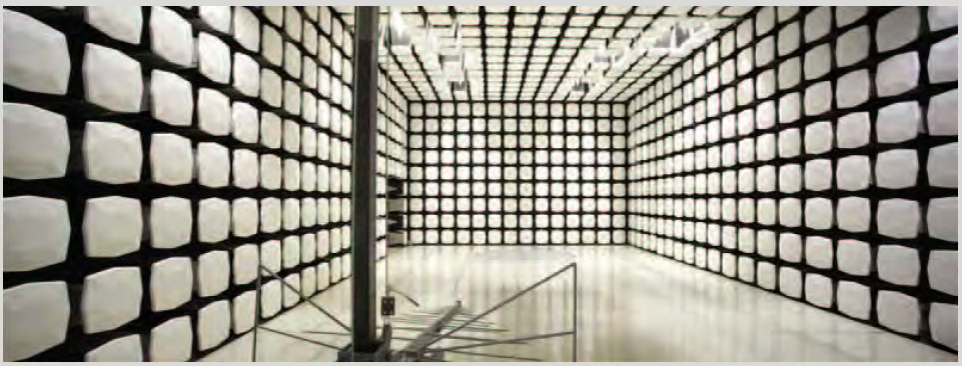
Intel Corporation

WSBUB-SDS

FCC 15.225:2014

FCC 15.207:2014

Report #: INTE5437.1



Report Prepared By Northwest EMC Inc.

NORTHWEST EMC – (888) 364-2378 – www.nwemc.com

California – Minnesota – Oregon – New York – Washington

NORTHWEST EMC

WTD 12.5.23

CERTIFICATE OF TEST

Last Date of Test: June 11, 2014
Intel Corporation
Model: WSBUB-SDS

Emissions

Test Description	Specification	Test Method	Pass/Fail
Field Strength of Fundamental	FCC 15.225:2014	ANSI C63.10:2009	Pass
Field Strength of Spurious Emissions < 30MHz	FCC 15.225:2014	ANSI C63.10:2009	Pass
Field Strength of Spurious Emissions > 30MHz	FCC 15.225:2014	ANSI C63.10:2009	Pass
Frequency Stability	FCC 15.225:2014	ANSI C63.10:2009	Pass
AC Powerline Conducted Emissions	FCC 15.207:2014	ANSI C63.10:2009	Pass

Deviations From Test Standards

None

Approved By:

Kyle Holgate, Operations Manager

NVLAP

NVLAP Lab Code: 200630-0
200629-0

This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government of the United States of America.

Product compliance is the responsibility of the client, therefore the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. This Report may only be duplicated in its entirety. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test.

NORTHWEST EMC
REV 2012.08.02

REVISION HISTORY

Revision Number	Description	Date	Page Number
00	None		

Barometric Pressure

The recorded barometric pressure has been normalized to sea level.

NORTHWEST EMC

REV 2012.05.24

ACCREDITATIONS AND AUTHORIZATIONS

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 Guide 65 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

KCC / 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.

Hong Kong

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

Vietnam

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

Russia

GOST – Accredited by Certinform VNIINMASH, CERTINFO, SAMTES, and Federal CHEC to perform EMC and Hygienic testing for Information Technology products to GOST standards.

SCOPE

For details on the Scopes of our Accreditations, please visit:
http://www.nwemc.com/accreditations/

MEASUREMENT UNCERTAINTY

Measurement Uncertainty

When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. Measurement uncertainty is a statistical expression of measurement error qualified by a probability distribution.

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) for each test is listed below. Our measurement data meets or exceeds the measurement uncertainty requirements of the applicable specification; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for estimating measurement uncertainty are based upon ETSI TR 100 028 (or CISPR 16-4-1 as applicable), and are available upon request.

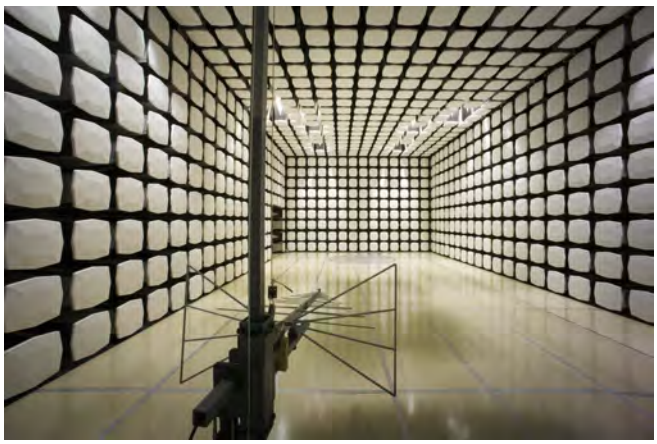
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

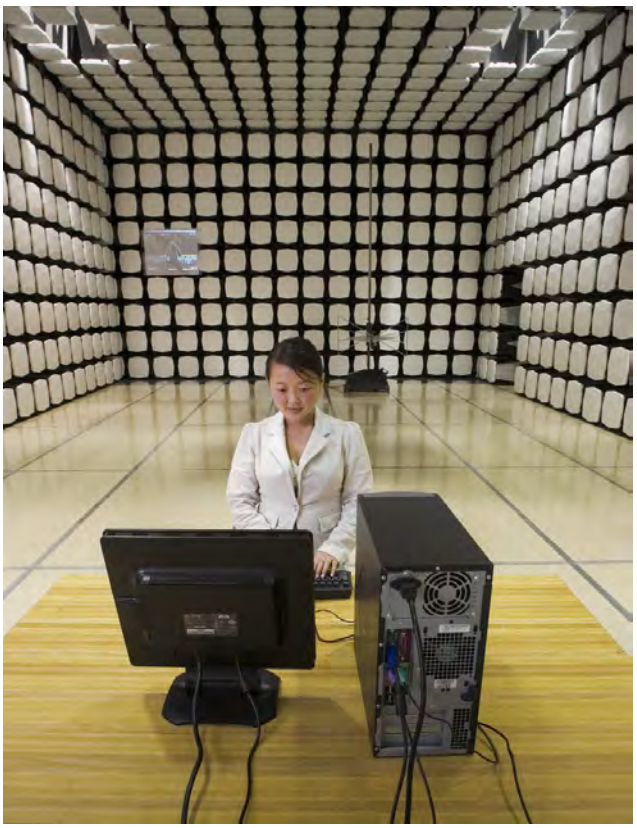
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.12	-0.01
Amplitude Accuracy (dB)	0.49	-0.49
Conducted Power (dB)	0.41	-0.41
Radiated Power via Substitution (dB)	0.69	-0.68
Temperature (degrees C)	0.81	-0.81
Humidity (% RH)	2.89	-2.89
Field Strength (dB)	3.80	-3.80
AC Powerline Conducted Emissions (dB)	2.94	-2.94

FACILITIES

REV 2013.06.28

Oregon	California	New York	Minnesota	Washington
Labs EV01-12 22975 NW Evergreen Pkwy Hillsboro, OR 97124 (503) 844-4066	Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 685-0796	Labs MN01-08 9349 W Broadway Ave. Brooklyn Park, MN 55445 (763) 425-2281	Labs NC01-05,SU02,SU07 19201 120th Ave. NE Bothell, WA 98011 (425) 984-6600
VCCI				
A-0108	A-0029		A-0109	A-0110
Industry Canada				
2834D-1, 2834D-*2*	2834B-1, 2834B-2, 2834B-3		2834E-1	2834F-1
NVLAP				
NVLAP Lab Code: 200630-0	NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200761-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200629-0





PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Intel Corporation
Address:	5200 NE Elam Young Pkwy
City, State, Zip:	Hillsboro, OR 91724
Test Requested By:	Mike Lowe
Model:	WSBUB-SDS
First Date of Test:	April 14, 2014
Last Date of Test:	June 11, 2014
Receipt Date of Samples:	April 14, 2014
Equipment Design Stage:	Production
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT (Equipment Under Test):
Laptop/Tablet Convertible

Testing Objective:
To demonstrate compliance to FCC Part 15.225 specifications.

CONFIGURATIONS

Configuration INTE5437- 1

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Laptop/Tablet Convertible	Intel Corporation	WSBUB-SDS	FZWC41000016

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Headphones	Apple	Ipod earbuds	N/A
AC/DC Adaptor	Delta Electronics	ADP-45BE AA	N/A

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
AC Power	No	0.5m	No	AC Mains	AC/DC Adaptor
DC Power	No	1.5m	No	AC/DC Adaptor	Laptop/Tablet Convertible
Headphones	No	1.1m	No	Laptop/Tablet Convertible	Headphones
HDMI	Yes	1.6m	No	Laptop/Tablet Convertible	Monitor
AC Power	No	1.8m	No	AC Mains	Monitor
Ethernet Cable (CAT 5e)	No	2m	No	Laptop/Tablet Convertible	Ethernet Switch
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

CONFIGURATIONS

Configuration INTE5437- 6

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Laptop/Tablet Convertible	Intel	WSBUB-SDS	FZWC41000006

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
External Hard drive 1	Kingston Technology	9931154-002.A00LF	08736030907680
Headphones	Apple	Ipod earbuds	N/A
AC/DC Adaptor	Delta Electronics	ADP-45BE AA	N/A
Ethernet Switch	Linksys	N/A	N/A
Monitor	Dell	1801FP	MX-0X1106-48323-43V-7C5L

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
DC Power	No	1.5m	No	AC/DC Adaptor	Laptop/Tablet Convertible
Headphones	No	1.1m	No	Laptop/Tablet Convertible	Headphones
USB	Yes	1.8m	PA	Laptop/Tablet Convertible	Mouse
HDMI	Yes	1.6m	No	Laptop/Tablet Convertible	Monitor
AC Power	No	1.8m	No	AC Mains	Monitor
Ethernet Cable (CAT 5e)	No	4m	No	Laptop/Tablet Convertible	Ethernet Switch
AC Power	No	2m	No	AC Mains	AC/DC Adaptor
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

Configuration INTE5437- 9

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Laptop/Tablet Convertible	Intel	WSBUB-SDS	FZWC41000008

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AC/DC Adaptor	Delta Electronics	ADP-45BE AA	N/A

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
AC Power	No	0.5m	No	AC Mains	AC/DC Adaptor
DC Power	No	1.5m	No	AC/DC Adaptor	Laptop/Tablet Convertible
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

MODIFICATIONS

WTD 12.5.23

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	4/14/2014	Field Strength of Fundamental	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	4/14/2014	Field Strength of Spurious Emissions < 30MHz.	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.
3	4/24/2014	Radiated Spurious Emissions > 30MHz	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.
4	5/07/2014	Conducted Emissions	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.
5	6/11/2014	Frequency Stability	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

FIELD STRENGTH OF FUNDAMENTAL

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Tx, NFC 13.56 MHz

POWER SETTINGS INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

INTE5437 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency	490 kHz	Stop Frequency	30 MHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Antenna, Loop	EMCO	6502	AOA	6/28/2011	36 mo
EV11 Cables	N/A	3m Test Distance Cables	EVM	2/13/2014	12 mo
Spectrum Analyzer	Agilent	E4443A	AFB	2/12/2014	24 mo

MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was continuously transmitting while set to the channel specified.

While scanning, fundamental carrier from the EUT was maximized by rotating the EUT, adjusting the measurement antenna height and orientation in 3 orthogonal planes, the EUT and/or associated antenna is positioned in 3 orthogonal planes (per ANSI C63.10). An active loop antenna was used for this test in order to provide sufficient measurement sensitivity.

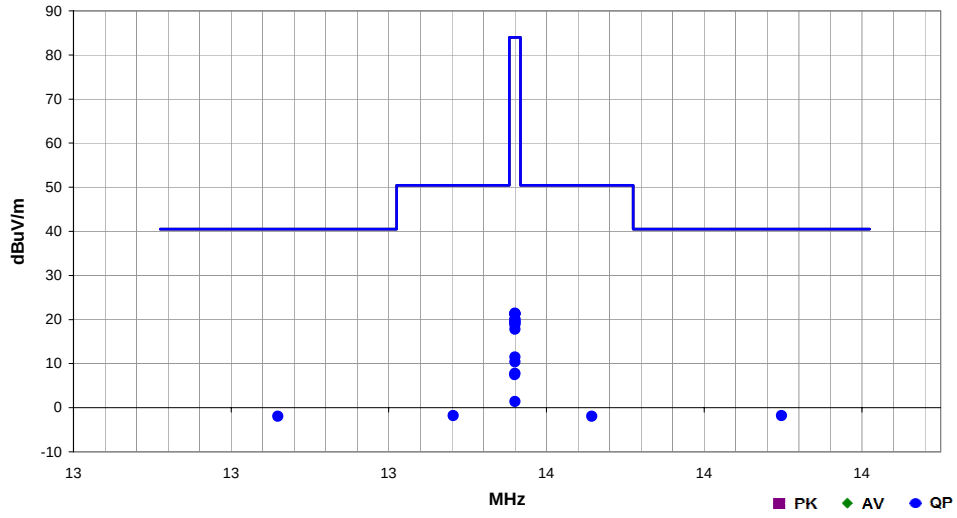
As outlined in 15.209(e) and 15.31(f)(2), measurements may be performed at a distance closer than what is specified with the limit. The limit at the specified distance is shown on the data sheet. Measurements are made at a closer distance and the data is adjusted using a distance correction factor of 40dB/decade for comparison to the limit.

FIELD STRENGTH OF FUNDAMENTAL

Work Order:	INTE5437	**Date:**	04/14/14		
Project:	None	**Temperature:**	22.1 °C		
Job Site:	EV11	**Humidity:**	29.9% RH		
Serial Number:	FZWC41000016	**Barometric Pres.:**	1019.6 mbar	**Tested by:**	Brandon Hobbs, Jared Ison
EUT:	WSBUB-SDS				
Configuration:	1				
Customer:	Intel Corporation				
Attendees:	None				
EUT Power:	110VAC/60Hz				
Operating Mode:	Tx, NFC 13.56 MHz				
Deviations:	None				
Comments:	Reference data comment for modulationType, data rate, EUT orientation and antenna orientation.				

Test Specifications	**Test Method**
FCC 15.225:2014	ANSI C63.10:2009

Run #	1	**Test Distance (m)**	10	**Antenna Height(s)**	1-4m	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
13.898	5.7	11.6	1.0	122.0	10.0	0.0	Horz	QP	-19.1	-1.8	40.5	-42.3	Mod. Type F, 424Mbps, EUT Horz, Ant Perp to EUT/Ant Perp to Gnd
13.259	5.6	11.6	1.0	207.0	10.0	0.0	Horz	QP	-19.1	-1.9	40.5	-42.4	Mod. Type F, 424Mbps, EUT Horz, Ant Perp to EUT/Ant Perp to Gnd
13.482	5.7	11.6	1.0	317.0	10.0	0.0	Horz	QP	-19.1	-1.8	50.5	-52.3	Mod. Type F, 424Mbps, EUT Horz, Ant Perp to EUT/Ant Perp to Gnd
13.658	5.6	11.6	1.0	338.0	10.0	0.0	Horz	QP	-19.1	-1.9	50.5	-52.4	Mod. Type F, 424Mbps, EUT Horz, Ant Perp to EUT/Ant Perp to Gnd
13.560	28.9	11.6	1.0	86.0	10.0	0.0	Horz	QP	-19.1	21.4	84.0	-62.6	Mod. Type F, 424Mbps, EUT Horz, Ant Perp to EUT/Ant Perp to Gnd
13.560	28.8	11.6	1.0	84.0	10.0	0.0	Horz	QP	-19.1	21.3	84.0	-62.7	Mod. Type B, 106Mbps, EUT Horz, Ant Perp to EUT/Ant Perp to Gnd
13.560	28.8	11.6	1.0	86.0	10.0	0.0	Horz	QP	-19.1	21.3	84.0	-62.7	Mod. Type F, 212Mbps, EUT Horz, Ant Perp to EUT/Ant Perp to Gnd
13.560	28.8	11.6	1.0	94.0	10.0	0.0	Horz	QP	-19.1	21.3	84.0	-62.7	Mod. Type B, 212Mbps, EUT Horz, Ant Perp to EUT/Ant Perp to Gnd
13.560	27.6	11.6	1.0	85.0	10.0	0.0	Horz	QP	-19.1	20.1	84.0	-63.9	Mod. Type A, 106Mbps, EUT Horz, Ant Perp to EUT/Ant Perp to Gnd
13.560	27.4	11.6	1.0	79.0	10.0	0.0	Horz	QP	-19.1	19.9	84.0	-64.1	Mod. Type A, 424Mbps, EUT Horz, Ant Perp to EUT/Ant Perp to Gnd
13.560	27.0	11.6	1.0	90.0	10.0	0.0	Horz	QP	-19.1	19.5	84.0	-64.5	Mod. Type A, 848Mbps, EUT Horz, Ant Perp to EUT/Ant Perp to Gnd
13.560	26.9	11.6	1.0	86.0	10.0	0.0	Horz	QP	-19.1	19.4	84.0	-64.6	Mod. Type A, 212Mbps, EUT Horz, Ant Perp to EUT/Ant Perp to Gnd
13.560	26.6	11.6	1.0	79.0	10.0	0.0	Vert	QP	-19.1	19.1	84.0	-64.9	Mod. Type A, 106Mbps, EUT Horz, Ant Perp to EUT/Ant Para to Gnd
13.560	26.3	11.6	1.0	252.0	10.0	0.0	Horz	QP	-19.1	18.8	84.0	-65.2	Mod. Type A, 106Mbps, EUT On Side, Ant Perp to EUT/Ant Perp to Gnd
13.560	25.3	11.6	1.0	277.0	10.0	0.0	Vert	QP	-19.1	17.8	84.0	-66.2	Mod. Type A, 106Mbps, EUT On Side, Ant Perp to EUT/Ant Para to Gnd
13.560	19.0	11.6	1.0	28.0	10.0	0.0	Horz	QP	-19.1	11.5	84.0	-72.5	Mod. Type A, 106Mbps, EUT Horz, Ant Para to EUT/Ant Perp to Gnd
13.560	17.9	11.6	1.0	207.0	10.0	0.0	Horz	QP	-19.1	10.4	84.0	-73.6	Mod. Type A, 106Mbps, EUT On Side, Ant Para to EUT/Ant Perp to Gnd
13.560	15.3	11.6	1.0	-4.0	10.0	0.0	Horz	QP	-19.1	7.8	84.0	-76.2	Mod. Type A, 106Mbps, EUT Vert, Ant Perp to EUT/Ant Perp to Gnd
13.560	15.0	11.6	1.0	364.0	10.0	0.0	Vert	QP	-19.1	7.5	84.0	-76.5	Mod. Type A, 106Mbps, EUT Vert, Ant Para to EUT/Ant Para to Gnd
13.560	8.9	11.6	1.0	135.0	10.0	0.0	Horz	QP	-19.1	1.4	84.0	-82.6	Mod. Type A, 106Mbps, EUT Vert, Ant Para to EUT/Ant Perp to Gnd

FIELD STRENGTH OF SPURIOUS EMISSIONS < 30MHz

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Tx, NFC 13.56 MHz

POWER SETTINGS INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

INTE5437 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency	490 kHz	Stop Frequency	30 MHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
EV11 Cables	N/A	3m Test Distance Cables	EVM	2/13/2014	12 mo
Antenna, Loop	EMCO	6502	AOA	6/28/2011	36 mo
EV11 Cables	N/A	10m Test Distance Cables	EVL	9/3/2013	12 mo
Spectrum Analyzer	Agilent	E4443A	AFB	2/12/2014	24 mo

MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was continuously transmitting while set to the channel specified.

While scanning, emissions from the EUT were maximized by rotating the EUT, adjusting the measurement antenna height and orientation in 3 orthogonal planes, the EUT and/or associated antenna is positioned in 3 orthogonal planes (per ANSI C63.10). An active loop antenna was used for this test in order to provide sufficient measurement sensitivity.

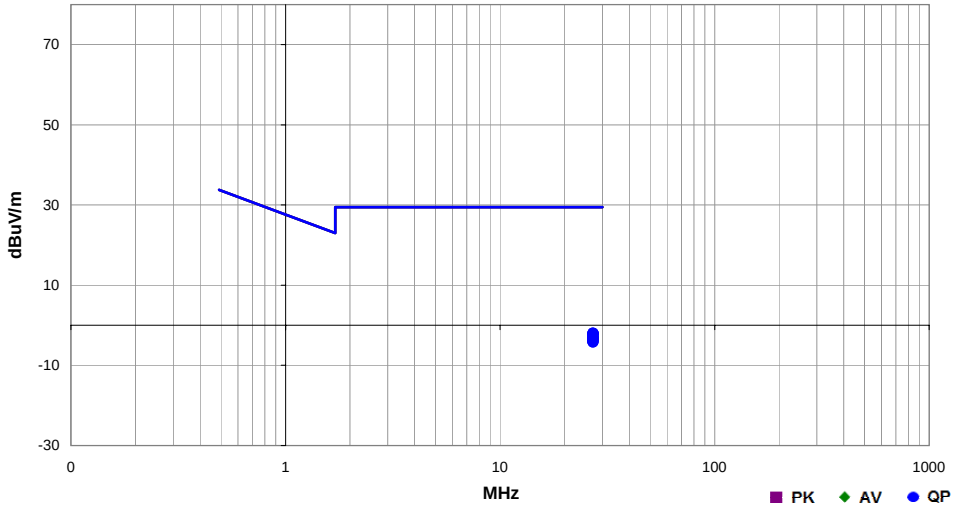
As outlined in 15.209(e) and 15.31(f)(2), measurements may be performed at a distance closer than what is specified with the limit. The limit at the specified distance is shown on the data sheet. Measurements are made at a closer distance and the data is adjusted using a distance correction factor of 40dB/decade for comparison to the limit.

FIELD STRENGTH OF SPURIOUS EMISSIONS < 30MHz

Work Order:	INTE5437	**Date:**	04/14/14		
Project:	None	**Temperature:**	22.7 °C		
Job Site:	EV11	**Humidity:**	31.7% RH		
Serial Number:	FZWC41000016	**Barometric Pres.:**	1018.1 mbar	**Tested by:**	Jared Ison
EUT:	WSBUB-SDS				
Configuration:	1				
Customer:	Intel Corporation				
Attendees:	None				
EUT Power:	110VAC/60Hz				
Operating Mode:	Tx, NFC 13.56 MHz				
Deviations:	None				
Comments:	The EUT is in the laptop configuration.				

Test Specifications	**Test Method**
FCC 15.225:2014	ANSI C63.10:2009

Run #	3	**Test Distance (m)**	10	**Antenna Height(s)**	1-4m	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
27.119	7.4	9.7	1.0	240.0	10.0	0.0	Horz	QP	-19.1	-2.0	29.5	-31.5	Mod. Type B, 424Mbps, EUT Vert, Ant Perp to EUT/Ant Perp to Gnd
27.119	7.3	9.7	1.0	66.0	10.0	0.0	Horz	QP	-19.1	-2.1	29.5	-31.6	Mod. Type F, 212Mbps, EUT Vert, Ant Perp to EUT/Ant Perp to Gnd
27.120	7.3	9.7	1.0	222.0	10.0	0.0	Horz	QP	-19.1	-2.1	29.5	-31.6	Mod. Type F, 424Mbps, EUT Vert, Ant Perp to EUT/Ant Perp to Gnd
27.120	7.3	9.7	1.0	58.0	10.0	0.0	Horz	QP	-19.1	-2.1	29.5	-31.6	Mod. Type B, 106Mbps, EUT Vert, Ant Perp to EUT/Ant Perp to Gnd
27.121	7.1	9.7	1.0	98.0	10.0	0.0	Horz	QP	-19.1	-2.3	29.5	-31.8	Mod. Type B, 848Mbps, EUT Vert, Ant Perp to EUT/Ant Perp to Gnd
27.120	6.9	9.7	1.0	201.0	10.0	0.0	Horz	QP	-19.1	-2.5	29.5	-32.0	Mod. Type B, 212Mbps, EUT Vert, Ant Perp to EUT/Ant Perp to Gnd
27.120	6.7	9.7	1.0	364.0	10.0	0.0	Horz	QP	-19.1	-2.7	29.5	-32.2	Mod. Type A, 106Mbps, EUT Vert, Ant Perp to EUT/Ant Perp to Gnd
27.121	6.4	9.7	1.0	39.0	10.0	0.0	Horz	QP	-19.1	-3.0	29.5	-32.5	Mod. Type A, 212Mbps, EUT Vert, Ant Perp to EUT/Ant Perp to Gnd
27.120	6.3	9.7	1.0	342.0	10.0	0.0	Horz	QP	-19.1	-3.1	29.5	-32.6	Mod. Type A, 848Mbps, EUT Vert, Ant Perp to EUT/Ant Perp to Gnd
27.121	6.3	9.7	1.0	168.0	10.0	0.0	Horz	QP	-19.1	-3.1	29.5	-32.6	Mod. Type F, 424Mbps, EUT On Side, Ant Perp to EUT/Ant Perp to Gnd
27.119	6.1	9.7	1.0	175.0	10.0	0.0	Horz	QP	-19.1	-3.3	29.5	-32.8	Mod. Type F, 424Mbps, EUT Horz, Ant Perp to EUT/Ant Perp to Gnd
27.121	6.0	9.7	1.0	196.0	10.0	0.0	Horz	QP	-19.1	-3.4	29.5	-32.9	Mod. Type A, 424Mbps, EUT Vert, Ant Perp to EUT/Ant Perp to Gnd
27.119	5.8	9.7	1.0	364.0	10.0	0.0	Horz	QP	-19.1	-3.6	29.5	-33.1	Mod. Type F, 424Mbps, EUT Horz, Ant Para to EUT/Ant Perp to Gnd
27.121	5.7	9.7	1.0	234.0	10.0	0.0	Horz	QP	-19.1	-3.7	29.5	-33.2	Mod. Type F, 424Mbps, EUT Vert, Ant Perp to EUT/Ant Para to Gnd
27.071	5.4	9.7	1.0	-3.0	10.0	0.0	Horz	QP	-19.1	-4.0	29.5	-33.5	Mod. Type F, 424Mbps, EUT Horz, Ant Perp to EUT/Ant Para to Gnd
27.155	5.4	9.7	1.0	137.0	10.0	0.0	Horz	QP	-19.1	-4.0	29.5	-33.5	Mod. Type F, 424Mbps, EUT On Side, Ant Perp to EUT/Ant Para to Gnd
27.166	5.3	9.7	1.0	90.0	10.0	0.0	Horz	QP	-19.1	-4.1	29.5	-33.6	Mod. Type F, 424Mbps, EUT Vert, Ant Para to EUT/Ant Perp to Gnd
27.150	5.2	9.7	1.0	107.0	10.0	0.0	Horz	QP	-19.1	-4.2	29.5	-33.7	Mod. Type F, 424Mbps, EUT On Side, Ant Para to EUT/Ant Perp to Gnd

RADIATED SPURIOUS EMISSIONS > 30 MHz

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Continous Transmit at 13.56 MHz, Type A
Continous Transmit at 13.56 MHz, Type B
Continous Transmit at 13.56 MHz, Type F

POWER SETTINGS INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

INTE5437 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	1000 MHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
EV01 Cables	N/A	Bilog Cables	EVA	2/18/2014	12 mo
Pre-Amplifier	Miteq	AM-1616-1000	AOL	2/18/2014	12 mo
Antenna, Biconilog	EMCO	3141	AXG	4/10/2012	36 mo
Spectrum Analyzer	Agilent	E4440	AFE	11/4/2013	24 mo

MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was transmitting while set at the operating channel.

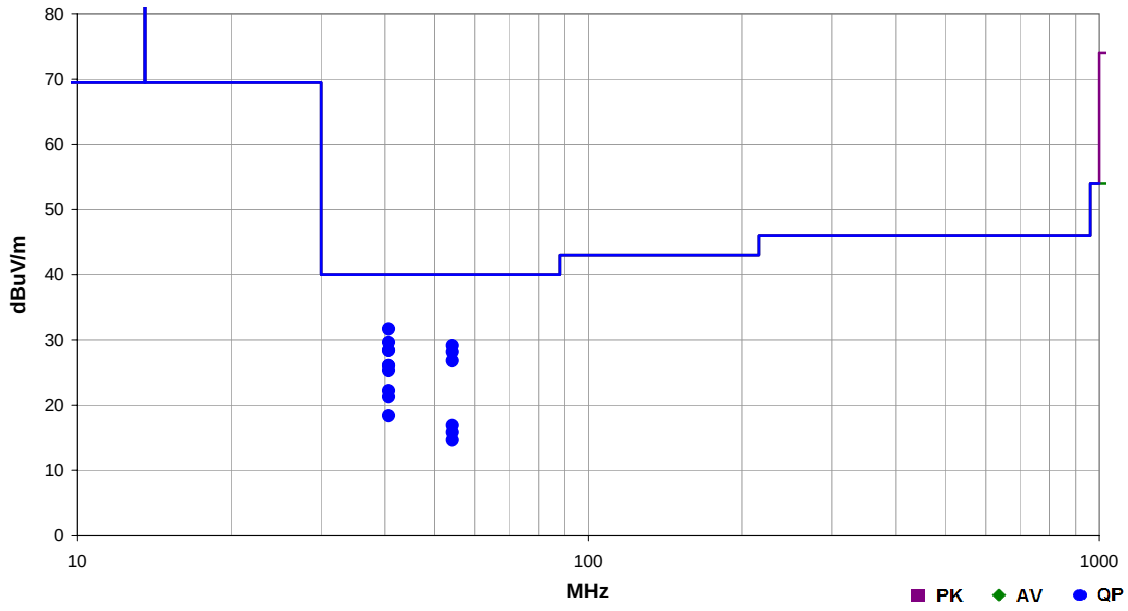
While scanning, emissions from the EUT were maximized by rotating the EUT, adjusting the measurement antenna height and polarization, and manipulating the EUT antenna in 3 orthogonal planes (per ANSI C63.10:2009).

FIELD STRENGTH OF SPURIOUS EMISSIONS > 30 MHz

Work Order:	INTE5437	**Date:**	04/24/14		
Project:	None	**Temperature:**	21.6 °C		
Job Site:	EV01	**Humidity:**	39.3% RH		
Serial Number:	FZWC41000016	**Barometric Pres.:**	1013.3 mbar	**Tested by:**	Jared Ison
EUT:	WSBUB-SDS				
Configuration:	1				
Customer:	Intel Corporation				
Attendees:	None				
EUT Power:	110VAC/60Hz				
Operating Mode:	Continous transmit.				
Deviations:	None				
Comments:	None				

Test Specifications	**Test Method**
FCC 15.225:2014	ANSI C63.10.2009

Run #	2	**Test Distance (m)**	3	**Antenna Height(s)**	1-4m	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
40.684	34.3	-2.6	1.0	273.0	3.0	0.0	Vert	QP	0.0	31.7	40.0	-8.3	Mod. Type F, 424kbps, EUT Horz
40.684	32.2	-2.6	1.0	265.0	3.0	0.0	Vert	QP	0.0	29.6	40.0	-10.4	Mod. Type B, 424kbps, EUT Horz
54.247	36.1	-7.0	1.0	287.0	3.0	0.0	Vert	QP	0.0	29.1	40.0	-10.9	Mod. Type A, 424kbps, EUT Horz
40.684	31.0	-2.6	1.0	274.0	3.0	0.0	Vert	QP	0.0	28.4	40.0	-11.6	Mod. Type F, 424kbps, EUT Vert
40.686	31.0	-2.6	3.8	173.0	3.0	0.0	Horz	QP	0.0	28.4	40.0	-11.6	Mod. Type F, 424kbps, EUT Horz
54.242	35.1	-7.0	1.0	170.0	3.0	0.0	Vert	QP	0.0	28.1	40.0	-11.9	Mod. Type B, 424kbps, EUT Horz
54.243	33.8	-7.0	1.0	337.0	3.0	0.0	Vert	QP	0.0	26.8	40.0	-13.2	Mod. Type F, 424kbps, EUT Horz
40.684	28.7	-2.6	3.8	180.0	3.0	0.0	Horz	QP	0.0	26.1	40.0	-13.9	Mod. Type F, 424kbps, EUT Vert
40.684	28.7	-2.6	3.7	164.0	3.0	0.0	Horz	QP	0.0	26.1	40.0	-13.9	Mod. Type B, 424kbps, EUT Horz
40.684	27.9	-2.6	1.0	25.0	3.0	0.0	Vert	QP	0.0	25.3	40.0	-14.7	Mod. Type F, 424kbps, EUT On Side
40.684	24.8	-2.6	1.0	87.0	3.0	0.0	Vert	QP	0.0	22.2	40.0	-17.8	Mod. Type A, 424kbps, EUT Horz
40.684	23.9	-2.6	3.6	137.0	3.0	0.0	Horz	QP	0.0	21.3	40.0	-18.7	Mod. Type F, 424kbps, EUT On Side
40.684	21.0	-2.6	3.8	305.0	3.0	0.0	Horz	QP	0.0	18.4	40.0	-21.6	Mod. Type A, 424kbps, EUT Horz
54.244	23.9	-7.0	3.2	22.0	3.0	0.0	Horz	QP	0.0	16.9	40.0	-23.1	Mod. Type A, 424kbps, EUT Horz
54.243	22.8	-7.0	2.5	360.0	3.0	0.0	Horz	QP	0.0	15.8	40.0	-24.2	Mod. Type F, 424kbps, EUT Horz
54.240	21.6	-7.0	1.4	207.0	3.0	0.0	Horz	QP	0.0	14.6	40.0	-25.4	Mod. Type B, 424kbps, EUT Horz

FREQUENCY STABILITY

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mo.)
Multimeter	Fluke	111	MMM	3/20/2013	36
Near Field Probe Set	Com-Power	PS-400	IPE	NCR	0
DC Power Supply	Hewlett Packard	6266B	TPH	NCR	0
Temp./Humidity Chamber	Tenney	T6S	TBG	8/23/2013	12
Thermometer	Omega	iTHX-W3	DUD	1/7/2013	36
NC02 Cable	ESM Cable Corp.	TTBJ-141 KMKM-72	NC5	6/9/2014	12
40GHz DC Block	Fairview Microwave	SD3379	AMJ	6/9/2014	12
Attenuator	Fairview Microwave	SA4014-20	TKE	2/13/2014	12
Spectrum Analyzer	Agilent	E4446A	AAT	6/28/2012	24

TEST DESCRIPTION

Variation of Supply Voltage

The primary supply voltage was varied from 85% to 115% of nominal. The EUT can be operated from the public AC mains, so an AC lab supply was used to vary the supply voltage from 115% to 85% of 120 V, 60 Hz. The EUT can also be battery operated, so a DC lab supply was used to vary the supply voltage from the EUT's normal operating voltage to the battery end point voltage.

Variation of Ambient Temperature

Using a temperature chamber, the transmit frequency was recorded at the extremes of the specified temperature range (-20° to +50° C) and at 10°C intervals.

A Near Feld Probe measurement was made between the EUT's antenna port and a spectrum analyzer. Measurements were made at the frequency specified in the test data to determine frequency stability. If the frequency variation is less than 100 ppm, the EUT will meet the requirements of 15.225(e), and that the emissions are maintained within the band of operation.

FREQUENCY STABILITY

EUT:	Laptop/Tablet Convertible			**Work Order:**	INTE5437
Serial Number:	FZWC41000008			**Date:**	06/11/14
Customer:	Intel Corporation			**Temperature:**	24°C
Attendees:	None			**Humidity:**	45%
Project:	None			**Barometric Pres.:**	1018
Tested by:	Richard Mellroth	**Power:**	20 VDC	**Job Site:**	NC04

TEST SPECIFICATIONS	Test Method
FCC 15.225:2014	ANSI C63.10:2009

COMMENTS

None

DEVIATIONS FROM TEST STANDARD

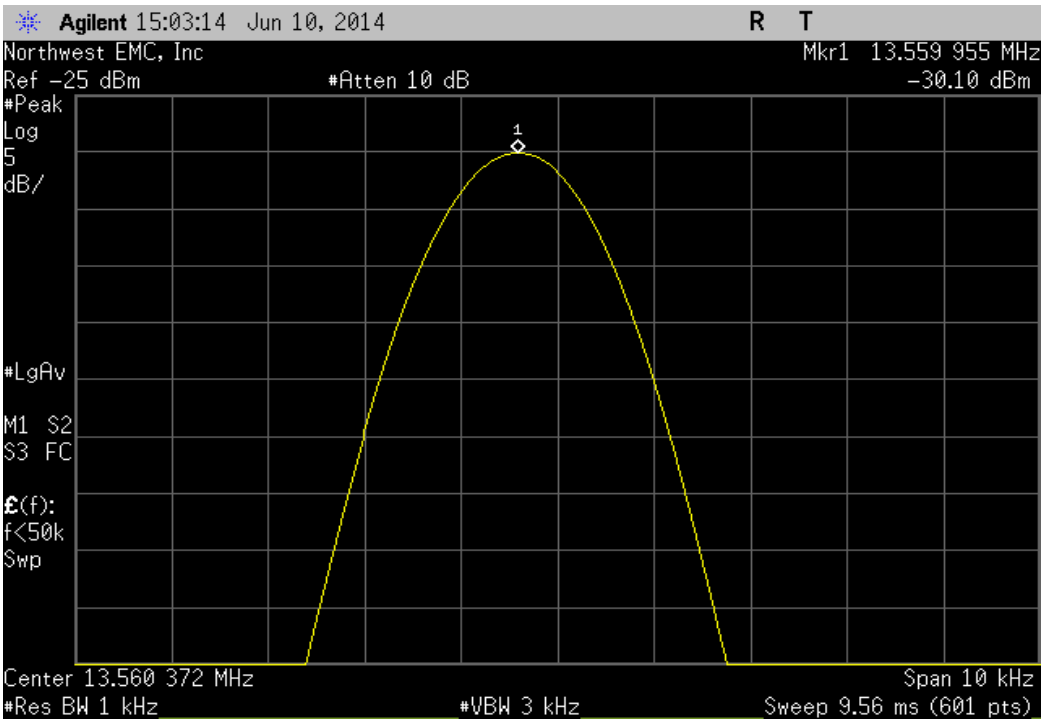
None

Configuration #	9	Signature

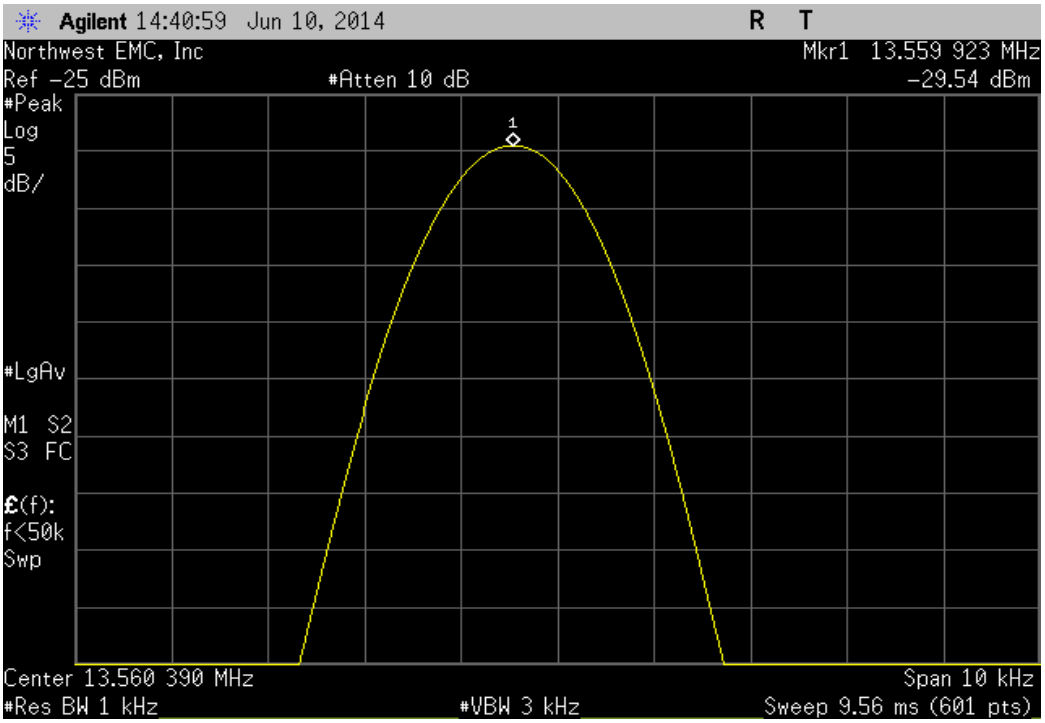
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
Temperature +50°C						
	Normal Voltage 20 VDC	13.559955	13.56	3.3	100	Pass
Temperature +40°C						
	Normal Voltage 20 VDC	13.559923	13.56	5.7	100	Pass
Temperature +30°C						
	Normal Voltage 20 VDC	13.559905	13.56	7	100	Pass
Temperature +20°C						
	Normal Voltage 20 VDC	13.559905	13.56	7	100	Pass
	End Point Voltage 17 VDC	13.559903	13.56	7.2	100	Pass
	115% Line Voltage 138 VAC / 60Hz	13.559905	13.56	7	100	Pass
	85% Line Voltage 102 VAC / 60Hz	13.559905	13.56	7	100	Pass
Temperature +10°C						
	Normal Voltage 20 VDC	13.559922	13.56	5.8	100	Pass
Temperature +0°C						
	Normal Voltage 20 VDC	13.559939	13.56	4.5	100	Pass
Temperature -10°C						
	Normal Voltage 20 VDC	13.559955	13.56	3.3	100	Pass
Temperature -20°C						
	Normal Voltage 20 VDC	13.559989	13.56	0.8	100	Pass

FREQUENCY STABILITY

Temperature +50°C, Normal Voltage 20 VDC						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		13.559955	13.56	3.3	100	Pass

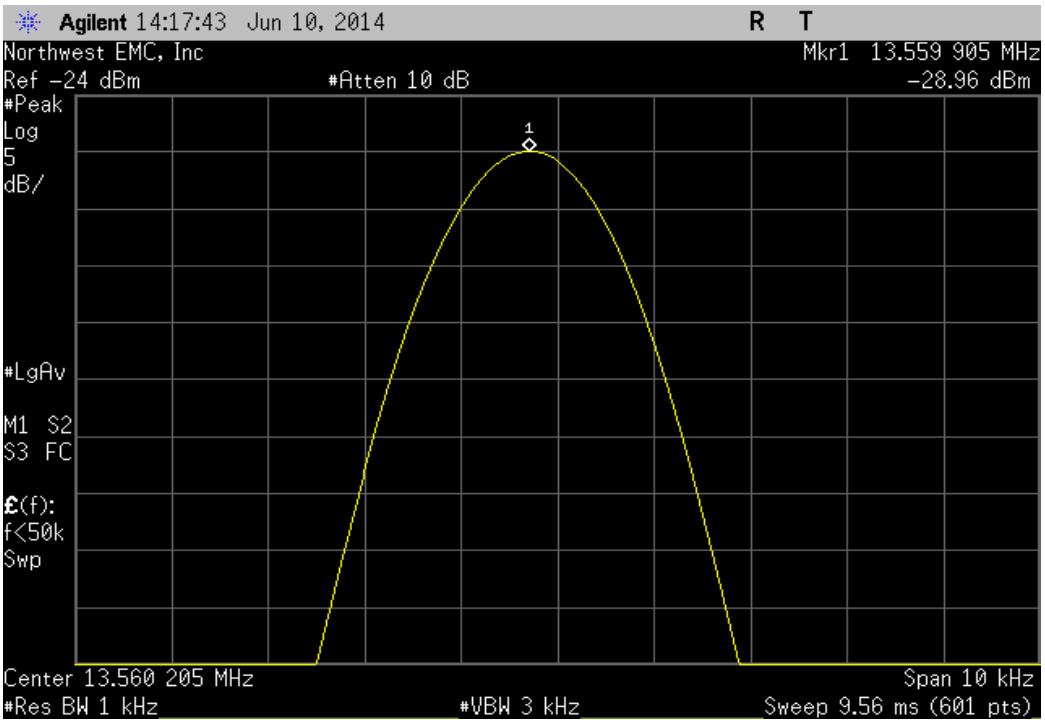


Temperature +40°C, Normal Voltage 20 VDC						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		13.559923	13.56	5.7	100	Pass

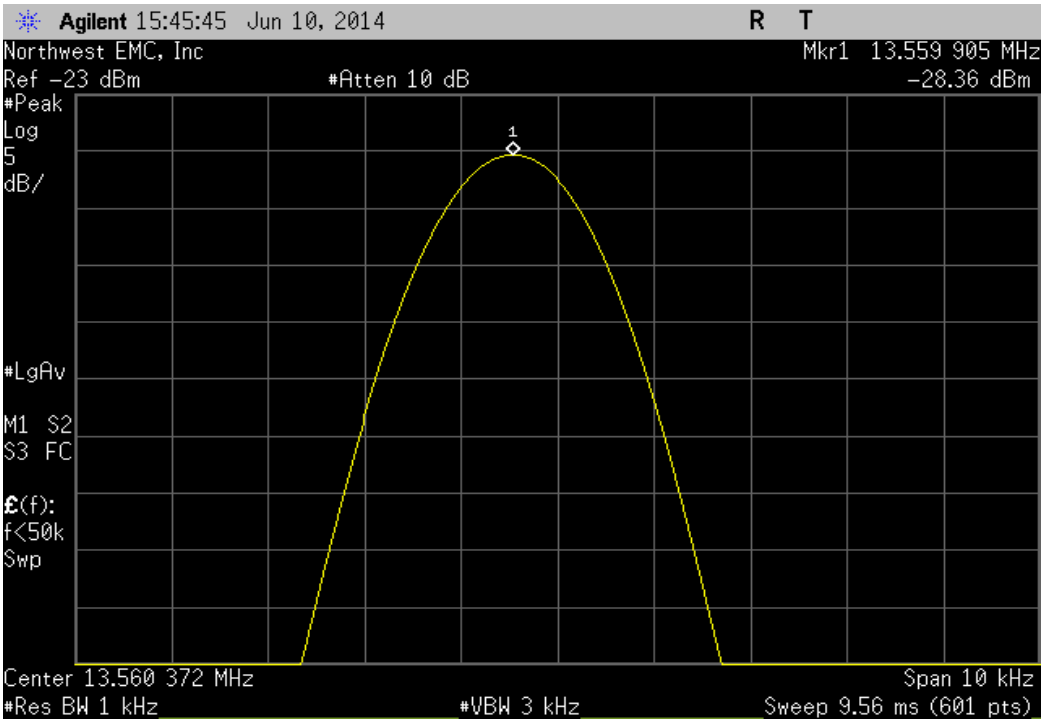


FREQUENCY STABILITY

Temperature +30°C, Normal Voltage 20 VDC						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		13.559905	13.56	7	100	Pass

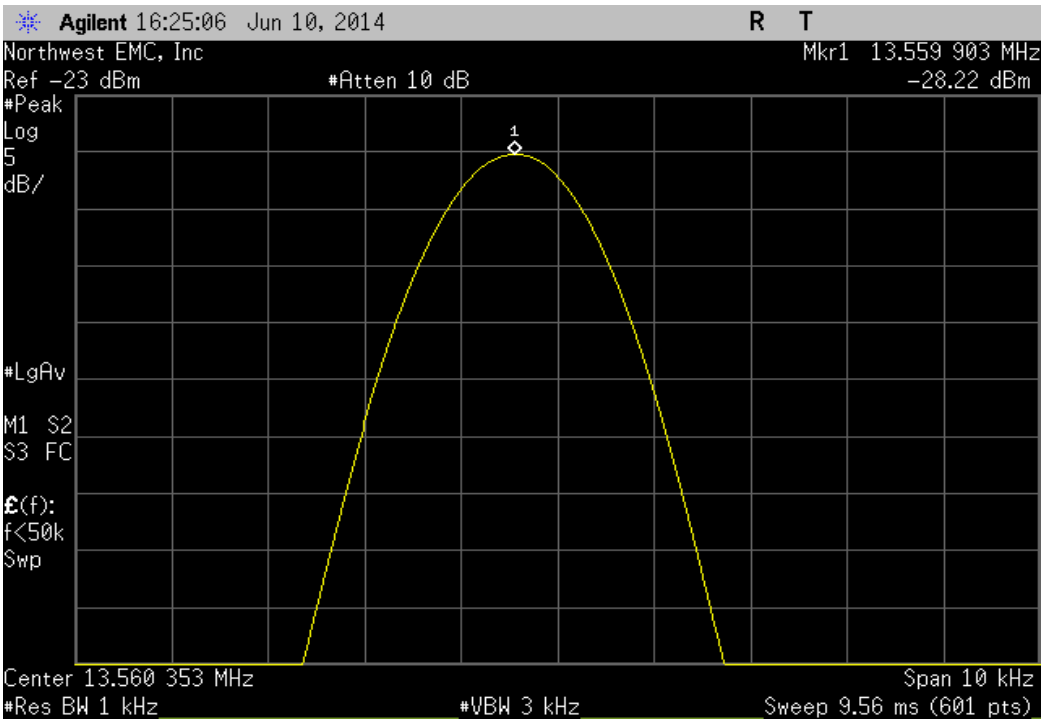


Temperature +20°C, Normal Voltage 20 VDC						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		13.559905	13.56	7	100	Pass

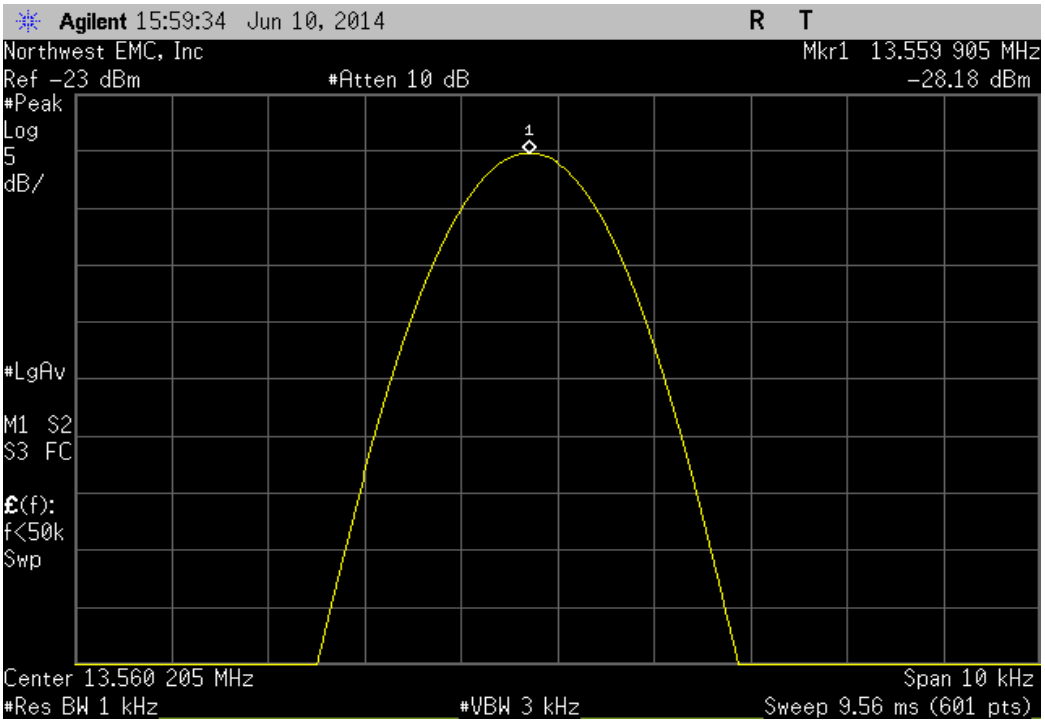


FREQUENCY STABILITY

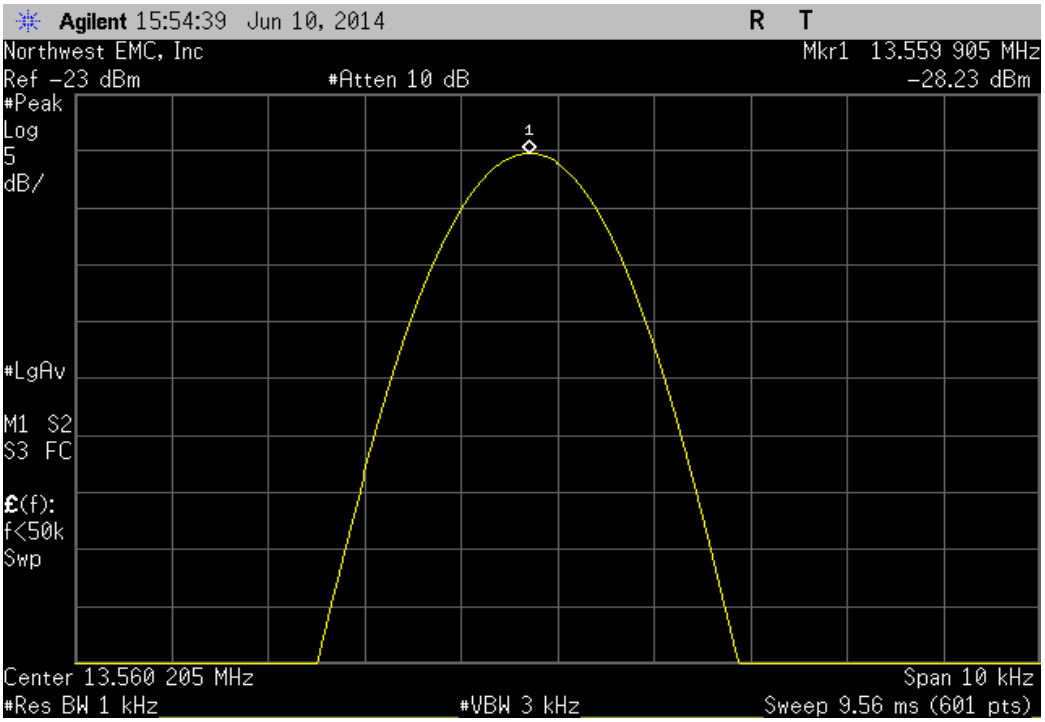
Temperature +20°C, End Point Voltage 17 VDC						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		13.559903	13.56	7.2	100	Pass



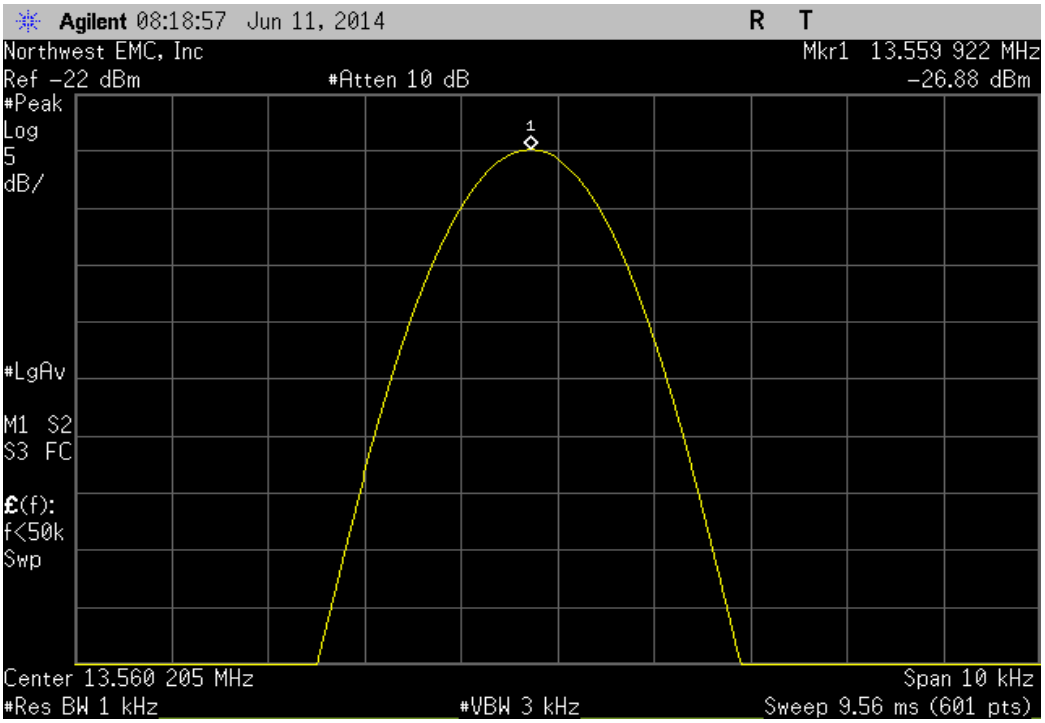
Temperature +20°C, 115% Line Voltage 138 VAC / 60Hz						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		13.559905	13.56	7	100	Pass



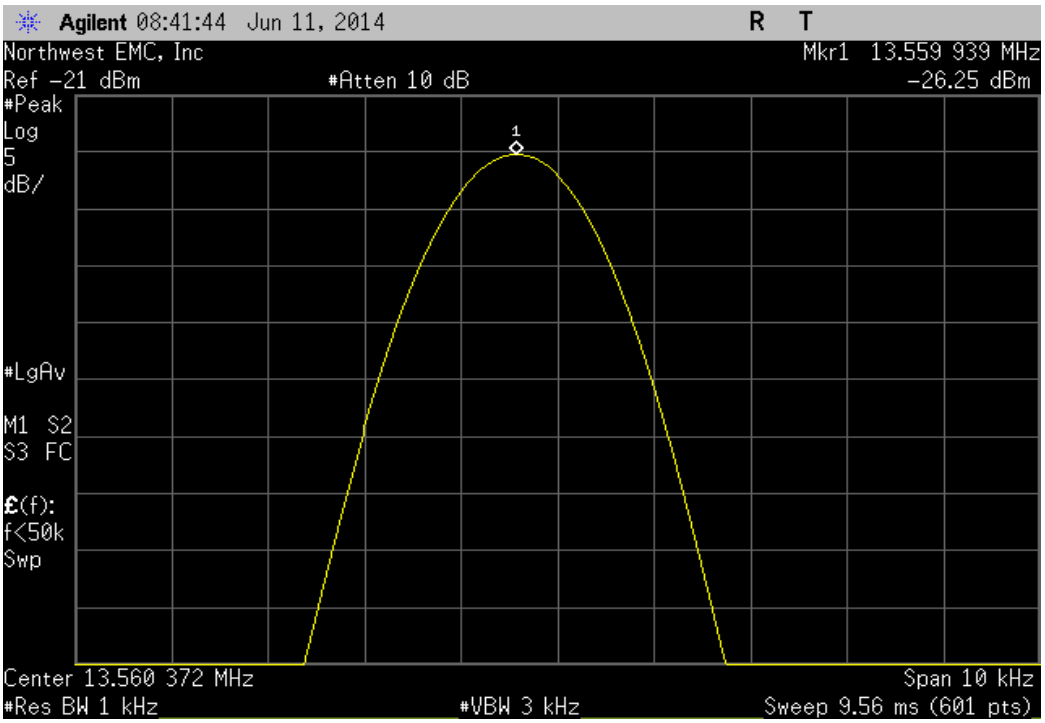
Temperature +20°C, 85% Line Voltage 102 VAC / 60Hz						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		13.559905	13.56	7	100	Pass



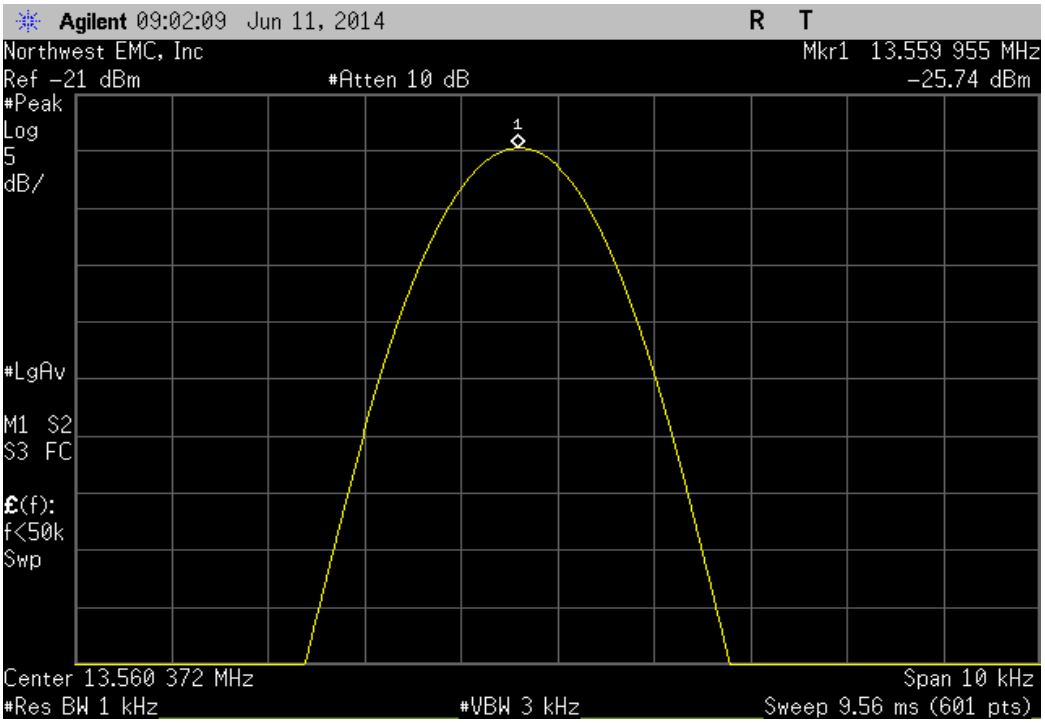
Temperature +10°C, Normal Voltage 20 VDC						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		13.559922	13.56	5.8	100	Pass



Temperature +0°C, Normal Voltage 20 VDC						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		13.559939	13.56	4.5	100	Pass

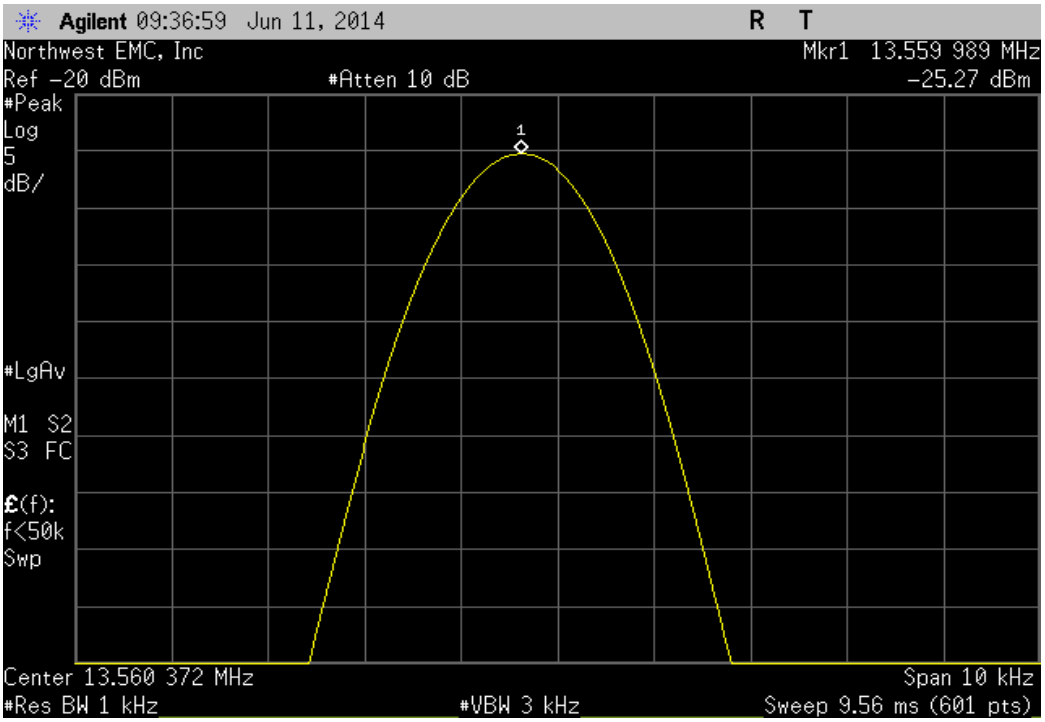


Temperature -10°C, Normal Voltage 20 VDC						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		13.559955	13.56	3.3	100	Pass



FREQUENCY STABILITY

Temperature -20°C, Normal Voltage 20 VDC						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		13.559989	13.56	0.8	100	Pass



CONDUCTED EMISSIONS

TEST DESCRIPTION

Using the mode of operation and configuration noted within this report, conducted emissions tests were performed. The frequency range investigated (scanned), is also noted in this report. Conducted power line measurements are made, unless otherwise specified, over the frequency range from 150 kHz to 30 MHz to determine the line-to-ground radio-noise voltage that is conducted from the EUT power-input terminals that are directly (or indirectly via separate transformer or power supplies) connected to a public power network. Equipment is tested with power cords that are normally used or that have electrical or shielding characteristics that are the same as those cords normally used. Typically those measurements are made using a LISN (Line Impedance Stabilization Network), the 50 Ω measuring port is terminated by a 50 Ω EMI meter or a 50 Ω resistive load. All 50 Ω measuring ports of the LISN are terminated by 50Ω.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
EV07 Cables	N/A	Conducted Cables	EVG	03/07/2014	12 mo
Attenuator	Fairview Microwave	SA6B10W-20	RKA	10/24/2013	12 mo
High Pass Filter	TTE	H97-100K-50-720B	HHD	01/22/2014	12 mo
Receiver	Rohde & Schwarz	ESCI	ARH	02/05/2014	12 mo
LISN	Solar	9252-50-R-24-BNC	LIP	02/16/2014	12 mo
LISN	Solar	9252-50-R-24-BNC	LIR	10/09/2013	12 mo

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	2.94 dB	-2.94 dB

CONFIGURATIONS INVESTIGATED

INTE5437-6

MODES INVESTIGATED

Poling type A, and 106kbps

CONDUCTED EMISSIONS

WTD.2013.07.23, PSA-ESCI 2014.02.19, PSA-ESCI Version 2013.2.20

EUT:	WSBUB-SDS	Work Order:	INTE5437
Serial Number:	FZWC41000006	Date:	05/07/2014
Customer:	Intel Corporation	Temperature:	21.8°C
Attendees:	Mike Lowe	Relative Humidity:	34.2%
Customer Project:	None	Bar. Pressure:	1016 mb
Tested By:	Brandon Hobbs	Job Site:	EV07
Power:	110VAC/60Hz	Configuration:	INTE5437-6

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2014	ANSI C63.10:2009

TEST PARAMETERS

Run #:	2	Line:	High Line	Ext. Attenuation (dB):	20

COMMENTS

None

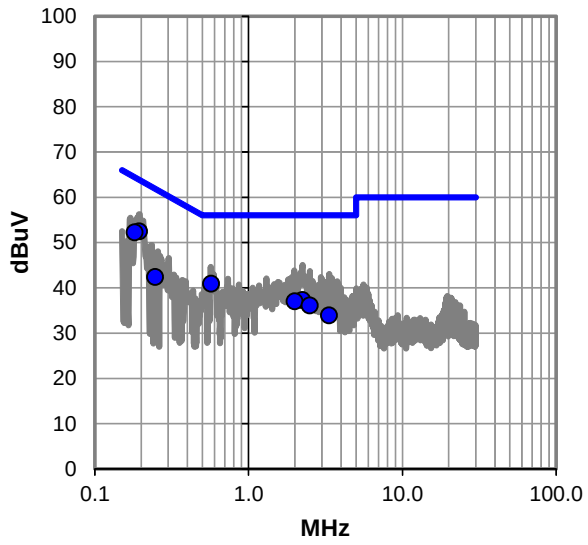
EUT OPERATING MODES

Polling type A, and 106kbps

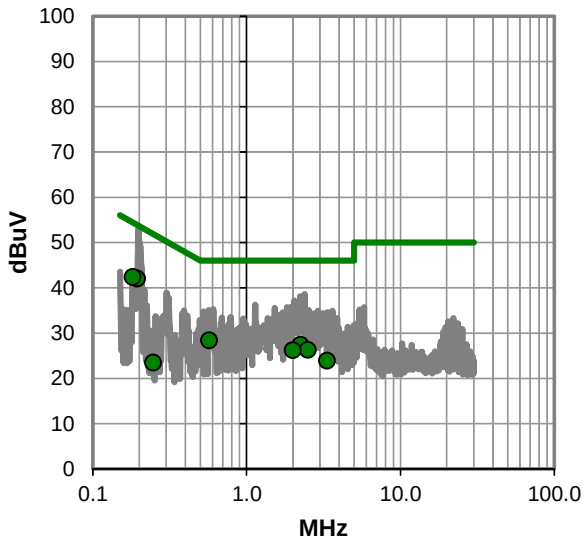
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



CONDUCTED EMISSIONS

RESULTS - Run #2

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.194	32.7	19.7	52.4	63.9	-11.4
0.182	32.5	19.7	52.2	64.4	-12.1
0.571	21.1	19.8	40.9	56.0	-15.1
2.236	17.7	19.6	37.3	56.0	-18.7
1.992	17.4	19.6	37.0	56.0	-19.0
0.247	22.6	19.7	42.3	61.9	-19.5
2.504	16.5	19.6	36.1	56.0	-19.9
3.332	14.3	19.6	33.9	56.0	-22.1

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.194	22.3	19.7	42.0	53.9	-11.8
0.182	22.6	19.7	42.3	54.4	-12.0
0.571	8.6	19.8	28.4	46.0	-17.6
2.236	7.8	19.6	27.4	46.0	-18.6
2.504	6.7	19.6	26.3	46.0	-19.7
1.992	6.6	19.6	26.2	46.0	-19.8
3.332	4.3	19.6	23.9	46.0	-22.1
0.247	3.7	19.7	23.4	51.9	-28.4

CONCLUSION

Pass

Tested By

CONDUCTED EMISSIONS

WTD.2013.07.23, PSA-ESCI 2014.02.19, PSA-ESCI Version 2013.2.20

EUT:	WSBUB-SDS	Work Order:	INTE5437
Serial Number:	FZWC41000006	Date:	05/07/2014
Customer:	Intel Corporation	Temperature:	21.8°C
Attendees:	Mike Lowe	Relative Humidity:	34.2%
Customer Project:	None	Bar. Pressure:	1016 mb
Tested By:	Brandon Hobbs	Job Site:	EV07
Power:	110VAC/60Hz	Configuration:	INTE5437-6

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2014	ANSI C63.10:2009

TEST PARAMETERS

Run #:	3	Line:	Neutral	Ext. Attenuation (dB):	20

COMMENTS

None

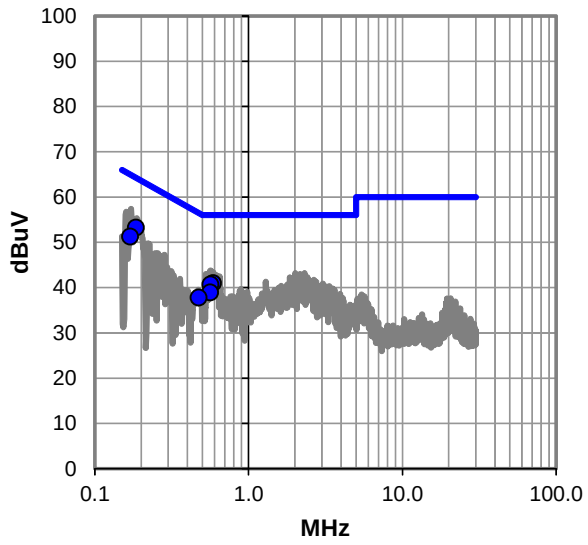
EUT OPERATING MODES

Polling type A, and 106kbps

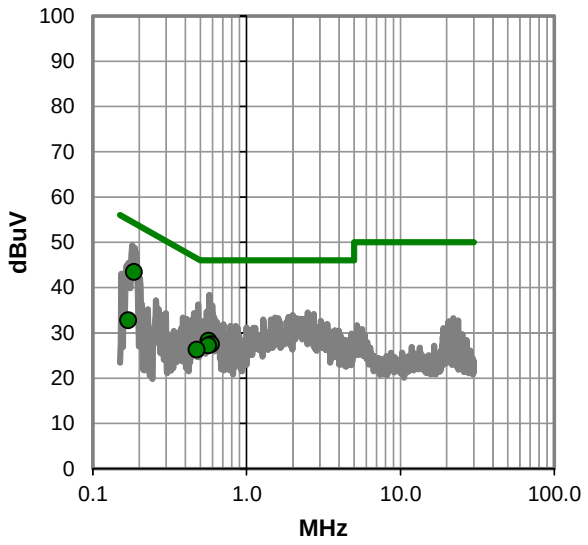
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



CONDUCTED EMISSIONS

RESULTS - Run #3

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.185	33.5	19.7	53.2	64.3	-11.0
0.170	31.5	19.7	51.2	65.0	-13.7
0.587	21.2	19.8	41.0	56.0	-15.0
0.565	20.9	19.8	40.7	56.0	-15.3
0.563	19.1	19.8	38.9	56.0	-17.1
0.473	18.0	19.8	37.8	56.5	-18.7

Average Data - vs - Average Limit

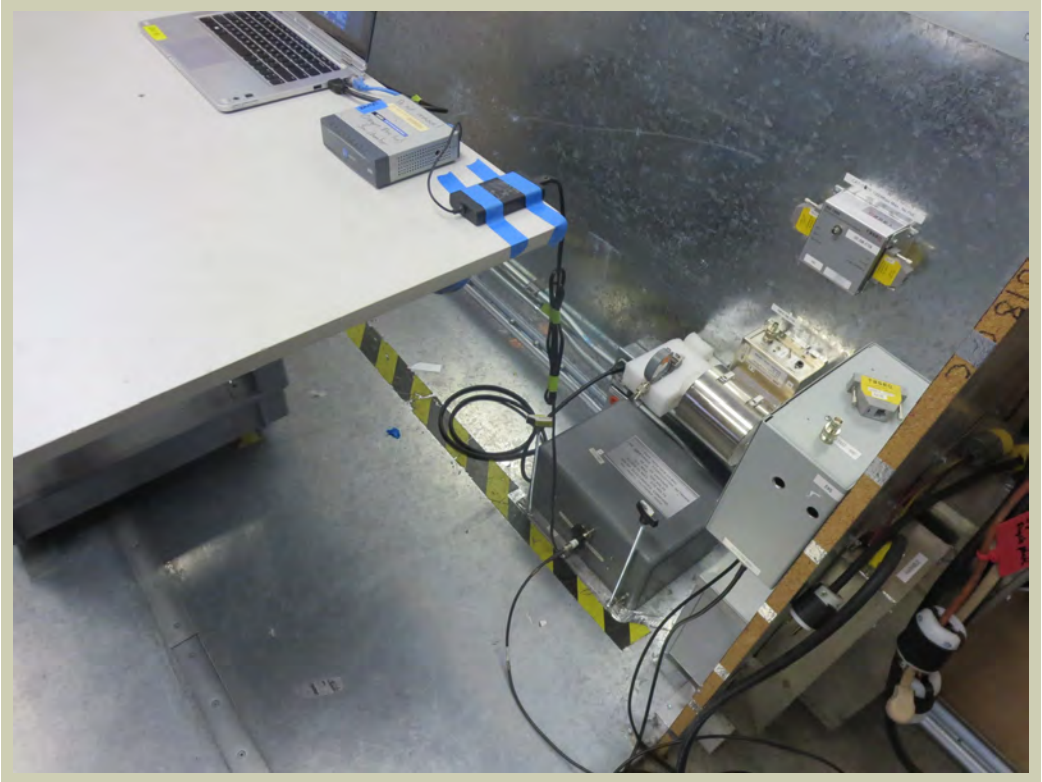
Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.185	23.7	19.7	43.4	54.3	-10.8
0.565	8.5	19.8	28.3	46.0	-17.7
0.587	7.7	19.8	27.5	46.0	-18.5
0.563	7.4	19.8	27.2	46.0	-18.8
0.473	6.5	19.8	26.3	46.5	-20.2
0.170	13.0	19.7	32.7	55.0	-22.2

CONCLUSION

Pass

Tested By

CONDUCTED EMISSIONS



CONDUCTED EMISSIONS