D04 v01r01 FCC KDB 865664 D01 v01r03 FCC KDB 865664 D02 v01r01 IEEE Std 1528:2013

RESULTS

	Actual Values		Target Values		Deviation (%)	
Frequency (MHz)	Relative Permittivity	Conductivity	Relative Permittivity	Conductivity	Relative Permittivity	Conductivity
5800	47.99	6.191	48.2	6.0	0.44	-3.18

Frequency (MHz)	Relative Permittivity	Conductivity
5000	48.94	5.116
5050	48.92	5.212
5100	48.86	5.256
5150	48.77	5.304
5200	48.58	5.384
5275	48.49	5.528
5325	48.5	5.621
5375	48.41	5.66
5425	48.38	5.713
5475	48.45	5.819
5550	48.16	5.837
5600	48.09	5.897
5650	47.89	6.049
5700	47.85	6.146
5775	48.09	6.127
5800	47.99	6.191
5825	47.84	6.153
5875	47.81	6.145
5925	47.44	6.258
5975	47.26	6.339
6050	47.1	6.541
6100	47.24	6.605
6150	47.28	6.679
6200	47.09	6.75
6275	46.92	6.907
6325	46.91	7.033
6375	46.74	7.165
6425	46.86	7.202
6475	46.76	7.205

TISSUE – EQUIVALENT LIQUID

NORTHWEST EMC
WSTE.2013.09.09

Date:	07/13/2015	Temperature:	24°C
Tissue:	Body, MSL501, 5800MHz	Liquid Temperature:	22°C
Tested By:	Luke Richardson	Relative Humidity:	40%
Job Site:	EV08	Bar. Pressure:	1015 mb

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2015 FCC 2.1093:2015	FCC KDB 248227 D01 V02r01 FCC KDB 447498 D01 v05r02 FCC KDB 616217 D04 v01r01 FCC KDB 865664 D01 v01r03 FCC KDB 865664 D02 v01r01 IEEE Std 1528:2013

RESULTS

	Actual Values		Target Values		Deviation (%)	
Frequency (MHz)	Relative Permittivity	Conductivity	Relative Permittivity	Conductivity	Relative Permittivity	Conductivity
5800	47.81	5.936	48.2	6.0	0.81	1.07

Frequency (MHz)	Relative Permittivity	Conductivity
5000	47.59	4.959
5050	47.3	5.06
5100	47.24	5.102
5150	47.15	5.141
5200	47.14	5.28
5275	47.54	5.428
5325	47.8	5.522
5375	48.04	5.492
5425	47.8	5.514
5475	47.35	5.511
5550	46.86	5.59
5600	46.6	5.747
5650	46.57	5.93
5700	46.8	6.109
5775	47.58	5.989
5800	47.81	5.936
5825	47.83	5.915
5875	47.54	5.814
5925	46.98	5.954
5975	46.29	6.045
6050	45.73	6.331
6100	45.8	6.522
6150	46.08	6.584
6200	46.17	6.621
6275	46.4	6.795
6325	46.42	6.868
6375	45.98	6.954
6425	45.69	7.015
6475	45.44	7.067

TISSUE – EQUIVALENT LIQUID

NORTHWEST EMC
WSTE.2013.09.09

Date:	07/14/2015	Temperature:	24°C
Tissue:	Body, MSL2450, 2450MHz	Liquid Temperature:	22°C
Tested By:	Luke Richardson	Relative Humidity:	40%
Job Site:	EV08	Bar. Pressure:	1015 mb

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2015 FCC 2.1093:2015	FCC KDB 248227 D01 V02r01 FCC KDB 447498 D01 v05r02 FCC KDB 616217 D04 v01r01 FCC KDB 865664 D01 v01r03 FCC KDB 865664 D02 v01r01 IEEE Std 1528:2013

RESULTS

	Actual Values		Target Values		Deviation (%)	
Frequency (MHz)	Relative Permittivity	Conductivity	Relative Permittivity	Conductivity	Relative Permittivity	Conductivity
2450	50.96	2.003	52.7	1.95	3.3	-2.72

Frequency (MHz)	Relative Permittivity	Conductivity
2000	52.43	1.476
2025	52.28	1.507
2050	52.18	1.538
2100	52.01	1.594
2125	51.91	1.622
2175	51.77	1.679
2200	51.7	1.705
2250	51.57	1.754
2275	51.52	1.776
2325	51.38	1.829
2350	51.32	1.86
2400	51.16	1.928
2425	51.04	1.965
2450	50.96	2.003
2475	50.87	2.042
2500	50.81	2.083
2550	50.73	2.155
2575	50.62	2.196
2625	50.52	2.279
2650	50.45	2.318
2700	50.16	2.377
2725	50.07	2.411
2775	49.81	2.49
2800	49.7	2.526
2850	49.42	2.601
2875	49.29	2.643
2925	49.06	2.719
2950	48.93	2.755
2975	48.8	2.792

SAR SYSTEM VERIFICATION DESCRIPTION

NORTHWEST EMC 2015.04.23

REQUIREMENT

Per IEEE 1528, Section 8.2.1, “System checks are performed prior to compliance tests and the results must always be within ± 10% of the target value corresponding to the test frequency, liquid, and the source used. The target values are 1 g or 10 g averaged SAR values measured on systems having current system validation and calibration status, and using the system check setup as shown in Figure 14. These target values should be determined using a standard source.”

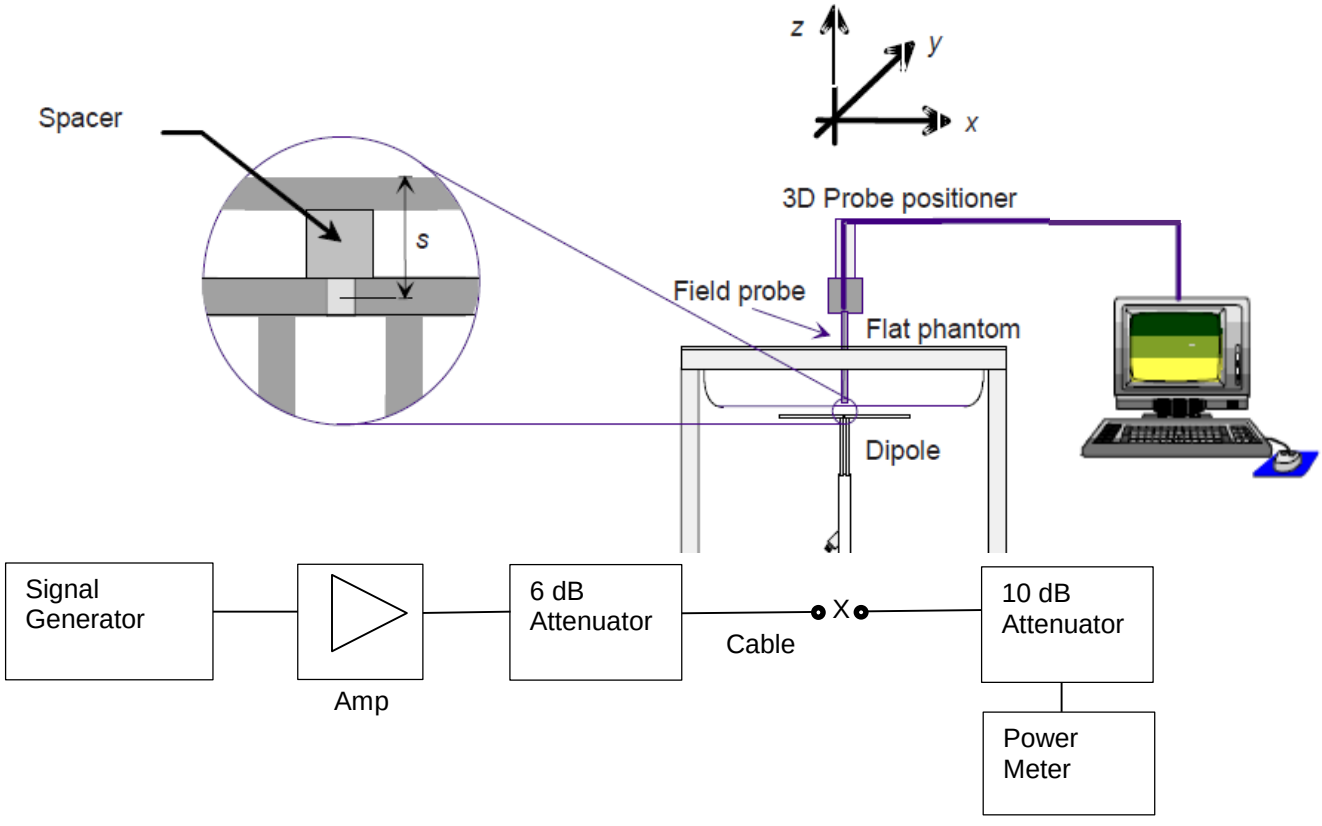
TEST DESCRIPTION

Within 24 hours of a measurement, then every 72 hours thereafter, Northwest EMC used the system validation kit (calibrated reference dipole) to test whether the system was operating within its specifications. The validation was performed in the indicated bands by making SAR measurements of the reference dipole with the phantom filled with the tissue-equivalent liquid. First, a signal generator and power amplifier were used to produce a 100mW level as measured with a power meter at the antenna terminals of the dipole (X). Then, the reference dipole was positioned below the bottom of the phantom and centered with its axis parallel to the longest side of the phantom. A low loss and low relative permittivity spacer was used to establish the correct distance between the center axis of the reference dipole and the liquid.

For the reference dipoles, the spacing distance s is given by:

s = 15mm, +/- 0.2mm for 300MHz ≤ f ≥ 1000 MHz:
s = 10mm, +/- 0.2mm for 1000MHz ≤ f ≥ 6000MHz

The measured 1 g and 10 g spatial average SAR values were normalized to a 1W dipole input power for comparison to the calibration data. The results are summarized in the attached table. The deviation is less than 10% in all cases, indicating that the system performance check was within tolerance.



SAR SYSTEM VERIFICATION

NORTHWEST EMC
WSSV.2013.09.09

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2015 FCC 2.1093:2015	FCC KDB 248227 D01 V02r01 FCC KDB 447498 D01 v05r02 FCC KDB 616217 D04 v01r01 FCC KDB 865664 D01 v01r03 FCC KDB 865664 D02 v01r01 IEEE Std 1528:2013

RESULTS

Date	Liquid part number and frequency	Conducted Power into the Dipole (dBm)	Correction Factor	Measured		Normalized to 1W		Target (Normalized to 1W) Get from Dipole Calibration Certificate		% Difference	
				1g	10g	1g	10g	1g	10g	1g	10g
6/19/2015	HSL 501 (5200 MHz)	18.87	12.97	5.92	1.68	76.78	21.79	77.00	21.40	-0.29	1.82
6/25/2015	MSL 501 (5500 MHz)	18.62	13.74	6.18	1.73	84.91	23.77	82.40	22.90	3.05	3.80
7/1/2015	MSL 501 (5800 MHz)	17.43	18.07	4.07	1.14	73.54	20.60	77.60	21.40	-5.23	-3.74
7/1/2015	MSL 2450 (2450 MHz)	20.00	10.00	4.84	2.26	48.40	22.60	50.60	23.70	-4.35	-4.64

SAR SYSTEM VERIFICATION

NORTHWEST EMC
WSSV.2013.09.09

Tested By:	Ethan Schoonover and Luke Richardson	Room Temperature (°C):	24.1°C
Date:	6/19/2015	Liquid Temperature (°C):	22.2°C
Configuration:		Humidity (%RH):	41.1%
		Bar. Pressure (mb):	1019.2 mb

MSL501 5200, 6-19-2015 System Checks
DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:xxx
Communication System: UID 10000, CW; Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5200 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 5200 MHz; σ = 5.135 S/m; ε_r = 47.67; ρ = 1000 kg/m^3 , Medium parameters used: σ = 0 S/m, ε_r = 1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

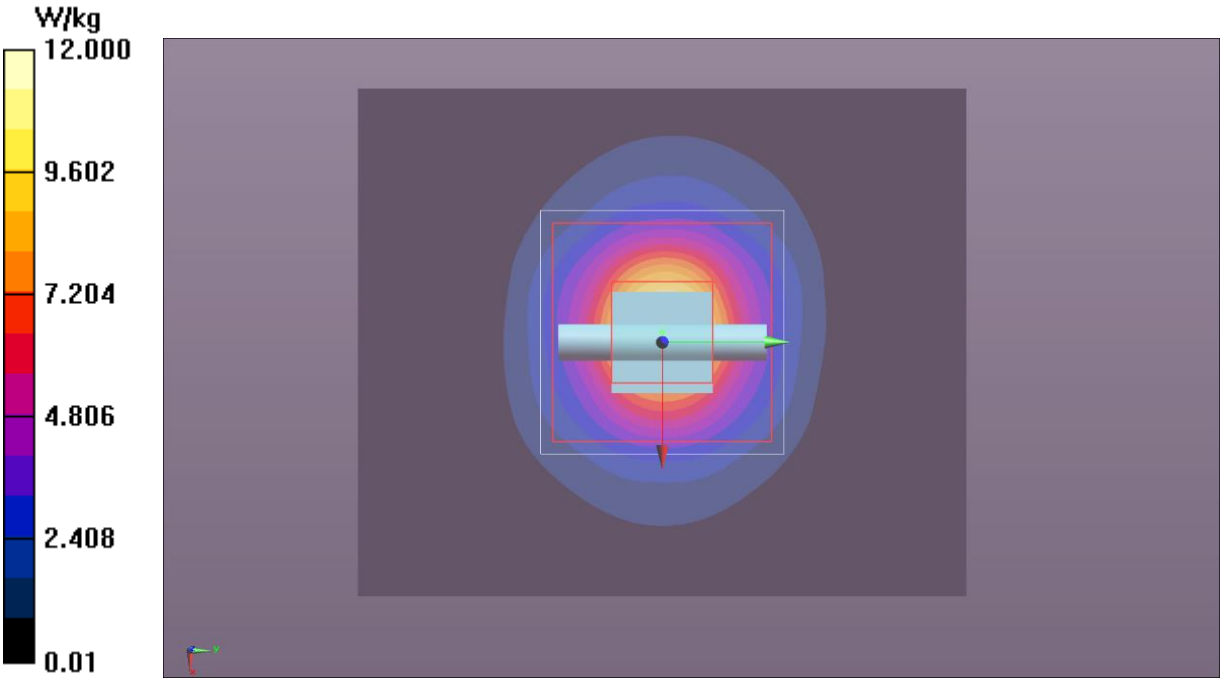
System Check/System Check - Low Channel/Zoom Scan (7x9x7) (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 53.86 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 22.8 W/kg
SAR(1 g) = 5.92 W/kg; SAR(10 g) = 1.68 W/kg
Maximum value of SAR (measured) = 12.4 W/kg

System Check/System Check - Low Channel/Area Scan (51x61x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 12.9 W/kg

System Check/System Check - Low Channel/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of Total (measured) = 23.67 V/m
Maximum value of SAR (measured) = 2.88 W/kg

Approved By

MSL501 5200 6-19-2015



SAR SYSTEM VERIFICATION

NORTHWEST EMC
WSSV.2013.09.09

Tested By:	Ethan Schoonover and Luke Richardson	Room Temperature (°C):	24.4°C
Date:	6/25/2015	Liquid Temperature (°C):	21.7°C
Configuration:		Humidity (%RH):	42.3%
		Bar. Pressure (mb):	1020 mb

MSL 501 5500, 5-25-15
DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:xxx
Communication System: UID 10000, CW; Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5500 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 5500 MHz; σ = 5.625 S/m; ε_r = 47.175; ρ = 1000 kg/m^3 , Medium parameters used: σ = 0 S/m, ε_r = 1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

System Check/System Check - Mid Channel/Area Scan (51x61x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 14.0 W/kg

System Check/System Check - Mid Channel/Zoom Scan (7x9x7) (9x9x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 54.10 V/m; Power Drift = -0.15 dB
Peak SAR (extrapolated) = 25.1 W/kg
SAR(1 g) = 6.18 W/kg; SAR(10 g) = 1.73 W/kg
Maximum value of SAR (measured) = 13.3 W/kg

System Check/System Check - Mid Channel/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of Total (measured) = 22.12 V/m
Maximum value of SAR (measured) = 2.75 W/kg

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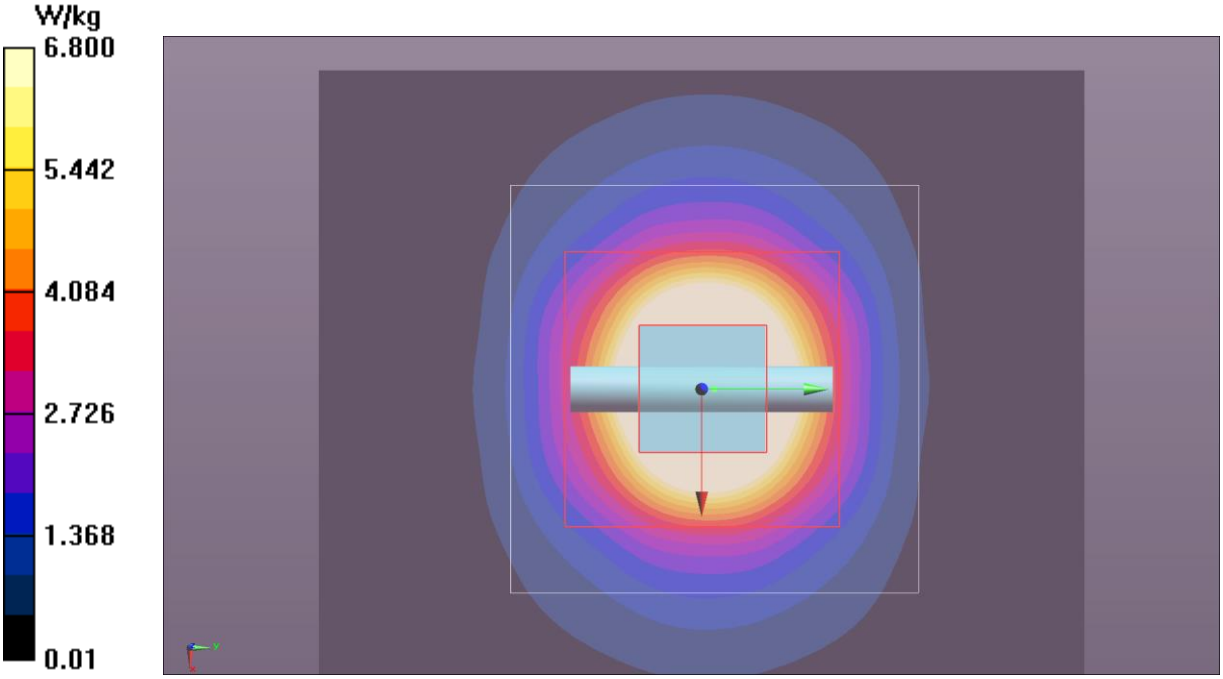
MSL 501 5500, 5-25-15



SAR SYSTEM VERIFICATION

NORTHWEST EMC
WSSV.2013.09.09

Tested By:	Ethan Schoonover and Luke Richardson	Room Temperature (°C):	23.8°C
Date:	7/1/2015	Liquid Temperature (°C):	22.4°C
Configuration:		Humidity (%RH):	44.8%
		Bar. Pressure (mb):	1015.7 mb

MSL 501 5800, 7-1-15
DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:xxx
Communication System: UID 10000, CW; Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5800 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 5800 MHz; σ = 5.812 S/m; ε_r = 46.812; ρ = 1000 kg/m^3 , Medium parameters used: σ = 0 S/m, ε_r = 1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

System Check/System Check - High Channel/Area Scan (51x61x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 8.84 W/kg

System Check/System Check - High Channel/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of Total (measured) = 14.11 V/m

System Check/System Check - High Channel/Zoom Scan (7x9x7) (9x9x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 34.60 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 17.3 W/kg
SAR(1 g) = 4.07 W/kg; SAR(10 g) = 1.14 W/kg
Maximum value of SAR (measured) = 8.81 W/kg
Maximum value of SAR (measured) = 1.16 W/kg

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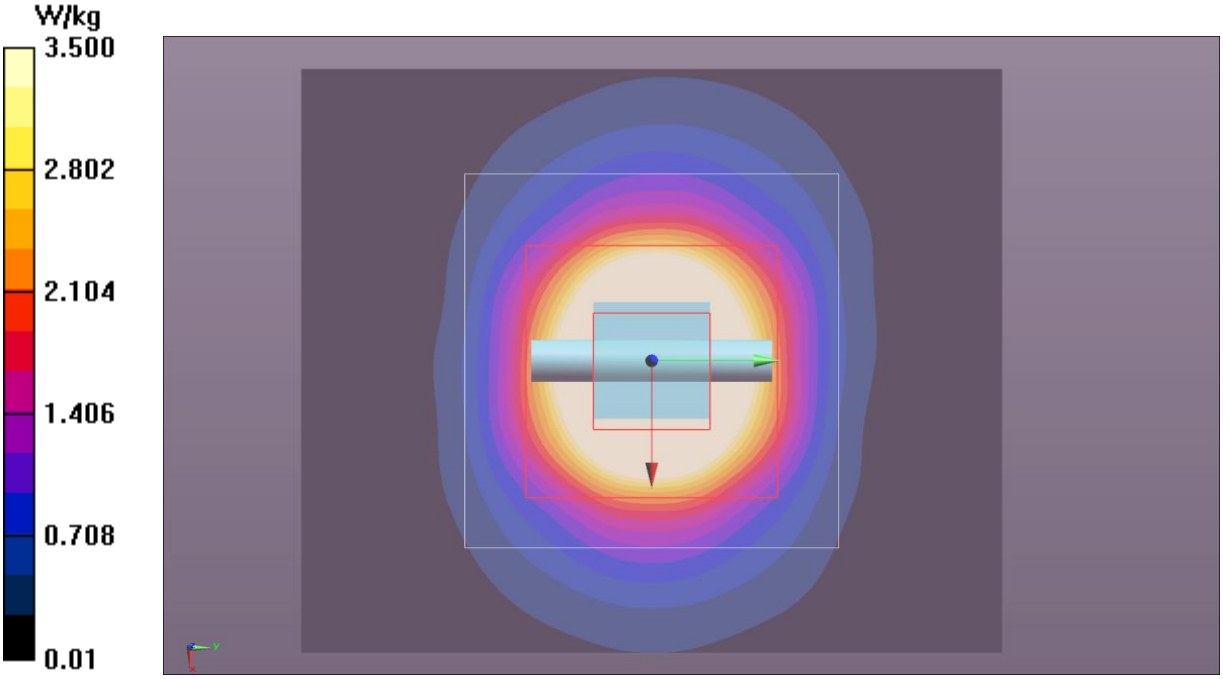
MSL 501 5800, 7-1-15



SAR SYSTEM VERIFICATION

NORTHWEST EMC
WSSV.2013.09.09

Tested By:	Carl Engholm	Room Temperature (°C):	23.2°C
Date:	7/1/2015	Liquid Temperature (°C):	22°C
Configuration:	Body	Humidity (%RH):	43%
		Bar. Pressure (mb):	1011 mb

MSL2450 System Check, 7-1-15
DUT: Dipole 2450 MHz D2450V2; Type: D2450V2; Serial: D2450V2 - SN:ADL
Communication System: UID 10000, CW; Communication System Band: D2450 (2450.0 MHz); Frequency: 2450 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 2450 MHz; σ = 1.946 S/m; ε_r = 50.887; ρ = 1000 kg/m^3 , Medium parameters used: σ = 0 S/m, ε_r = 1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

System Check/System Check/Area Scan (51x61x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 5.12 W/kg

System Check/System Check/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of Total (measured) = 51.97 V/m

System Check/System Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 49.82 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 9.59 W/kg
SAR(1 g) = 4.84 W/kg; SAR(10 g) = 2.26 W/kg
Maximum value of SAR (measured) = 4.86 W/kg
Maximum value of SAR (measured) = 5.26 W/kg

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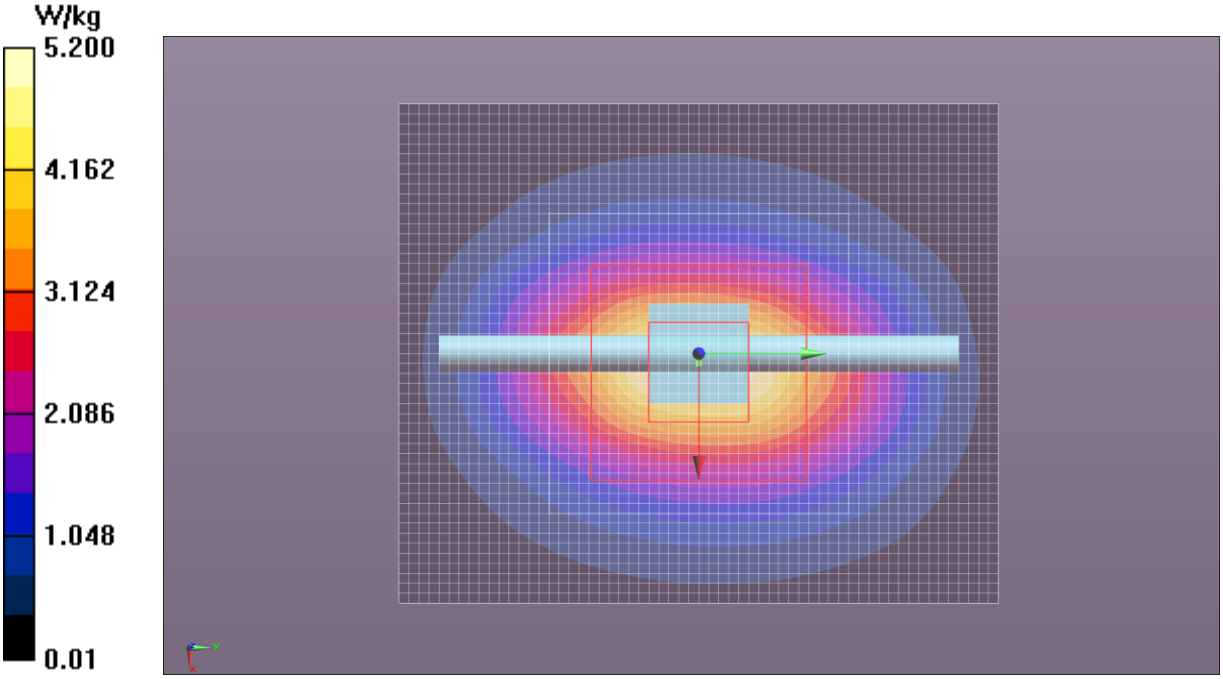
MSL2450 System Check, 7-1-15



OUTPUT POWER DESCRIPTION

2.4 AND 5 GHz Bands

Per FCC KDB 248227, the conducted output power was measured at the lowest, a middle, and highest channel in each band. Measurements were made while the EUT transmitted at the lowest, middle and the highest data rates for each channel.

Per FCC KDB 248227, among the channels required for normal testing, SAR was measured on the highest output channel. When the SAR measured on the highest output channel was >0.8 W/kg, SAR evaluation for the other required test channels was necessary.

When the measured SAR exceeded the desired level, the output power was lowered and the SAR re-measured. The output power for those lowered channels was re-measured. See “Output Power Data – Reduced Power Levels”.

Output power measurements are on the following pages.

OUTPUT POWER DATA

EUT:	SKL21-SDS	Work Order:	INTE5597
Serial Number:	IASY515S0018	Date:	7/2/2015
Customer:	Intel Corporation	Temperature:	23.5°C
Attendees:	Mike Lowe	Relative Humidity:	42%
Customer Project:	None	Bar. Pressure:	1005 mb
Tested By:	Luke Richardson	Job Site:	EV03
Power:	110VAC/60Hz	Configuration:	INTE5597-1

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2015 FCC 2.1093:2015	FCC KDB 248227 D01 V02r01 FCC KDB 447498 D01 v05r02 FCC KDB 616217 D04 v01r01 FCC KDB 865664 D01 v01r03 FCC KDB 865664 D02 v01r01 IEEE Std 1528:2013

COMMENTS

Conducted output power.

DEVIATIONS FROM TEST STANDARD

None

RESULTS

20MHz Bandwidth

Channel	Frequency (MHz)	Radio Mode	Data Rate (Mbps)	Modulation	Software Power Setting	Main Antenna dBm	Main Antenna mW	Software Power Setting	Aux Antenna dBm	Aux Antenna mW
1	2412	802.11b	1	BPSK	13.54	11.1	12.882	15 CCK	12.9	19.498
			11	CCK	13.54	10.9	12.303	15 CCK	13.2	20.893
		802.11g	6	OFDM	12.5	10.9	12.303	13 OFDM	11.4	13.804
			54	OFDM	12.5	10.5	11.220	13 OFDM	11.1	12.882
		802.11n	MCS0	OFDM	12.5	10.3	10.715	13 OFDM	11.4	13.804
			MCS7	OFDM	12.5	9.9	9.772	13 OFDM	11.0	12.589
			MCS8	OFDM	12	9.1	8.128	10.5 OFDM	8.7	7.413
			MCS15	OFDM	12	9.0	7.943	10.5 OFDM	8.2	6.607

OUTPUT POWER DATA

NORTHWEST EMC
WSTD.2013.09.09

20MHz Bandwidth

Channel	Frequency (MHz)	Radio Mode	Data Rate (Mbps)	Modulation	Software Power Setting	Main Antenna dBm	Main Antenna mW	Software Power Setting	Aux Antenna dBm	Aux Antenna mW
6	2437	802.11b	1	BPSK	13.54	12.1	16.218	16 CCK	14.4	27.542
			11	CCK	13.54	11.9	15.488	16 CCK	14.2	26.303
		802.11g	6	OFDM	13.54	12.2	16.596	16 OFDM	14.1	25.704
			54	OFDM	13.54	11.8	15.136	16 OFDM	13.8	23.988
		802.11n	MCS0	OFDM	13.54	12.0	15.849	16 OFDM	14.0	25.119
			MCS7	OFDM	13.54	11.6	14.454	16 OFDM	13.6	22.909
			MCS8	OFDM	13.54	11.3	13.490	16 OFDM	13.3	21.380
			MCS15	OFDM	13.54	11.1	12.882	16 OFDM	13.2	20.893
11	2462	802.11b	1	BPSK	13.54	12.7	18.621	15 CCK	13.6	22.909
			11	CCK	13.54	12.6	18.197	15 CCK	13.3	21.380
		802.11g	6	OFDM	11	10.7	11.749	11 OFDM	9.6	9.120
			54	OFDM	11	10.3	10.715	11 OFDM	9.3	8.511
		802.11n	MCS0	OFDM	11	10.6	11.482	11 OFDM	9.5	8.913
			MCS7	OFDM	11	10.2	10.471	11 OFDM	9.1	8.128
			MCS8	OFDM	10.5	9.8	9.550	10.5 OFDM	8.3	8.400
			MCS15	OFDM	10.5	9.4	8.710	10.5 OFDM	8.3	6.761

OUTPUT POWER DATA

NORTHWEST EMC
WSTD.2013.09.09

40MHz Bandwidth

Channel	Frequency (MHz)	Radio Mode	Data Rate (Mbps)	Modulation	Software Power Setting	Main Antenna dBm	Main Antenna mW	Software Power Setting	Aux Antenna dBm	Aux Antenna mW
3F	2422	802.11n	MCS0	BPSK	12	10.0	10.000	12.000	10.3	10.715
			MCS7	64-QAM	12	9.7	9.333	12.000	9.7	9.333
			MCS8	BPSK	8	5.3	3.388	8.000	6.0	3.981
			MCS15	64-QAM	8	4.9	3.090	8.000	5.2	3.311
7F	2442	802.11n	MCS0	OFDM	13	11.6	14.454	12.000	10.2	10.471
			MCS7	OFDM	13	11.0	12.589	12.000	9.8	9.550
			MCS8	OFDM	11	9.0	7.943	8.000	6.1	4.074
			MCS15	OFDM	11	8.7	7.413	8.000	5.3	3.388
11F	2462	802.11n	MCS0	OFDM	0	-0.4	0.912	0.000	-1.7	0.676
			MCS7	OFDM	0	-1.1	0.776	0.000	-2.3	0.586
			MCS8	OFDM	0	-1.3	0.741	0.000	-2.2	0.603
			MCS15	OFDM	0	-2.2	0.603	0.000	-3.0	0.501

Tested By

OUTPUT POWER DATA

NORTHWEST EMC
WSTD.2013.09.09

20MHz Bandwidth

Channel	Frequency (MHz)	Radio Mode	Data Rate (Mbps)	Modulation	Software Power Setting	Main Antenna dBm	Main Antenna mW	Software Power Setting	Aux Antenna dBm	Aux Antenna mW
36	5180	802.11a	6	BPSK	11.02	13.4	6.981	11.000	15.2	33.113
			54	64-QAM	11.02	13.0	19.953	12.500	15.4	34.674
		802.11n	MCS7	64-QAM	11.02	12.6	18.197	12.500	15.2	33.113
			MCS15	64-QAM	10	10.0	10.000	10.000	11.2	13.183
		802.11ac (SISO)	MCS0	64-QAM	11.02	12.9	19.498	12.500	15.4	34.674
			MCS08	256-QAM	11.02	12.4	17.378	12.500	15.0	31.623
		802.11ac (MIMO)	MCS0	64-QAM	10	11.3	13.490	10.000	12.4	17.378
			MCS08	256-QAM	10	10.9	12.303	10.000	11.9	15.488
40	5200	802.11a	6	BPSK	11.02	13.0	19.953	12.500	16.6	45.709
			54	64-QAM	11.02	12.6	18.197	13.500	17.1	51.286
		802.11n	MCS7	64-QAM	11.02	12.4	17.378	13.500	16.7	46.774
			MCS15	64-QAM	10	10.0	10.000	10.000	11.8	15.136
		802.11ac (SISO)	MCS0	64-QAM	11.02	12.8	19.055	13.500	17.0	50.119
			MCS08	256-QAM	11.02	12.4	17.378	13.500	16.5	44.668
		802.11ac (MIMO)	MCS0	64-QAM	10	11.2	13.183	10.000	12.5	17.783
			MCS08	256-QAM	10	10.7	11.749	10.000	12.1	16.218
44	5220	802.11a	6	BPSK	11.02	13.0	19.953	13.500	17.1	51.286
			54	64-QAM	11.02	12.7	18.621	13.500	16.9	48.978
		802.11n	MCS7	64-QAM	11.02	12.4	17.378	13.500	16.7	46.774
			MCS15	64-QAM	10	10.5	11.220	10.000	12.1	16.218
		802.11ac (SISO)	MCS0	64-QAM	11.02	13.2	20.893	13.500	17.1	51.286
			MCS08	256-QAM	11.02	12.8	19.055	13.500	16.6	45.709
		802.11ac (MIMO)	MCS0	64-QAM	10	10.8	12.023	10.000	13.1	20.417
			MCS08	256-QAM	10	10.3	10.715	10.000	13.0	19.953
48	5240	802.11a	6	BPSK	11.02	13.5	22.387	12.500	16.6	45.499
			54	64-QAM	11.02	13.2	20.893	13.500	17.1	51.286
		802.11n	MCS7	64-QAM	11.02	13.1	20.417	13.500	16.9	48.978
			MCS15	64-QAM	10	10.3	10.715	10.000	12.3	16.982
		802.11ac (SISO)	MCS0	64-QAM	11.02	13.4	21.878	13.500	17.0	50.119
			MCS08	256-QAM	11.02	13.0	19.953	13.500	16.5	44.668
		802.11ac (MIMO)	MCS0	64-QAM	10	11.1	12.882	10.000	12.5	17.783
			MCS08	256-QAM	10	10.5	11.220	10.000	12.3	16.982

OUTPUT POWER DATA

NORTHWEST EMC
WSTD.2013.09.09

20MHz Bandwidth

Channel	Frequency (MHz)	Radio Mode	Data Rate (Mbps)	Modulation	Software Power Setting	Main Antenna dBm	Main Antenna mW	Software Power Setting	Aux Antenna dBm	Aux Antenna mW
52	5260	802.11a	6	BPSK	11.02	13.7	23.442	11.500	15.5	35.563
			54	64-QAM	11.02	13.1	20.417	14.200	17.3	53.703
		802.11n	MCS7	64-QAM	11.02	13.3	21.380	14.200	17.2	52.481
			MCS15	64-QAM	12	12.1	16.218	12.000	14.8	30.200
		802.11ac (SISO)	MCS0	64-QAM	11.02	13.2	20.893	14.200	17.5	56.234
			MCS08	256-QAM	11.02	12.9	19.498	14.200	17.1	51.286
		802.11ac (MIMO)	MCS0	64-QAM	12	13.2	20.893	12.000	14.5	28.184
			MCS08	256-QAM	12	12.8	19.055	12.000	14.3	26.915
56	5280	802.11a	6	BPSK	11.02	14.1	25.704	14.200	17.0	50.119
			54	64-QAM	11.02	13.4	21.878	14.200	16.6	45.709
		802.11n	MCS7	64-QAM	11.02	13.7	23.442	14.200	16.9	48.978
			MCS15	64-QAM	12	13.7	23.442	12.000	13.8	23.988
		802.11ac (SISO)	MCS0	64-QAM	11.02	13.6	22.909	14.200	17.5	56.234
			MCS08	256-QAM	11.02	13.2	20.893	14.200	16.7	46.774
		802.11ac (MIMO)	MCS0	64-QAM	12	13.6	22.909	12.000	14.6	28.840
			MCS08	256-QAM	10	13.1	20.417	12.000	14.0	25.119
60	5300	802.11a	6	BPSK	11.02	14.4	27.542	11.000	15.1	32.584
			54	64-QAM	11.02	14.1	25.704	14.200	16.6	45.709
		802.11n	MCS7	64-QAM	11.02	13.9	24.547	14.200	16.4	43.652
			MCS15	64-QAM	12	13.2	20.893	12.000	13.7	23.442
		802.11ac (SISO)	MCS0	64-QAM	11.02	14.0	25.119	14.200	16.8	47.863
			MCS08	256-QAM	11.02	13.5	22.387	14.200	16.4	43.652
		802.11ac (MIMO)	MCS0	64-QAM	12	13.9	24.547	12.000	14.2	26.303
			MCS08	256-QAM	12	13.4	21.878	12.000	13.6	22.909
64	5320	802.11a	6	BPSK	11.02	13.7	23.442	11.000	14.7	29.512
			54	64-QAM	11.02	13.3	21.380	12.000	14.4	27.542
		802.11n	MCS7	64-QAM	11.02	13.2	20.893	12.000	14.4	27.542
			MCS15	64-QAM	10	11.0	12.589	10.000	11.3	13.490
		802.11ac (SISO)	MCS0	64-QAM	11.02	14.0	25.119	12.000	14.6	28.840
			MCS08	256-QAM	11.02	13.7	23.442	12.000	14.2	26.303
		802.11ac (MIMO)	MCS0	64-QAM	10	12.5	17.783	10.000	11.6	14.454
			MCS08	256-QAM	10	11.5	14.125	10.000	11.5	14.125

OUTPUT POWER DATA

NORTHWEST EMC
WSTD.2013.09.09

20MHz Bandwidth

Channel	Frequency (MHz)	Radio Mode	Data Rate (Mbps)	Modulation	Software Power Setting	Main Antenna dBm	Main Antenna mW	Software Power Setting	Aux Antenna dBm	Aux Antenna mW
100	5500	802.11a	6	BPSK	11.02	14.4	27.542	12.000	15.1	32.359
			54	64-QAM	11.02	14.0	25.119	12.000	14.8	30.200
		802.11n	MCS7	64-QAM	11.02	13.9	24.547	12.000	14.6	28.840
			MCS15	64-QAM	9	11.5	14.125	9.000	11.2	13.183
		802.11ac (SISO)	MCS0	64-QAM	11.02	14.2	26.303	12.000	15.4	34.674
			MCS08	256-QAM	11.02	13.8	23.988	12.000	15.0	31.623
		802.11ac (MIMO)	MCS0	64-QAM	9	11.0	12.589	9.000	12.0	15.849
			MCS08	256-QAM	9	10.8	12.023	9.000	11.3	13.490
104	5520	802.11a	6	BPSK	11.02	14.8	30.200	14.200	16.9	48.978
			54	64-QAM	11.02	14.4	27.542	14.200	16.5	44.668
		802.11n	MCS7	64-QAM	11.02	14.0	25.119	14.200	16.3	42.658
			MCS15	64-QAM	13	15.6	36.308	13.000	14.3	26.915
		802.11ac (SISO)	MCS0	64-QAM	11.02	14.2	26.303	14.200	17.0	50.119
			MCS08	256-QAM	11.02	13.9	24.547	14.200	16.6	45.709
		802.11ac (MIMO)	MCS0	64-QAM	13	15.9	38.905	13.000	15.6	36.308
			MCS08	256-QAM	13	15.4	34.674	13.000	15.1	32.359
108	5540	802.11a	6	BPSK	11.02	14.4	27.542	14.200	16.5	44.668
			54	64-QAM	11.02	14.1	25.704	14.200	16.1	40.738
		802.11n	MCS7	64-QAM	11.02	13.9	24.547	14.200	16.3	42.658
			MCS15	64-QAM	13	15.6	36.308	13.000	14.5	28.184
		802.11ac (SISO)	MCS0	64-QAM	11.02	14.3	26.915	14.200	16.7	46.774
			MCS08	256-QAM	11.02	13.9	24.547	14.200	16.3	42.658
		802.11ac (MIMO)	MCS0	64-QAM	13	15.7	37.154	13.000	15.0	31.623
			MCS08	256-QAM	13	15.2	33.113	13.000	14.8	30.200
112	5560	802.11a	6	BPSK	11.02	14.9	30.903	14.200	16.5	44.668
			54	64-QAM	11.02	14.6	28.840	14.200	16.2	41.687
		802.11n	MCS7	64-QAM	11.02	14.5	28.184	14.200	16.0	39.811
			MCS15	64-QAM	13	15.6	36.308	13.000	14.1	25.704
		802.11ac (SISO)	MCS0	64-QAM	11.02	14.7	29.512	14.200	16.8	47.863
			MCS08	256-QAM	11.02	14.0	25.119	14.200	16.4	43.652
		802.11ac (MIMO)	MCS0	64-QAM	13	16.0	39.811	13.000	14.9	30.903
			MCS08	256-QAM	13	15.5	35.481	13.000	14.4	27.542

OUTPUT POWER DATA

NORTHWEST EMC
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20MHz Bandwidth

Channel	Frequency (MHz)	Radio Mode	Data Rate (Mbps)	Modulation	Software Power Setting	Main Antenna dBm	Main Antenna mW	Software Power Setting	Aux Antenna dBm	Aux Antenna mW
116	5580	802.11a	6	BPSK	11.02	15.5	35.481	14.200	16.2	41.687
			54	64-QAM	11.02	14.4	27.542	14.200	15.8	38.019
		802.11n	MCS7	64-QAM	11.02	14.3	26.915	14.200	15.7	37.154
			MCS15	64-QAM	13	15.4	34.674	13.000	13.9	24.547
		802.11ac (SISO)	MCS0	64-QAM	11.02	14.3	26.915	14.200	16.0	39.811
			MCS08	256-QAM	11.02	13.8	23.988	14.200	15.6	36.308
		802.11ac (MIMO)	MCS0	64-QAM	13	14.5	28.184	12.000	14.2	26.303
			MCS08	256-QAM	13	15.3	33.884	13.000	14.1	25.704
132	5660	802.11a	6	BPSK	11.02	14.2	26.303	14.200	15.9	38.905
			54	64-QAM	11.02	13.9	24.547	14.200	15.6	36.308
		802.11n	MCS7	64-QAM	11.02	13.8	23.988	14.200	15.0	31.623
			MCS15	64-QAM	13	14.8	30.200	13.000	13.3	21.380
		802.11ac (SISO)	MCS0	64-QAM	11.02	14.1	25.704	14.200	16.4	43.652
			MCS08	256-QAM	11.02	13.4	21.878	14.200	15.3	33.884
		802.11ac (MIMO)	MCS0	64-QAM	13	15.2	33.113	13.000	14.0	25.119
			MCS08	256-QAM	13	14.6	28.840	13.000	13.4	21.878
136	5680	802.11a	6	BPSK	11.02	14.3	26.915	14.200	15.6	36.308
			54	64-QAM	11.02	13.9	24.547	14.200	15.2	33.113
		802.11n	MCS7	64-QAM	11.02	13.4	21.878	14.200	15.1	32.359
			MCS15	64-QAM	13	14.0	25.119	13.000	14.1	25.704
		802.11ac (SISO)	MCS0	64-QAM	11.02	13.6	22.909	13.000	15.3	33.963
			MCS08	256-QAM	11.02	13.3	21.380	14.200	15.0	31.623
		802.11ac (MIMO)	MCS0	64-QAM	13	14.5	28.184	12.000	12.9	19.498
			MCS08	256-QAM	13	14.4	27.542	13.000	13.4	21.878
140	5700	802.11a	6	BPSK	11.02	13.7	23.442	11.500	13.6	22.909
			54	64-QAM	11.02	13.3	21.380	11.500	13.2	20.893
		802.11n	MCS7	64-QAM	11.02	13.2	20.893	11.500	13.1	20.417
			MCS15	64-QAM	9.5	10.8	12.023	9.500	10.4	10.965
		802.11ac (SISO)	MCS0	64-QAM	11.02	13.5	22.387	11.500	13.8	23.988
			MCS08	256-QAM	11.02	13.1	20.417	11.500	13.4	21.878
		802.11ac (MIMO)	MCS0	64-QAM	9.5	10.6	11.482	9.500	10.2	10.471
			MCS08	256-QAM	9.5	10.5	11.220	9.500	10.1	10.233

OUTPUT POWER DATA

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20MHz Bandwidth

Channel	Frequency (MHz)	Radio Mode	Data Rate (Mbps)	Modulation	Software Power Setting	Main Antenna dBm	Main Antenna mW	Software Power Setting	Aux Antenna dBm	Aux Antenna mW
149	5745	802.11a	6	BPSK	10.61	13.0	19.953	14.000	17.2	52.481
			54	64-QAM	10.61	12.7	18.621	14.000	16.9	48.978
		802.11n	MCS7	64-QAM	10.61	12.6	18.197	14.000	16.4	43.652
			MCS15	64-QAM	12	14.0	25.119	12.000	13.6	22.909
		802.11ac (SISO)	MCS0	64-QAM	10.61	13.3	21.380	14.000	17.0	50.119
			MCS08	256-QAM	10.61	12.5	17.783	14.000	16.7	46.774
		802.11ac (MIMO)	MCS0	64-QAM	12	14.4	27.542	12.000	13.7	23.442
			MCS08	256-QAM	12	14.1	25.704	12.000	13.5	22.387
153	5765	802.11a	6	BPSK	10.61	13.0	19.953	14.000	17.0	50.119
			54	64-QAM	10.61	12.7	18.621	14.000	16.7	46.774
		802.11n	MCS7	64-QAM	10.61	12.6	18.197	14.000	16.5	44.668
			MCS15	64-QAM	12	14.2	26.303	12.000	14.1	25.704
		802.11ac (SISO)	MCS0	64-QAM	10.61	12.8	19.055	14.000	16.8	47.863
			MCS08	256-QAM	10.61	12.4	17.378	14.000	16.5	44.668
		802.11ac (MIMO)	MCS0	64-QAM	12	14.7	29.512	12.000	13.8	23.988
			MCS08	256-QAM	12	14.0	25.119	12.000	13.6	22.909
157	5785	802.11a	6	BPSK	10.61	13.0	19.953	14.000	17.2	52.481
			54	64-QAM	10.61	12.7	18.621	14.000	16.9	48.978
		802.11n	MCS7	64-QAM	10.61	12.6	18.197	14.000	16.7	46.774
			MCS15	64-QAM	12	13.4	21.878	12.000	14.1	25.704
		802.11ac (SISO)	MCS0	64-QAM	10.61	13.0	19.953	14.000	17.3	53.703
			MCS08	256-QAM	10.61	12.5	17.783	14.000	16.6	45.709
		802.11ac (MIMO)	MCS0	64-QAM	12	14.5	28.184	12.000	14.3	26.915
			MCS08	256-QAM	12	14.1	25.704	12.000	14.0	25.119
161	5805	802.11a	6	BPSK	10.61	13.6	22.909	14.000	17.3	53.703
			54	64-QAM	10.61	13.2	20.893	14.000	17.0	50.119
		802.11n	MCS7	64-QAM	10.61	13.0	19.953	14.000	15.7	37.154
			MCS15	64-QAM	12	13.9	24.547	12.000	13.5	22.387
		802.11ac (SISO)	MCS0	64-QAM	10.61	13.1	20.417	14.000	17.4	54.954
			MCS08	256-QAM	10.61	13.0	19.953	14.000	17.0	50.119
		802.11ac (MIMO)	MCS0	64-QAM	12	14.6	28.840	12.000	14.5	28.184
			MCS08	256-QAM	12	14.1	25.704	12.000	14.0	25.119

OUTPUT POWER DATA

NORTHWEST EMC
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20MHz Bandwidth

Channel	Frequency (MHz)	Radio Mode	Data Rate (Mbps)	Modulation	Software Power Setting	Main Antenna dBm	Main Antenna mW	Software Power Setting	Aux Antenna dBm	Aux Antenna mW
165	5825	802.11a	6	BPSK	10.61	13.6	22.909	14.000	16.8	47.863
			54	64-QAM	10.61	13.3	21.380	14.000	16.4	43.652
		802.11n	MCS7	64-QAM	10.61	13.2	20.893	14.000	16.2	41.687
			MCS15	64-QAM	12	14.3	26.915	12.000	13.5	22.387
		802.11ac (SISO)	MCS0	64-QAM	10.61	13.4	21.878	14.000	16.8	47.863
			MCS08	256-QAM	10.61	13.0	19.953	14.000	16.5	44.668
		802.11ac (MIMO)	MCS0	64-QAM	12	14.5	28.184	12.000	14.0	25.119
			MCS08	256-QAM	12	14.2	26.303	12.000	13.9	24.547

Tested By

OUTPUT POWER DATA

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40MHz Bandwidth

Channel	Frequency (MHz)	Radio Mode	Data Rate (Mbps)	Modulation	Software Power Setting	Main Antenna dBm	Main Antenna mW	Software Power Setting	Aux Antenna dBm	Aux Antenna mW
36/40 (38F)	5190	802.11n	MCS7	64-QAM	10.5	11.7	14.791	12.000	14.7	29.512
			MCS15	64-QAM	8.5	8.2	6.607	8.500	10.2	10.471
		802.11ac (SISO)	MCS0	64-QAM	10.5	12.0	15.849	12.000	15.2	33.113
			MCS09	256-QAM	10.5	11.5	14.125	12.000	14.4	27.542
		802.11ac (MIMO)	MCS0	64-QAM	8.5	9.1	8.128	8.500	10.0	10.000
			MCS09	256-QAM	8.5	8.9	7.762	8.500	9.6	9.120
44/48 (46F)	5230	802.11n	MCS7	64-QAM	11.02	12.5	17.783	14.200	16.8	47.863
			MCS15	64-QAM	13	13.7	23.442	13.000	15.3	33.884
		802.11ac (SISO)	MCS0	64-QAM	11.02	12.6	18.197	12.500	16.8	47.863
			MCS09	256-QAM	11.02	12.0	15.849	14.200	16.6	45.709
		802.11ac (MIMO)	MCS0	64-QAM	13	14.1	25.704	13.000	15.8	38.019
			MCS09	256-QAM	13	13.6	22.909	13.000	15.1	32.359
52/56 (54F)	5270	802.11n	MCS7	64-QAM	11.02	12.3	16.982	14.200	16.6	45.709
			MCS15	64-QAM	15	15.7	37.154	15.000	16.4	43.652
		802.11ac (SISO)	MCS0	64-QAM	11.02	13.0	19.953	11.500	15.7	37.239
			MCS09	256-QAM	11.02	12.5	17.783	14.200	16.5	44.668
		802.11ac (MIMO)	MCS0	64-QAM	15	14.7	29.648	13.500	16.4	43.752
			MCS09	256-QAM	15	15.4	34.674	15.000	17.0	50.119
60/64 (62F)	5310	802.11n	MCS7	64-QAM	11.02	13.6	22.909	12.000	14.2	26.303
			MCS15	64-QAM	10	11.1	12.882	10.000	11.1	12.882
		802.11ac (SISO)	MCS0	64-QAM	11.02	14.0	25.119	11.500	15.2	33.420
			MCS09	256-QAM	11.02	13.4	21.878	12.000	14.1	25.704
		802.11ac (MIMO)	MCS0	64-QAM	10	11.8	15.136	10.000	11.9	15.488
			MCS09	256-QAM	10	11.0	12.589	10.000	11.3	13.490

OUTPUT POWER DATA

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40MHz Bandwidth

Channel	Frequency (MHz)	Radio Mode	Data Rate (Mbps)	Modulation	Software Power Setting	Main Antenna dBm	Main Antenna mW	Software Power Setting	Aux Antenna dBm	Aux Antenna mW
100/104 (102F)	5510	802.11n	MCS7	64-QAM	11.02	13.6	22.909	12.500	14.7	29.512
			MCS15	64-QAM	10	12.1	16.218	10.000	11.0	12.589
		802.11ac (SISO)	MCS0	64-QAM	11.02	14.1	25.704	12.500	15.2	33.113
			MCS09	256-QAM	11.02	13.5	22.387	12.500	14.5	28.184
		802.11ac (MIMO)	MCS0	64-QAM	10	12.0	15.849	10.000	11.8	15.136
			MCS09	256-QAM	10	11.6	14.454	10.000	11.4	13.804
108/112 (110F)	5550	802.11n	MCS7	64-QAM	11.02	13.7	23.442	14.200	16.6	45.709
			MCS15	64-QAM	15	16.2	41.687	15.000	16.1	40.738
		802.11ac (SISO)	MCS0	64-QAM	11.02	14.6	28.840	14.200	16.4	43.652
			MCS09	256-QAM	11.02	14.0	25.119	14.200	15.8	38.019
		802.11ac (MIMO)	MCS0	64-QAM	15	17.9	61.660	15.000	16.9	48.978
			MCS09	256-QAM	15	17.3	53.703	15.000	16.4	43.652
132/136 (134F)	5670	802.11n	MCS7	64-QAM	11.02	13.3	21.380	14.200	15.2	33.113
			MCS15	64-QAM	15	15.8	38.019	15.000	15.5	35.481
		802.11ac (SISO)	MCS0	64-QAM	11.02	13.8	23.988	14.200	15.7	37.154
			MCS09	256-QAM	11.02	13.2	20.893	14.200	15.1	32.359
		802.11ac (MIMO)	MCS0	64-QAM	15	13.9	24.717	11.500	12.9	19.588
			MCS09	256-QAM	15	16.3	42.658	15.000	15.3	33.884
149/153 (151F)	5755	802.11n	MCS7	64-QAM	10.61	12.2	16.596	14.200	16.2	41.687
			MCS15	64-QAM	15	15.7	37.154	15.000	16.0	39.811
		802.11ac (SISO)	MCS0	64-QAM	10.61	13.1	20.417	14.200	16.6	45.709
			MCS09	256-QAM	10.61	12.5	17.783	14.200	16.1	40.738
		802.11ac (MIMO)	MCS0	64-QAM	15	17.3	53.703	15.000	17.2	52.481
			MCS09	256-QAM	15	16.4	43.652	15.000	17.0	50.119
157/161 (159F)	5795	802.11n	MCS7	64-QAM	10.61	12.4	17.378	14.200	16.6	45.709
			MCS15	64-QAM	15	16.2	41.687	15.000	16.4	43.652
		802.11ac (SISO)	MCS0	64-QAM	10.61	13.2	20.893	14.200	17.2	52.481
			MCS09	256-QAM	10.61	12.2	16.596	14.200	16.7	46.774
		802.11ac (MIMO)	MCS0	64-QAM	15	16.6	45.920	14.000	16.4	43.752
			MCS09	256-QAM	15	16.4	43.652	15.000	17.0	50.119

OUTPUT POWER DATA

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80MHz Bandwidth

Channel	Frequency (MHz)	Radio Mode	Data Rate (Mbps)	Modulation	Software Power Setting	Main Antenna dBm	Main Antenna mW	Software Power Setting	Aux Antenna dBm	Aux Antenna mW
42	5210	802.11ac (SISO)	MCSO	64-QAM	11.02	13.1	20.417	12.000	16.0	39.994
			MCS9	256-QAM	11.02	12.7	18.621	14.200	16.3	42.658
42	5210	802.11ac (MIMO)	MCSO	64-QAM	10	11.2	13.183	10.000	12.0	15.849
			MCS9	256-QAM	10	10.5	11.220	10.000	11.4	13.804
58	5290	802.11ac (SISO)	MCSO	64-QAM	11.02	13.3	21.380	11.500	14.9	30.903
			MCS9	256-QAM	11.02	12.8	19.055	12.000	14.0	25.119
58	5290	802.11ac (MIMO)	MCSO	64-QAM	10	11.4	13.804	10.000	11.8	15.136
			MCS9	256-QAM	10	10.5	11.220	10.000	10.9	12.303
106	5530	802.11ac (SISO)	MCSO	64-QAM	11.02	14.2	26.303	12.000	15.3	33.884
			MCS9	256-QAM	11.02	13.3	21.380	12.000	14.4	27.542
106	5530	802.11ac (MIMO)	MCSO	64-QAM	10	11.7	14.791	10.000	11.6	14.454
			MCS9	256-QAM	10	11.3	13.490	10.000	11.2	13.183
155	5775	802.11ac (SISO)	MCSO	64-QAM	11.02	13.7	23.442	14.200	17.0	50.119
			MCS9	256-QAM	11.02	12.7	18.621	14.200	16.0	39.811
155	5775	802.11ac (MIMO)	MCSO	64-QAM	15	15.6	36.475	13.500	15.3	34.198
			MCS9	256-QAM	15	16.2	41.687	15.000	16.6	45.709

Tested By

OUTPUT POWER DATA – REDUCED POWER LEVELS

EUT:	SKL21-SDS	Work Order:	INTE5597
Serial Number:	IASY515S0018	Date:	7/2/2015
Customer:	Intel Corporation	Temperature:	23.5°C
Attendees:	Mike Lowe	Relative Humidity:	42%
Customer Project:	None	Bar. Pressure:	1005 mb
Tested By:	Luke Richardson	Job Site:	EV03
Power:	110VAC/60Hz	Configuration:	INTE5597-1

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2015 FCC 2.1093:2015	FCC KDB 248227 D01 V02r01 FCC KDB 447498 D01 v05r02 FCC KDB 616217 D04 v01r01 FCC KDB 865664 D01 v01r03 FCC KDB 865664 D02 v01r01 IEEE Std 1528:2013

COMMENTS

This data sheet contains the conducted output power measurements that needed to be reduced throughout the WIFI SAR testing.

DEVIATIONS FROM TEST STANDARD

None

RESULTS

20MHz Bandwidth

Channel	Frequency (MHz)	Radio Mode	Data Rate (Mbps)	Modulation	Software Power Setting	Main Antenna dBm	Main Antenna mW	Software Power Setting	Aux Antenna dBm	Aux Antenna mW
6	2437	802.11n	MCS8	OFDM	14.5	14.2	26.363	14.5	13.5	22.131
11	2462	802.11b	1	BPSK	13.00	13.6	22.909	No Change	No Change	No Change
36	5180	802.11a	6	BPSK	No Change	No Change	No Change	11	15.2	33.113
40	5200	802.11a	6	BPSK	No Change	No Change	No Change	12.5	16.6	45.709
48	5240	802.11a	6	BPSK	No Change	No Change	No Change	12.5	16.6	45.499
52	5260	802.11a	6	BPSK	No Change	No Change	No Change	11.5	15.5	35.563
60	5300	802.11a	6	BPSK	No Change	No Change	No Change	11	15.1	32.584
64	5320	802.11a	6	BPSK	No Change	No Change	No Change	11	14.7	29.512
116	5580	802.11ac (MIMO)	MCS0	64-QAM	12	14.5	28.184	12.000	14.2	26.303
136	5680	802.11ac (SISO)	MCS0	64-QAM	No Change	No Change	No Change	13	15.3	33.963
136	5680	802.11ac (MIMO)	MCS0	64-QAM	13	14.5	28.184	12.000	12.9	19.498

OUTPUT POWER DATA – REDUCED POWER LEVELS

NORTHWEST EMC
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40 MHz Bandwidth

Channel	Frequency (MHz)	Radio Mode	Data Rate (Mbps)	Modulation	Software Power Setting	Main Antenna dBm	Main Antenna mW	Software Power Setting	Aux Antenna dBm	Aux Antenna mW
46(F)	5230	802.11ac (SISO)	MCS0	64-QAM	No Change	No Change	No Change	12.5	16.8	47.863
54(F)	5270	802.11ac (SISO)	MCS0	64-QAM	No Change	No Change	No Change	11.5	15.7	37.239
54(F)	5270	802.11ac (MIMO)	MCS0	64-QAM	13.5	14.7	29.648	13.500	16.4	43.752
62(F)	5310	802.11ac (SISO)	MCS0	64-QAM	No Change	No Change	No Change	11.5	15.2	33.420
134(F)	5670	802.11ac (MIMO)	MCS0	64-QAM	11.5	13.9	24.717	11.500	12.9	19.588
159(F)	5795	802.11ac (MIMO)	MCS0	64-QAM	14	16.6	45.920	14.000	16.4	43.752

80 MHz Bandwidth

Channel	Frequency (MHz)	Radio Mode	Data Rate (Mbps)	Modulation	Software Power Setting	Main Antenna dBm	Main Antenna mW	Software Power Setting	Aux Antenna dBm	Aux Antenna mW
42	5210	802.11ac (SISO)	MCSO	64-QAM	No Change	No Change	No Change	12	16.0	39.994
58	5290	802.11ac (SISO)	MCSO	64-QAM	No Change	No Change	No Change	11.5	14.9	30.903
155	5775	802.11ac (MIMO)	MCSO	64-QAM	13.5	15.6	36.475	13.500	15.3	34.198

Tested By

TEST RESULTS

Test Locations

Per FCC KDB 447498, section 4.3.1, Item #1, the left and right edges as well as the back side adjacent to the antennas were tested. Each of these positions was tested with the keyboard folded under the display ("thick tablet mode") or extended away from the display ("tablet" or "tent mode"). Testing was done with a 0 cm spacing to the phantom.

The bottom edge has greater than 50 mm separation from the antenna and is excluded from stand-alone SAR testing. The front surface of the tablet is excluded from SAR testing per Section 4.3 of KDB 616217.

The highest output power of the Bluetooth radio is equal to 3 mW. Using the formula from KDB 447498, section 4.3.1, Item #1, it is below the exclusion threshold limit of 3; therefore it is excluded from stand-alone SAR testing.

Simultaneous Transmission

MIMO measurements for the WLAN are contained in this SAR report. A discussion of the simultaneous transmission of the other co-located radios is found in the SAR report for the WWAN radio.

MIMO Evaluation

MIMO SAR evaluations were conducted in the 2.4 and 5 GHz bands to show that with a 30 cm antenna spacing, there were no overlapping SAR regions. The zoom scans of each hot spot were centered on the individual antennas.

Operating Mode

All testing was performed with the EUT configured in a worst – case configuration and operating mode to produce the highest SAR levels. The EUT used client provided test software that permitted the selection of transmit channel, modulation type, and data rate. The radio module operated continuously at nearly 100% duty cycle at the maximum rated power.

Summary

The following tables summarize the measured SAR values.

Per FCC KDB 248227, among the channels required for normal testing, SAR must be measured on the channel with the highest conducted output power. When the SAR measured on the highest output channel is >0.8 W/kg, SAR evaluation for the other required test channels is necessary.

Also, when the measured SAR is >0.8 W/kg, SAR measurement variability is assessed per FCC KDB 865664 D01 v01r03, Section 2.8.1.