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ENGINEERING TEST REPORT # TR 315131 A

LSR Job #: C-2290

Compliance Testing of:

1DX0JB0AX

Test Date(s):

November 4, 5, 12, 13, 20 2015

December 23, 2015

Prepared For:

FCC:

Stanley Black and Decker

Attn: Kirwan Magdamo

701 E. Joppa Road

Towson, MD 21286

IC:

Stanley Black and Decker Canada

Attn: Mark Emmerson

6275 Millcreek Drive

Mississauga, Ontario L5N7K6

This Test Report issued:

Tom Smith, VP of Test Services

Signature:

Date: 12-23-15

Quality Assurance by:

Adam Alger, Quality Manager – Test Services

Signature:

Date: 12-23-15

Report by:

Kimberly Bay, EMC Engineer

Signature:

Date: 12-22-15

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Prepared For: Stanley Black and Decker	Name: 1DX0JB0AX
Report: TR 315131	Model: See section 3.1
LSR: C-2290	Serial: See Section 3.1

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LS Research, LLC in Review

As an EMC Testing Laboratory, our Accreditation and Assessments are recognized through the following:



TESTING CERT #1255.01

A2LA – American Association for Laboratory Accreditation

Accreditation based on ISO/IEC 17025: 2005 with Electrical (EMC) Scope of Accreditation

A2LA Certificate Number: 1255.01



Federal Communications Commission (FCC) – USA

Listing of 3 Meter Semi-Anechoic Chamber based on Title 47 CFR – Part 2.948

FCC Registration Number: 90756



Canada

Industry Canada

On file, 3 Meter Semi-Anechoic Chamber based on RSS-212 – Issue 1

File Number: IC 3088-A

On file, 3 and 10 Meter OATS based on RSS-212 – Issue 1

File Number: IC 3088



U. S. Conformity Assessment Body (CAB) Validation

Validated by the European Commission as a U. S. Competent Body operating under the U. S./EU, Mutual Recognition Agreement (MRA) operating under the European Union Electromagnetic Compatibility – Council Directive 2004/108/EC (formerly 89/336/EEC, Article 10.2).

Date of Validation: January 16, 2001

Validated by the European Commission as a U.S. Notified Body operating under the U.S. /EU, Mutual Recognition Agreement (MRA) operating under the European Union Telecommunication Equipment – Council Directive 99/5/EC, Annex V.

Date of Validation: November 20, 2002

Notified Body Identification Number: 1243

Prepared For: Stanley Black and Decker	Name: 1DX0JB0AX
Report: TR 315131	Model: See section 3.1
LSR: C-2290	Serial: See Section 3.1

1.0 Summary of Test Report

In November 2015 the EUT, 1DX0JB0AX, as provided by Stanley Black and Decker was tested and MEETS the following requirements:

FCC Requirement	IC Requirement	Test Requirements	Measurement Procedure	Compliance (Yes/No)
15.247 (a)(2)	RSS-247 Section 5.2 (1)	6 dB Bandwidth of a Digital Modulation System	ANSI C63.10-2013 Section 11.8	Yes
15.247(b) & 1.1310	RSS-247 Section 5.4 (4)	Maximum Output Power	ANSI C63.10-2013 Section 11.9	Yes
15.247 (e)	RSS-247 Section 5.2 (2)	Power Spectral Density of a Digital Modulation System	ANSI C63.10-2013 Section 11.10	Yes
15.247(d)	RSS-247 Section 5.5	RF Conducted Spurious Emissions at the Transmitter Antenna Terminal	ANSI C63.10-2013 Section 11.11	Yes
15.247(c), 15.209 & 15.205	RSS-GEN Section 8.9, 8.10	Transmitter Radiated Emissions in Restricted Bands	ANSI C63.10-2013 Section 11.12 (6.3,6.5,6.6)	Yes
2.1055 (d)	RSS-GEN Section 6.11	Frequency Stability	ANSI C63.10-2013 Section 6.8	Yes

2.0 Test Facilities

All testing was performed at:

LS Research, LLC
W66 N220 Commerce Court
Cedarburg, Wisconsin, 53012 USA

LS Research, LLC is accredited by A2LA (American Association for Laboratory Accreditation) to the requirements of ISO/IEC 17025, 2005 “General Requirements for the Competence of Calibration and Testing Laboratories”.

LS Research, LLC’s scope of accreditation includes all test methods listed herein, unless otherwise noted.

Prepared For: Stanley Black and Decker	Name: 1DX0JB0AX
Report: TR 315131	Model: See section 3.1
LSR: C-2290	Serial: See Section 3.1

3.0 Client Information

FCC

Manufacturer Name:	Stanley Black and Decker
Address:	701 E. Joppa Road Towson, MD 21286
Contact Person:	Kirwan Magdamo

IC

Manufacturer Name:	Stanley Black and Decker Canada
Address:	6275 Millcreek Drive Mississauga, Ontario L5N7K6
Contact Person:	Mark Emmerson

3.1 Equipment Under Test (EUT) Information

The following information has been supplied by the applicant.

Product Name:	1DX0JB0AX
Model Number:	Module - Model: 1DX0JB0AX Battery Pack – Model: LBXR20BT
Serial Number:	None (engineering sample)
FCC ID:	YJ71DK0JB0AX
IC:	9082A-1DK0JB0AX

3.2 Product Information

Bluetooth Low Energy product utilizing PCB trace antenna with peak gain of 0 dBi as stated by the manufacturer.

3.3 Modifications Incorporated In the EUT for Compliance Purposes

None noted at time of test

3.4 Deviations & Exclusions from Test Specifications

None noted at time of test

3.5 Additional Information

This EUT contains a TI CC2541 BLE radio module. It was programmed for continuous transmit via USB cable connected to a laptop computer running SmartRF Studio 7. Test channels; Low Channel (2402 MHz), Mid Channel (2440 MHz), and High Channel (2480 MHz).

Prepared For: Stanley Black and Decker	Name: 1DX0JB0AX
Report: TR 315131	Model: See section 3.1
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4.0 Conditions of Test

Environmental:

Temperature: 20-25° C
Relative Humidity: 30-60%
Atmospheric Pressure: 86-106 kPa

5.0 Test Equipment

All test equipment is calibrated by a calibration laboratory accredited by A2LA to the requirements of ISO 17025. For a complete list of test equipment and calibration dates, see Appendix A. Unless otherwise noted, resolution bandwidth of measuring instrument used during testing for given frequency range, see below.

Frequency Range	Resolution Bandwidth
9 kHz – 150 kHz	200 Hz
150 kHz – 30 MHz	9 kHz
30 MHz – 1000 MHz	120 kHz
Above 1000 MHz	1 MHz

6.0 Conformance Summary

The EUT was found to MEET the requirements as described within the specification of FCC Title 47, CFR Part 15.247, Industry Canada RSS-247, Issue 1 (2015), RSS-GEN Issue 4 (2014).

If some emissions are seen to be within 3 dB of their respective limits:

As these levels are within the tolerances of the test equipment and site employed, there is a possibility that this unit, or a similar unit selected out of production may not meet the required limit specification if tested by another agency.

LS Research, LLC certifies that the data contained herein was taken under conditions that meet or exceed the requirements of the test specifications. The results in this Test Report apply only to the item(s) tested on the above-specified dates. Any modifications made to the EUT subsequent to the indicated test date(s) will invalidate the data herein, and void this certification.

Prepared For: Stanley Black and Decker	Name: 1DX0JB0AX
Report: TR 315131	Model: See section 3.1
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Appendix A – Test Equipment



Date : 12-Nov-2015

Type Test : Band-Edge

Job # : C-2290

Prepared By: Coty Hammerer

Customer : Stanley Black and Decker

Quote #: 315131

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	AA 960158	Double Ridge Horn Antenna	ETS Lindgren	3117	109300	7/9/2015	7/9/2016	Active Calibration
2	EE 960085	N9038A MXE 26.5GHz Receiver	Agilent	N9038A	MY51210148	5/6/2015	5/6/2016	Active Calibration



Date : 12-Nov-2015

Type Test : Radiated Emissions (109)

Job # : C-2290

Prepared By: Coty Hammerer

Customer : Stanley Black and Decker

Quote #: 315131

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	AA 960158	Double Ridge Horn Antenna	ETS Lindgren	3117	109300	7/9/2015	7/9/2016	Active Calibration
2	EE 960085	N9038A MXE 26.5GHz Receiver	Agilent	N9038A	MY51210148	5/6/2015	5/6/2016	Active Calibration
3	EE 960159	0.8 - 21GHz LNA	Mini-Circuits	ZVA-213X-S+	740411007	7/9/2015	7/9/2016	Active Calibration
4	AA 960150	Biconical Antenna	ETS	3110B	0003-3346	1/22/2015	1/22/2016	Active Calibration
5	AA 960163	Log Periodic Antenna	A.H. Systems, Inc	SAS-512-2	500	3/16/2015	3/16/2016	Active Calibration



Date : November 4, 5, 20 2015

Type Test : Radiated And Conducted Emissions

Job # : C-2290

Prepared By: Peter Feilen

Customer : Stanley Black and Decker

Quote #: 315131

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	AA 960150	Biconical Antenna	ETS	3110B	0003-3346	1/22/2015	1/22/2016	Active Calibration
2	EE 960088	8GHz MXE Spectrum Analyzer	Agilent	N9038A	MY51210138	1/9/2015	1/9/2016	Active Calibration
3	AA 960078	Log Periodic Antenna	EMCO	93146	9701-4855	1/19/2015	1/19/2016	Active Calibration
4	AA 960158	Double Ridge Horn Antenna	ETS Lindgren	3117	109300	7/9/2015	7/9/2016	Active Calibration
5	EE 960159	0.8 - 21GHz LNA	Mini-Circuits	ZVA-213X-S+	740411007	7/9/2015	7/9/2016	Active Calibration
6	EE 960085	N9038A MXE 26.5GHz Receiver	Agilent	N9038A	MY51210148	5/6/2015	5/6/2016	Active Calibration
7	AA 960153	2.4GHz High Pass Filter	KWM	HPF-L-14186	7272-04	4/15/2015	4/15/2016	Active Calibration
8	EE 960146	Std. Gain Horn Ant. w/preamp	Adv. Micro / EMC	WLA622-4 / 3160-09	123001	8/19/2015	8/19/2016	Active Calibration
9	EE 960087	44GHz EXA Spectrum Analyzer	Agilent	N9010A	MY53400296	12/11/2014	12/11/2015	Active Calibration



Date : 23-Dec-2015

Type Test : AC Emissions

Job # : C-2290

Prepared By: Adam A

Customer : Stanley Black and Decker

Quote #: 315131

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	EE 960088	8GHz MXE Spectrum Analyzer	Agilent	N9038A	MY51210138	1/9/2015	1/9/2016	Active Calibration
2	EE 960162	LISN - 15A	COM-POWER	LI-215A	191969	7/24/2015	7/24/2016	Active Calibration

Prepared For: Stanley Black and Decker

Name: 1DX0JB0AX

Report: TR 315131

Model: See section 3.1

LSR: C-2290

Serial: See Section 3.1

Appendix B – Test Data
B.1 – RF Conducted Emissions

Manufacturer	Stanley Black and Decker
Test Location	LS Research, LLC
Rule Part	FCC 15.247 IC RSS-247
General Measurement Procedure	ANSI C63.10 Section 6.7
General Description of Measurement	A direct measurement of the transmitted signal was performed at the antenna port of the EUT via a cable connection to a spectrum analyzer. An attenuator was placed in series with the cable to protect the spectrum analyzer. The loss from the cable and the attenuator were added on the analyzer as gain offset settings there by allowing direct measurements, without the need for any further corrections. The EUT was configured to run in a continuous transmit mode, while being modulated.

Prepared For: Stanley Black and Decker	Name: 1DX0JB0AX
Report: TR 315131	Model: See section 3.1
LSR: C-2290	Serial: See Section 3.1

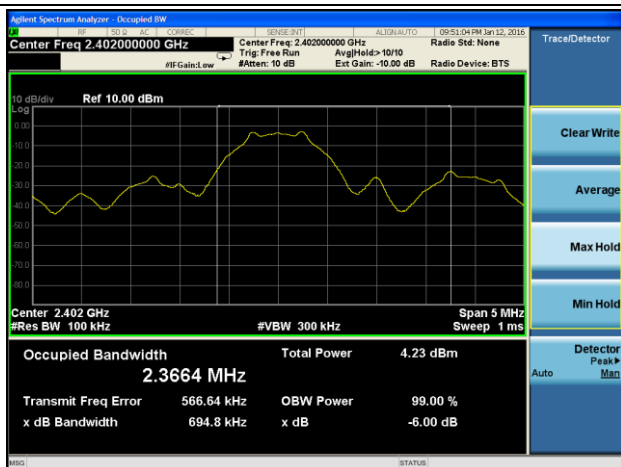
B.1.1 – RF Conducted – Fundamental Bandwidth

Manufacturer	Stanley Black and Decker
Date	November 4, 2015
Operator	Peter Feilen
Temp. / R.H.	20 - 25° C / 30-60% R.H.
Rule Part	FCC 15.247 (a)(2) IC RSS-247 Section 5.2(1)
Specific Measurement Procedure	ANSI C63.10-2013 Section 11.8
Additional Description of Measurement	Peak detector used
Additional Notes	1. Continuous transmit modulated used for this test.

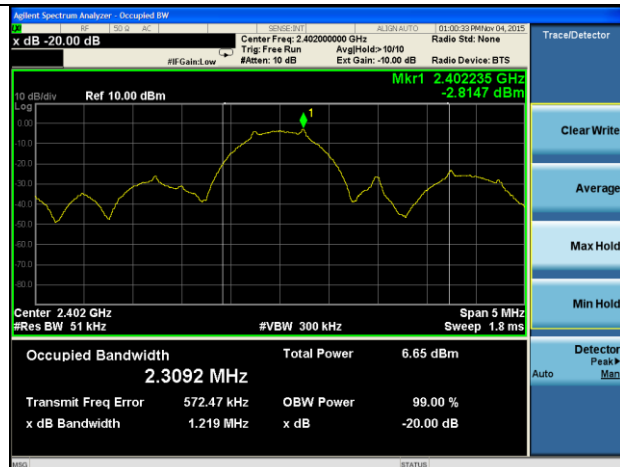
Table

Frequency (MHz)	6 dB DTS BW (kHz)	99% OBW (MHz)	20 dB OBW (MHz)
2402	695	2.31	1.220
2440	697	2.294	1.236
2480	691	1.106	1.236

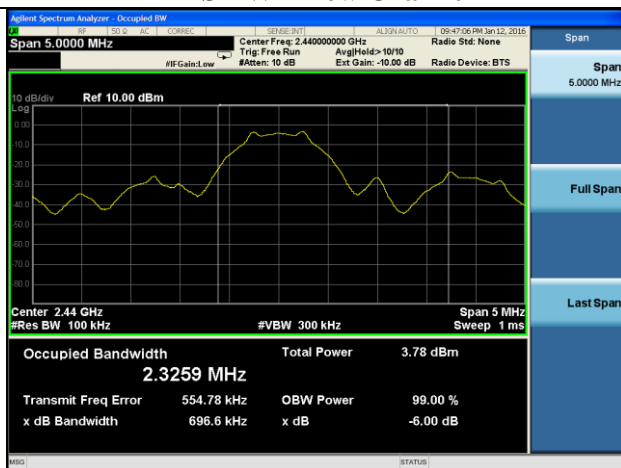
Plots



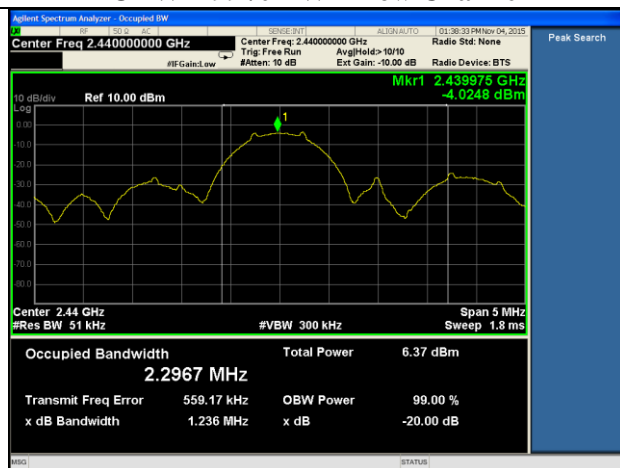
DTS BW – Low Channel



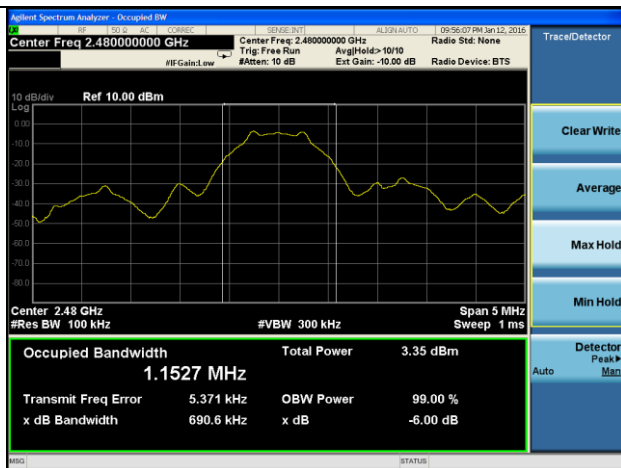
OBW + 99% BW – Low Channel



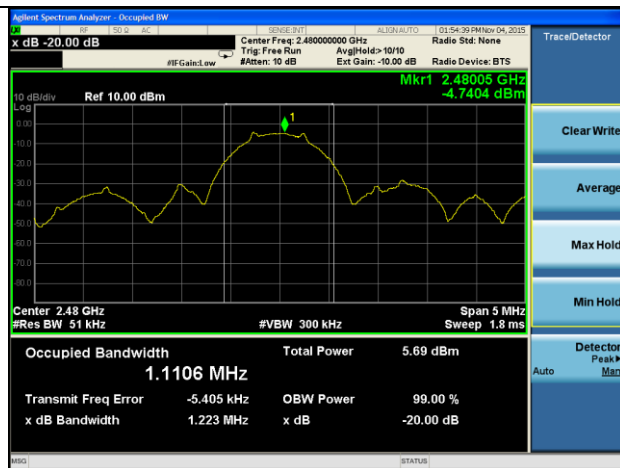
DTS BW – Mid Channel



OBW + 99% BW – Mid Channel



DTS BW – High Channel



OBW + 99% BW – High Channel

Prepared For: Stanley Black and Decker

Report: TR 315131

LSR: C-2290

Name: 1DX0JB0AX

Model: See section 3.1

Serial: See Section 3.1

B.1.2 – RF Conducted – Fundamental Power and Spectral Density

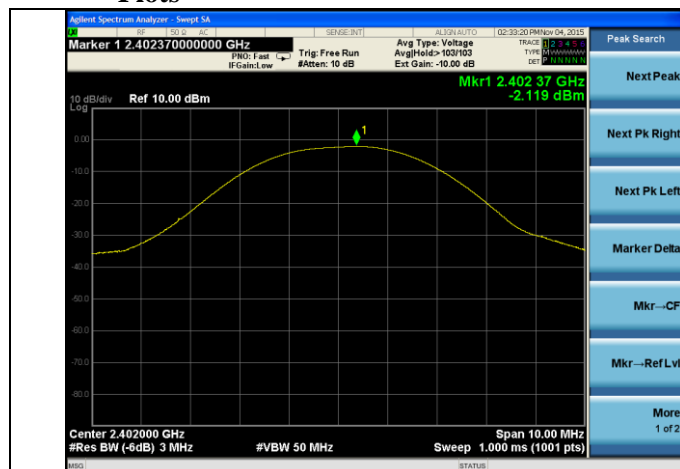
Manufacturer	Stanley Black and Decker
Date	November 4, 2015
Operator	Peter Feilen
Temp. / R.H.	20 - 25° C / 30-60% R.H.
Rule Part	FCC 15.247 (b) & (e) IC RSS-247 Section 5.4 (4) & 5.2 (2)
Specific Measurement Procedure	ANSI C63.10-2013 Section 11.9 and 11.10
Additional Description of Measurement	Peak Output Power and Peak PSD methods utilized for measurement 30 kHz resolution bandwidth used for Peak Power Spectral Density measurement
Additional Notes	1. Continuous transmit modulated used for this test. Sample Calculation: Margin (dB) = Limit – Measured Level

Table

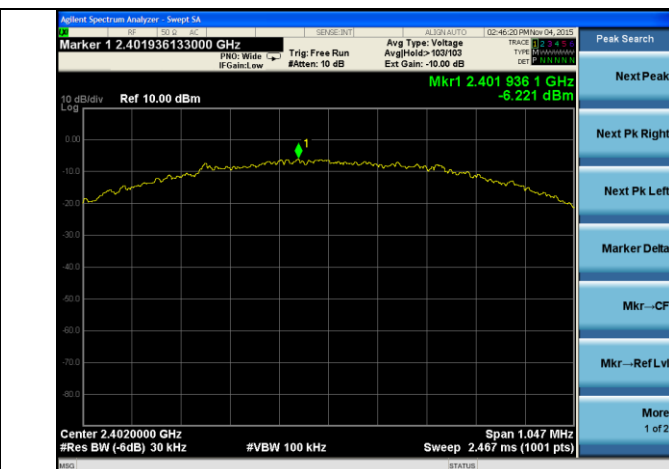
Frequency (MHz)	6 dB DTS BW (kHz)	99% OBW (MHz)	20 dB OBW (MHz)	30 kHz PSD (dBm)	PSD Limit (dBm / 3 kHz)	PSD Margin (dB)	Max Output Power (dBm)	Max Output Power Limit (dBm)	Max Output Power Margin (dB)
2402	698	2.31	1.220	-6.22	8	14.22	-2.1	30	32.1
2440	722	2.294	1.236	-6.58	8	14.58	-2.5	30	32.5
2480	682	1.106	1.236	-6.81	8	14.81	-3.1	30	33.1

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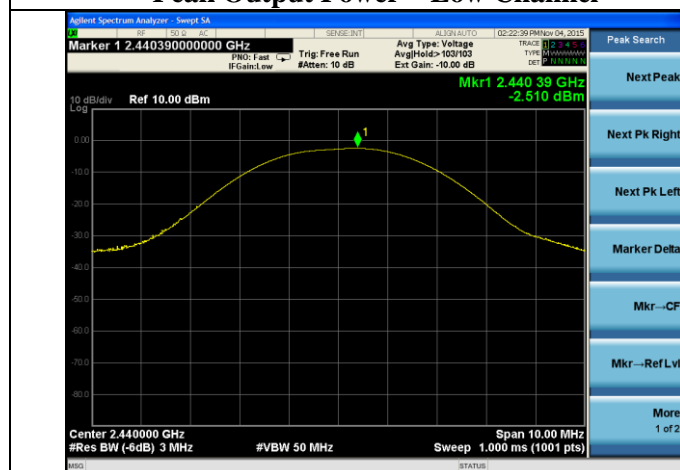
Plots



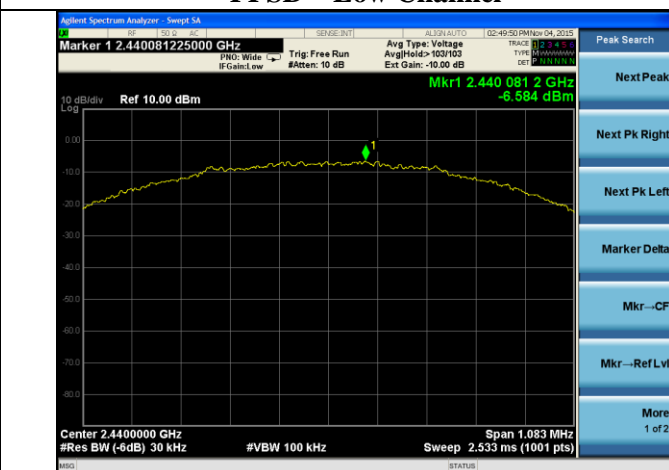
Peak Output Power - Low Channel



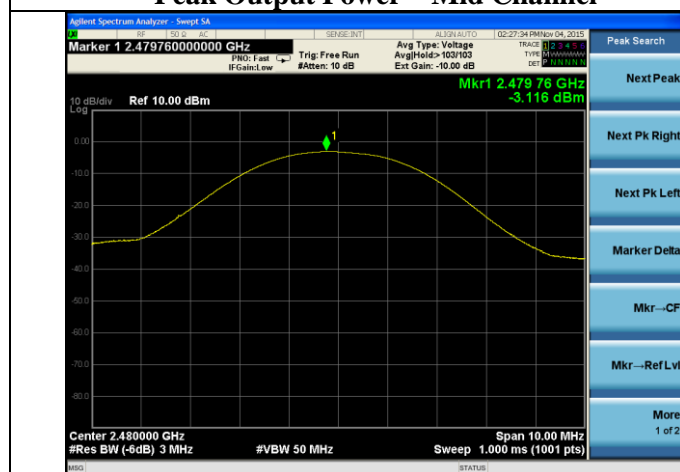
PPSP - Low Channel



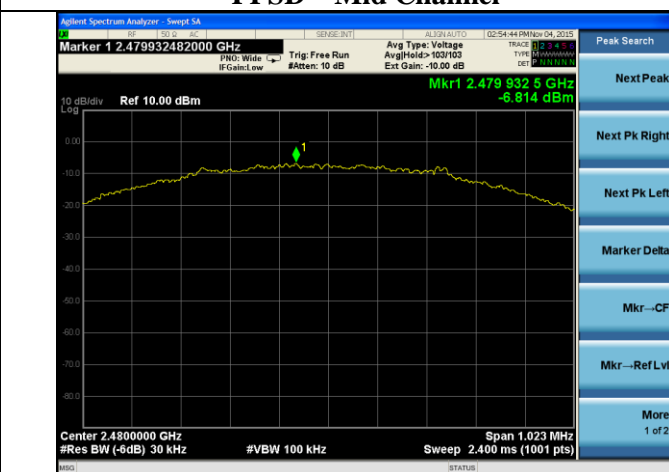
Peak Output Power - Mid Channel



PPSP - Mid Channel



Peak Output Power - High Channel



PPSP - High Channel

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Report: TR 315131

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Name: 1DX0JB0AX

Model: See section 3.1

Serial: See Section 3.1

B.1.3 – RF Conducted – Spurious Emissions

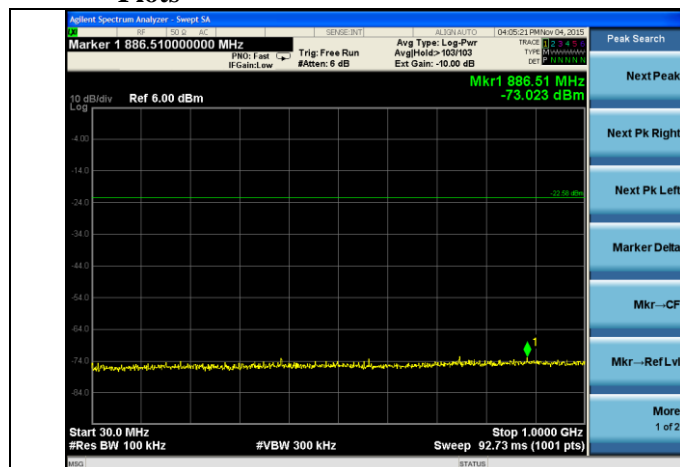
Manufacturer	Stanley Black and Decker
Date	November 4, 2015
Operator	Peter Feilen
Temp. / R.H.	20 - 25° C / 30-60% R.H.
Rule Part	FCC 15.247 (d) IC RSS-247 Section 5.5
Specific Measurement Procedure	ANSI C63.10-2013 Section 11.11
Additional Description of Measurement	Peak output power measurements therefore spurious emissions attenuated 20 dBc.
Additional Notes	1. Continuous transmit modulated used for this test. 2. See DTS BW plots for 100 kHz reference

Table

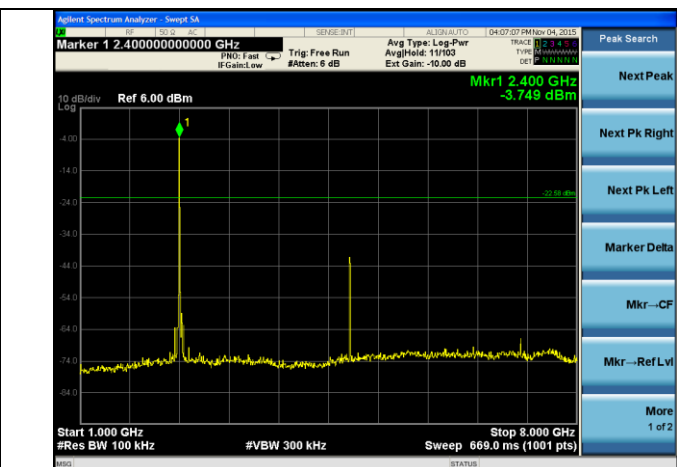
Channel	Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)
Low	4804	-39.881	-22.58	17.301
	7209	-65.132	-22.58	42.552
Mid	4880	-45.54	-23.01	22.53
	7320	-64.36	-23.01	41.35
High	4960	-50.276	-23.45	26.826
	7440	-61.437	-23.45	37.987

Prepared For: Stanley Black and Decker	Name: 1DX0JB0AX
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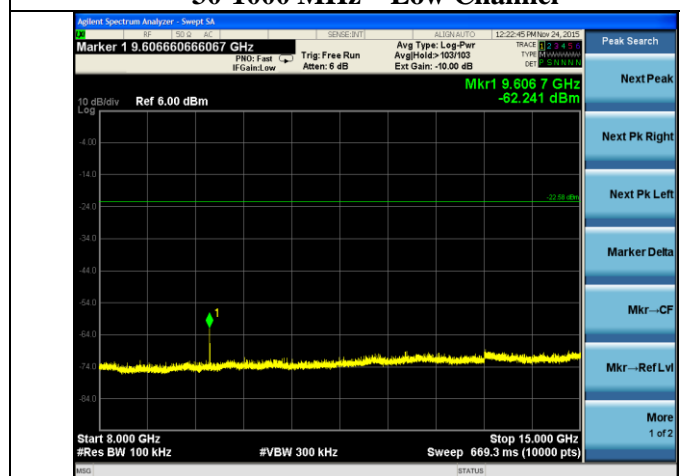
Plots



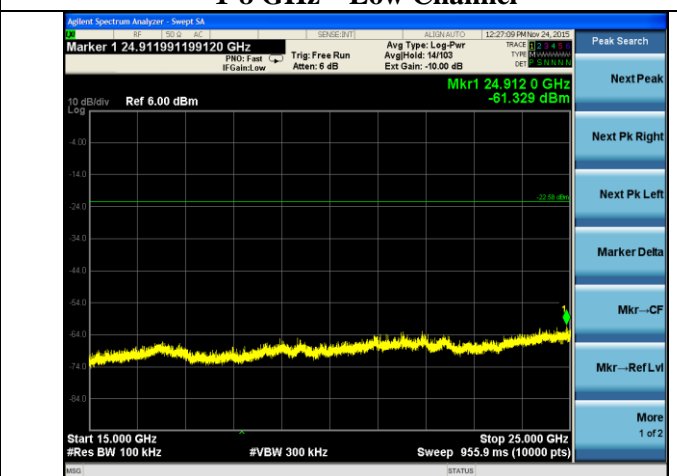
30-1000 MHz – Low Channel



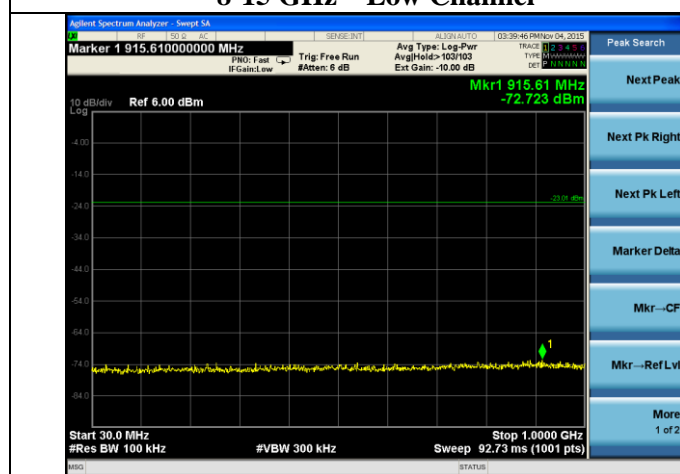
1-8 GHz – Low Channel



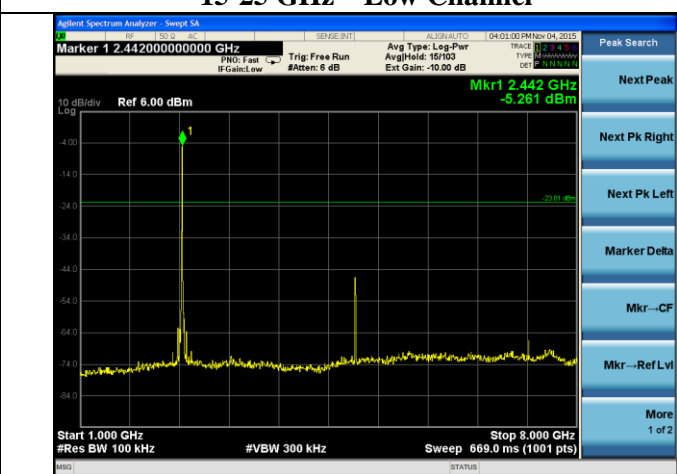
8-15 GHz – Low Channel



15-25 GHz – Low Channel



30-1000 MHz – Mid Channel



1-8 GHz – Mid Channel

Prepared For: Stanley Black and Decker

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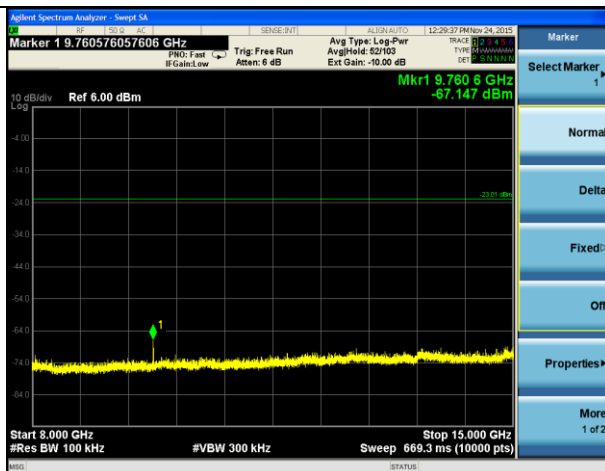
LSR: C-2290

Name: 1DX0JB0AX

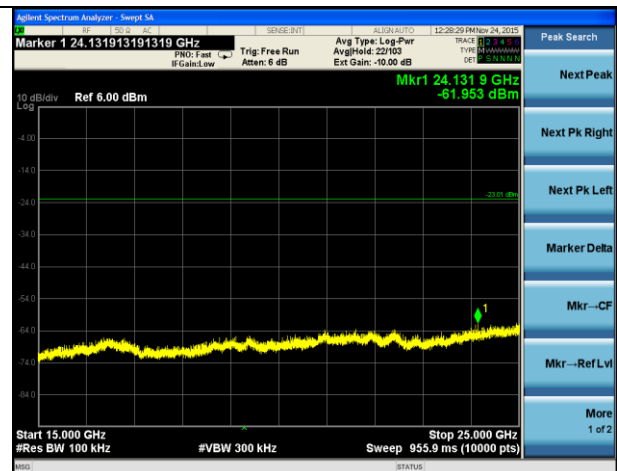
Model: See section 3.1

Serial: See Section 3.1

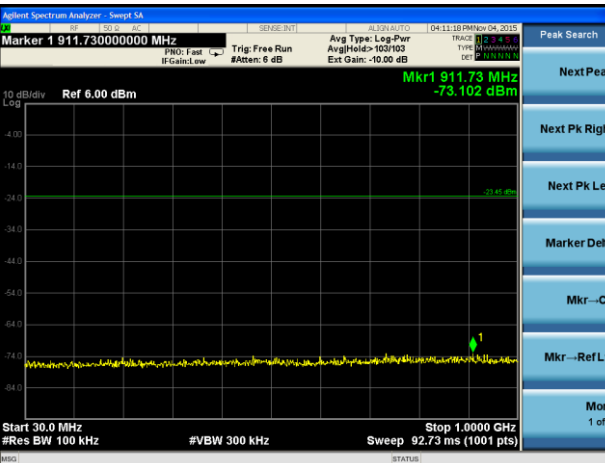
Plots



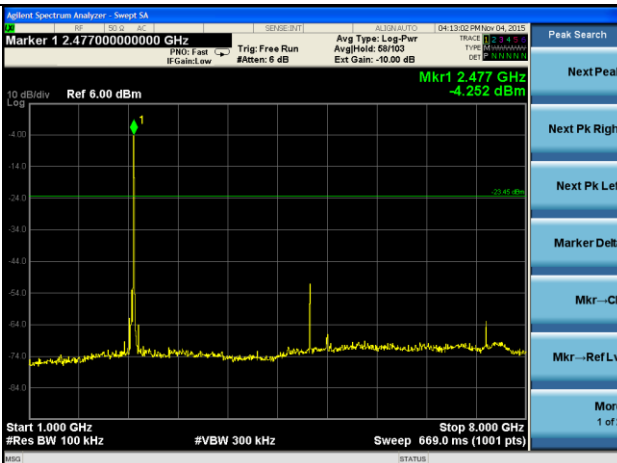
8-15 GHz – Mid Channel



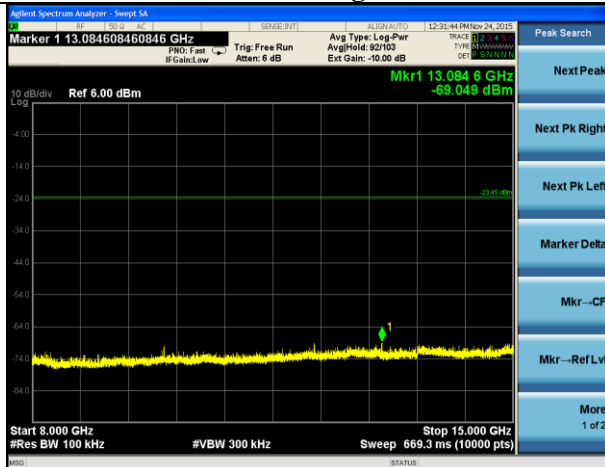
15-25 GHz – Mid Channel



30-1000 MHz – High Channel



1-8 GHz – High Channel



8-15 GHz – High Channel



15-25 GHz – High Channel

Prepared For: Stanley Black and Decker

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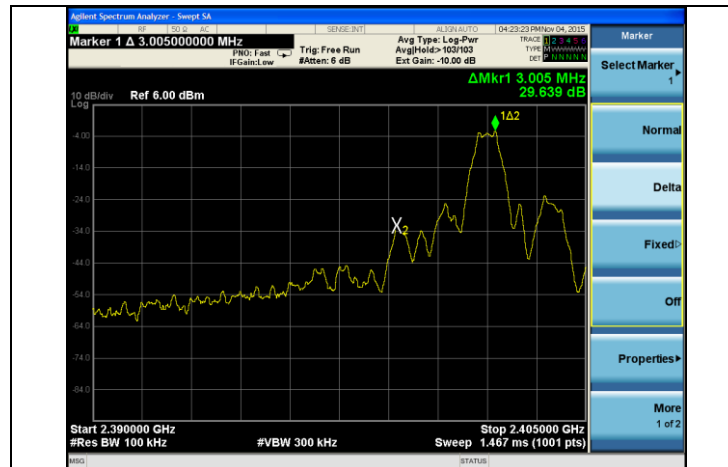
LSR: C-2290

Name: 1DX0JB0AX

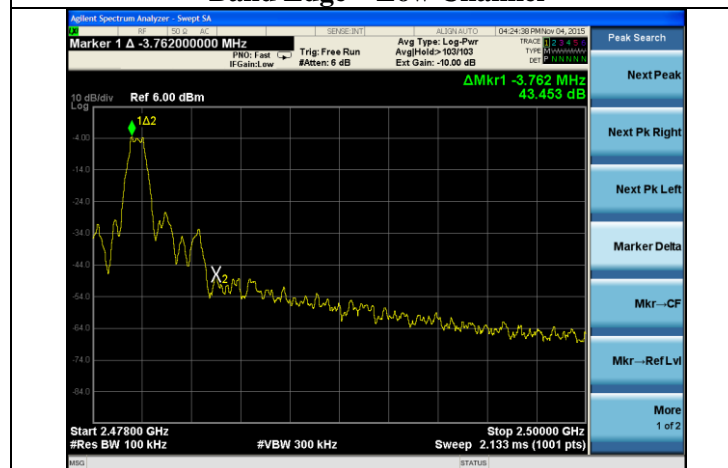
Model: See section 3.1

Serial: See Section 3.1

Plots



Band Edge – Low Channel



Band Edge – High Channel

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Report: TR 315131	Model: See section 3.1
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B.1.4 – RF Conducted – Frequency Stability

Manufacturer	Stanley Black and Decker
Date	November 4, 2015
Operator	Peter Feilen
Temp. / R.H.	20 - 25° C / 30-60% R.H.
Rule Part	FCC 2.1055 RSS-GEN Section 6.11
Specific Measurement Procedure	ANSI C63.10-2013 Section 6.8
Additional Description of Measurement	RF Conducted Measurement
Additional Notes	<p>The power and frequency stability of the device was examined as a function of the input voltage available to the EUT. A Spectrum Analyzer was used to measure the RF output power and frequency at the appropriate frequency markers. Power was supplied by an external bench-type DC power supply and was varied from the nominal.</p> <p>The power was then cycled On/Off to observe system response. No unusual response was observed, the emission characteristics were well behaved, and the system returned to the same state of operation as before the power cycle.</p> <p>Below is data showing stability of the fundamental frequency.</p> <p>Continuous transmit un-modulated used for this test.</p>

Table

Channel	Nominal (20 VDC)	-15% (17 VDC)	Max Drift (Hz)
	Frequency (Hz)	Frequency (Hz)	
Low	2401994755	2401994684	71
Mid	2439995201	2439994821	380
High	2479994995	2479994877	118

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B.2 – Transmitter Radiated Emissions in Restricted Bands

Rule Part(s)	FCC: 15.247 / 15.205 / 15.209 IC: RSS-GEN Section 8.9,8.10			
Measurement Procedure	ANSI C63.10 – 2013 Section 11.12 (6.3,6.5,6.6)			
Test Location	LS Research, LLC - FCC Listed 3 meter Semi-Anechoic Chamber			
Test Distance	See data section			
EUT Placement	Above 1 GHz: 150 cm height non-conductive table above reference ground plane covered with absorbers Below 1 GHz: 80 cm height non-conductive table above reference ground plane			
Frequency Range of Measurement	Biconical: 30-200 MHz	Log Periodic Dipole Array: 200-1000 MHz	Double-Ridged Waveguide Horn: 1-18 GHz	Standard Gain Horn: 18-26GHz
Measurement Detectors	30-1000MHz RBW: 120 kHz VBW: At least 300 kHz		1 - 40 GHz: RBW : 1MHz VBW: At least 3 (MHz) Peak 10 Hz Average	
Description of Measurement	1) The antenna, cable, pre-amp, and other necessary measurement system correction factors are loaded onto the EMI receiver / spectrum analyzer when the measurements are preformed. The data is gathered and reported as the corrected values. 2) The EUT is placed on a non-conductive pedestal <u>made of expanded polyethylene foam</u> centered on a turn-table in the test location with the antenna at the test distance from the EUT 3) Maximum radiated RF emissions are determined by rotation of azimuth and scanning the sense antenna between 1 and 4 meters in height using both horizontal and vertical antenna polarities. Maximized levels are manually noted at degree values of azimuth and at sense antenna height.			
Example Calculations	Reported Measurement data = Raw receiver measurement + Antenna Correction Factor + Cable factor (dB) - amplification factor (when applicable) + Additional factor (when applicable)			

Limits:

Frequency (MHz)	3 m Limit ($\mu\text{V/m}$)	3 m Limit ($\text{dB}\mu\text{V/m}$)	Type
30-88	100	40.0	Quasi-Peak
88-216	150	43.5	Quasi-Peak
216-960	200	46.0	Quasi-Peak
Above 960	500	54.0	Average (>1 GHz)

Prepared For: Stanley Black and Decker	Name: 1DX0JB0AX
Report: TR 315131	Model: See section 3.1
LSR: C-2290	Serial: See Section 3.1

B.2.1 – Transmitter Band-Edge Restricted Band

Manufacturer	Stanley Black and Decker
Date	November 12, 2015
Operator	Coty Hammerer
Temp. / R.H.	20 - 25° C / 30-60% R.H.
Rule Part	FCC 15.247/ 15.205 / 15.209 IC RSS-247 / RSS-GEN
Measurement Procedure	ANSI C63.10-2013 Section 11.12
Test Distance	3 meter
EUT Placement	150 cm height non-conductive table centered on turn-table , absorbers covering ground plane
Detectors	Final Measurements: Peak / Max Hold, RBW 1 MHz, Average VBW 10Hz, Peak VBW 3 MHz
Additional Notes	1) EUT maximized in orientation, azimuth, and antenna height with maximum results reported.
Example Calculation	$\text{Limit (dB}\mu\text{V/m)} - \text{Reading (dB}\mu\text{V/m)} = \text{Margin (dB)}$

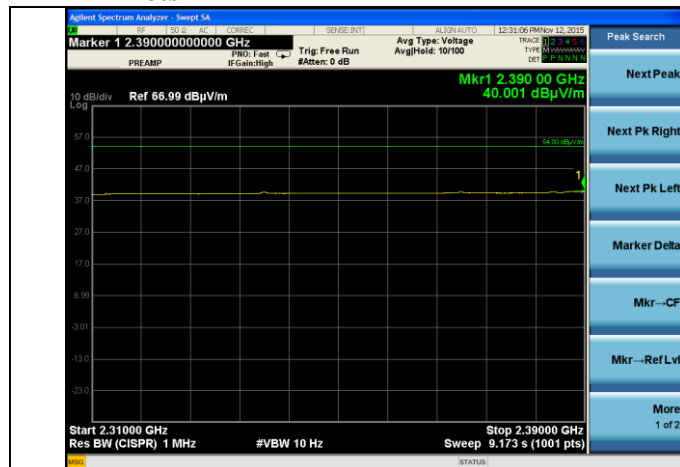
Average Table

EUT Channel	Frequency (MHz)	Average Reading (dB μ V/m)	Average Limit (dB μ V/m)	Average Margin (dB)
Low	2390.00	40.00	54	14.00
High	2489.50	44.65	54	9.35

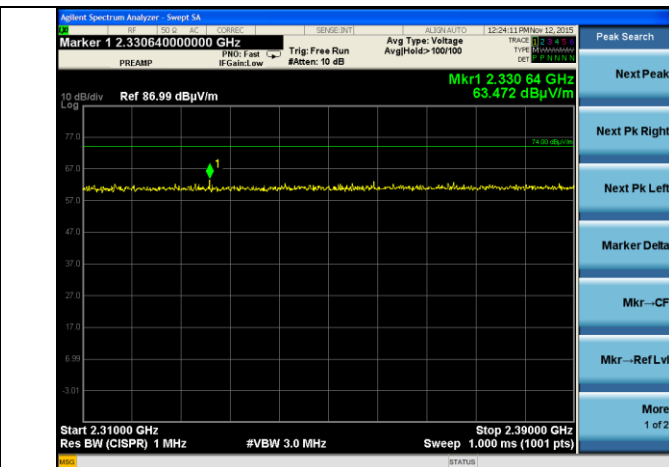
Peak Table

EUT Channel	Frequency (MHz)	Peak Reading (dB μ V/m)	Peak Limit (dB μ V/m)	Peak Margin (dB)
Low	2330.64	63.47	74	10.53
High	2485.48	63.49	74	10.51

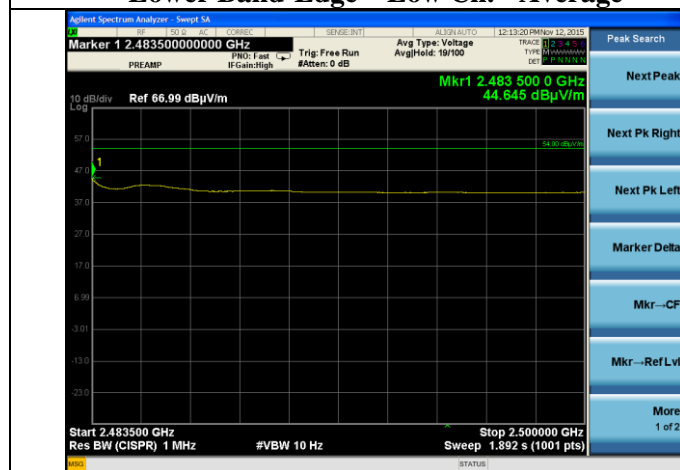
Plots



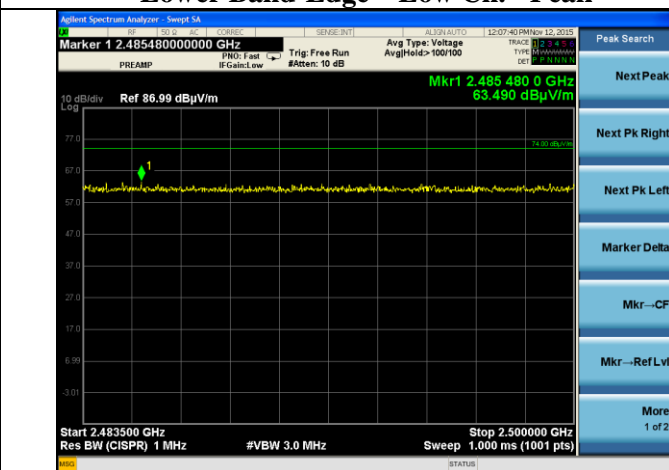
Lower Band-Edge – Low Ch. - Average



Lower Band-Edge – Low Ch. - Peak



Upper Band-Edge – High Ch. - Average



Upper Band-Edge – High Ch. - Peak

Prepared For: Stanley Black and Decker

Report: TR 315131

LSR: C-2290

Name: 1DX0JB0AX

Model: See section 3.1

Serial: See Section 3.1

B.2.2 – Transmitter Radiated Spurious Emissions in Restricted Bands

Manufacturer	Stanley Black and Decker
Date	November 5, 12, 13, 20 2015
Operator	Peter Feilen/Coty Hammerer
Temp. / R.H.	20 - 25° C / 30-60% R.H.
Rule Part	FCC 15.247/ 15.205 / 15.209 IC RSS-247 / RSS-GEN
Measurement Procedure	ANSI C63.10-2013 Section 11.12
Test Distance	3 meter
EUT Placement	150 cm height non-conductive table centered on turn-table , absorbers covering ground plane
Detectors	Final Measurements: Peak / Max Hold, RBW 1 MHz, Average VBW 10Hz, Peak VBW 3 MHz
Additional Notes	EUT maximized in azimuth, and antenna height with maximum results reported for each orientation.
Example Calculation	Limit (dBμV/m) – Reading (dBμV/m) = Margin (dB)

Table
30-1000 MHz

Frequency (MHz)	Quasi-Peak Reading (dBμV/m)	Quasi-Peak Limit (dBμV/m)	Margin (dB)
181.9	18.1	43.5	25.4
195.3	18.0	43.5	25.5
987.6	29.0	54.0	25.0
982.2	29.2	54.0	24.8

Note: Noise Floor readings

1-25 GHz

EUT Channel	Frequency (MHz)	EUT orientation	Antenna Polarity	Azimuth (degree)	Height (cm)	Average Reading (dBμV/m)	Peak Reading (dBμV/m)	Average Limit (dBμV/m)	Average Margin (dB)	Peak Limit (dBμV/m)	Peak Margin (dB)
High	4960	Flat	Horizontal	339	213	38.5	45.3	54	15.5	74	28.7
			Vertical	184	142	44.7	50.4		9.3		23.6
High	4960	Horizontal	Horizontal	270	101	43.6	49.5		10.4		24.5
			Vertical	319	175	42.2	48.2		11.8		25.8
High	4960	Vertical	Horizontal	16	127	41.9	48.6		12.1		25.4
			Vertical	340	101	39.8	46.5		14.2		27.5
Low	4805	Flat	Horizontal	350	180	46.4	51.6		7.6		22.4
			Vertical	187	101	49.3	54.1		4.7		19.9
Low	4805	Horizontal	Horizontal	280	106	49.5	54.4		4.5		19.6
			Vertical	82	124	46.8	51.7		7.2		22.3
Low	4805	Vertical	Horizontal	355	101	46.7	51.9		7.3		22.1
			Vertical	222	215	40.5	47.6		13.5		26.4
Mid	4880	Flat	Horizontal	340	150	44.7	50.3		9.3		23.7
			Vertical	181	150	48.7	53.4		5.3		20.6
Mid	4880	Horizontal	Horizontal	263	101	48.2	53.3		5.8		20.7
			Vertical	89	101	45.1	50.5		8.9		23.5
Mid	4880	Vertical	Horizontal	334	122	45.2	50.6		8.8		23.4
			Vertical	18	323	45.6	51.2		8.4		22.8

Prepared For: Stanley Black and Decker

Name: 1DX0JB0AX

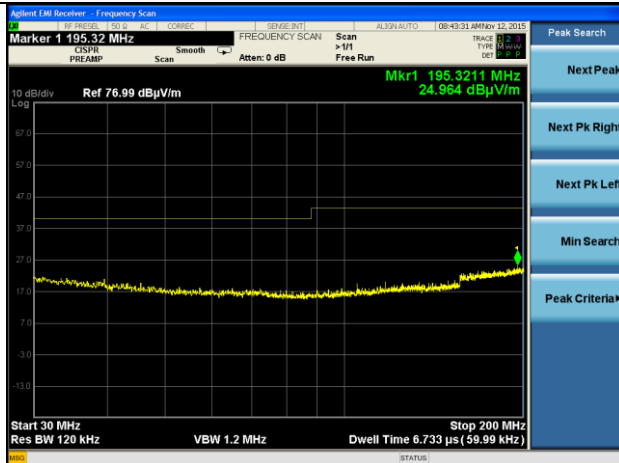
Report: TR 315131

Model: See section 3.1

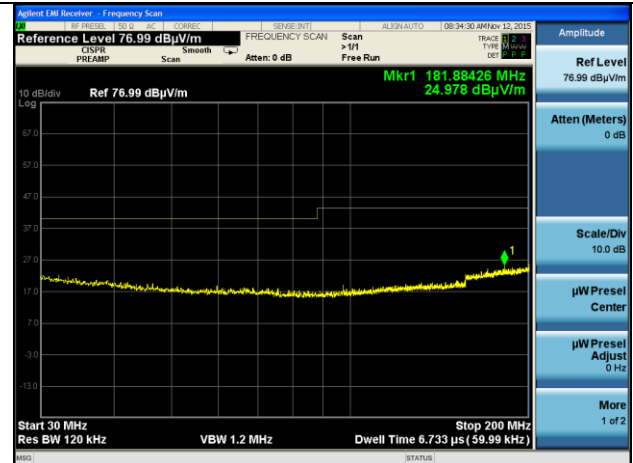
LSR: C-2290

Serial: See Section 3.1

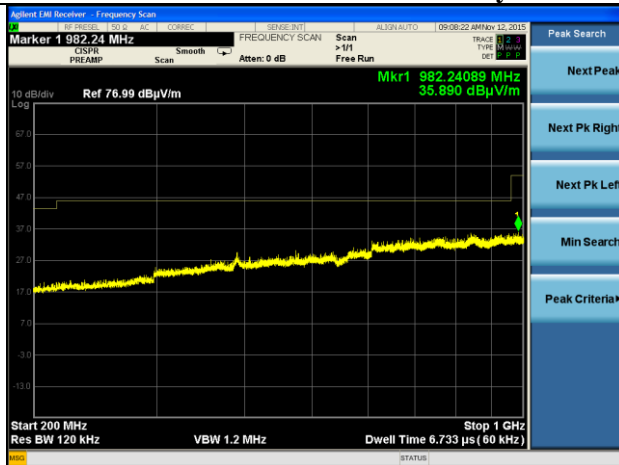
Plots



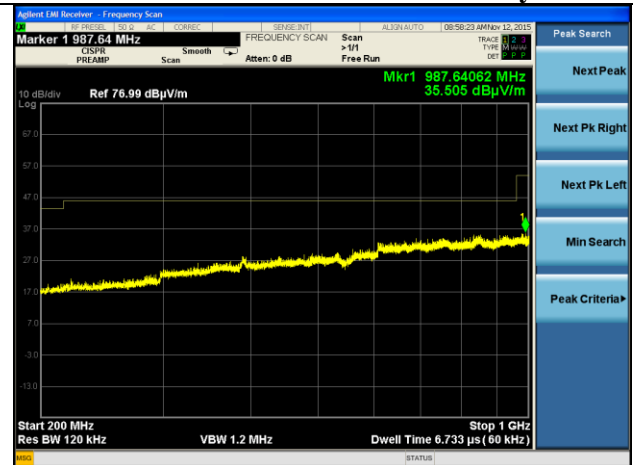
30-200 MHz - Vertical Polarity



30-200 MHz - Horizontal Polarity



200-1000 MHz - Vertical Polarity



200-1000 MHz - Horizontal Polarity

Prepared For: Stanley Black and Decker

Report: TR 315131

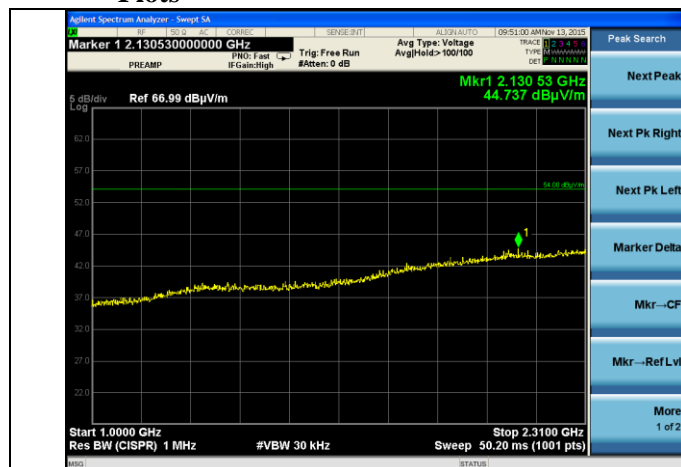
LSR: C-2290

Name: 1DX0JB0AX

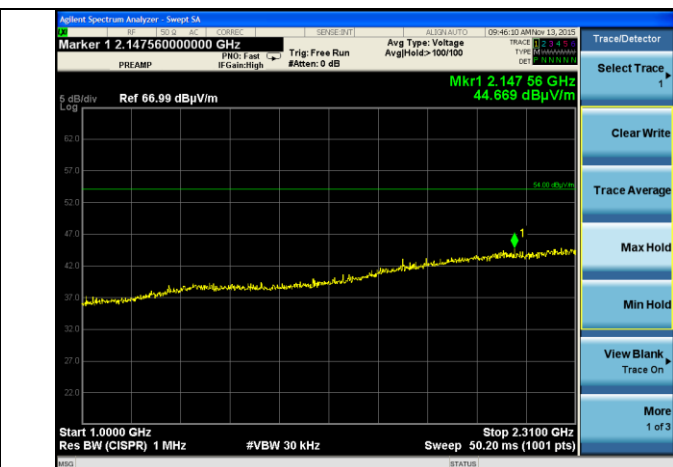
Model: See section 3.1

Serial: See Section 3.1

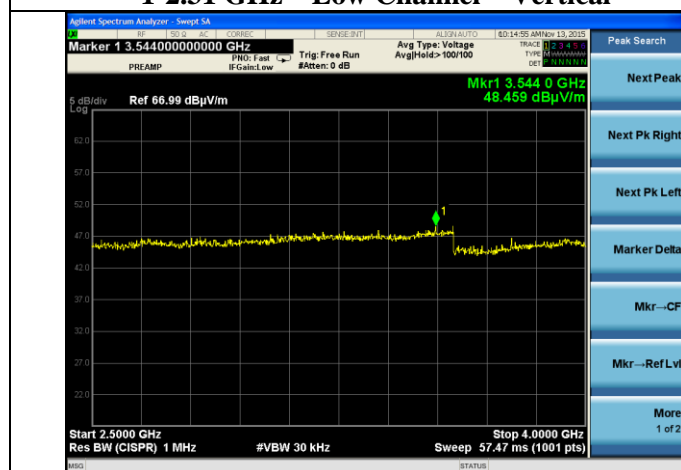
Plots



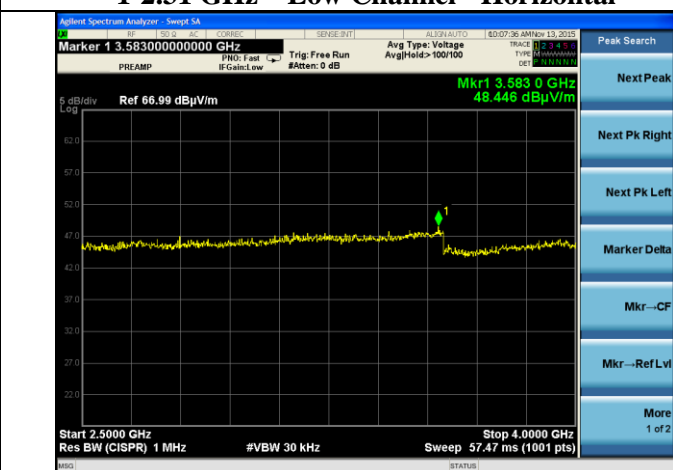
1-2.31 GHz – Low Channel – Vertical



1-2.31 GHz – Low Channel - Horizontal



2.5-4 GHz – Low Channel - Vertical



2.5-4 GHz – Low Channel - Horizontal

Prepared For: Stanley Black and Decker

Report: TR 315131

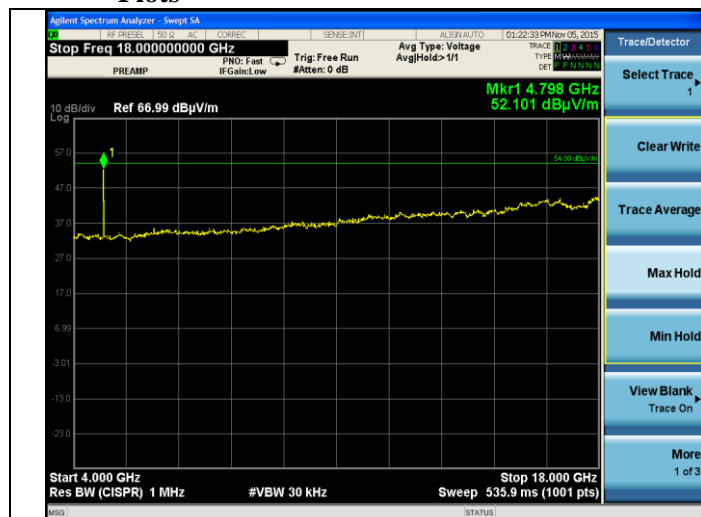
LSR: C-2290

Name: 1DX0JB0AX

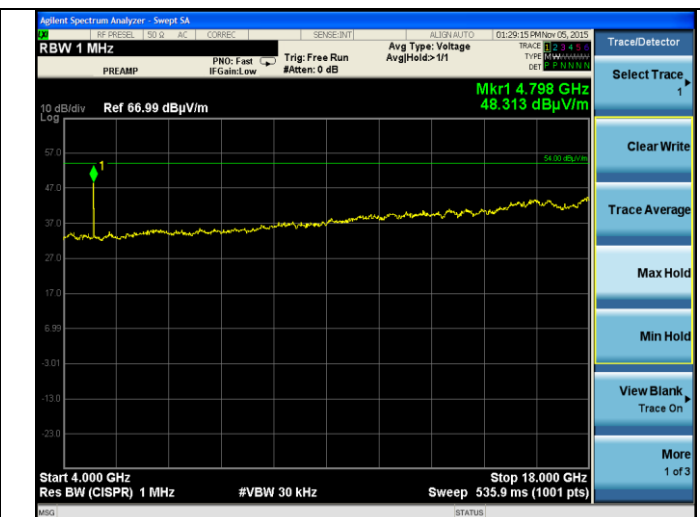
Model: See section 3.1

Serial: See Section 3.1

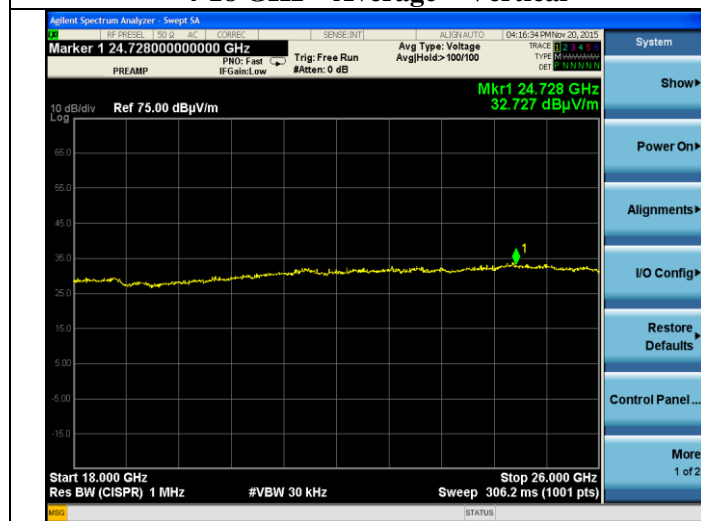
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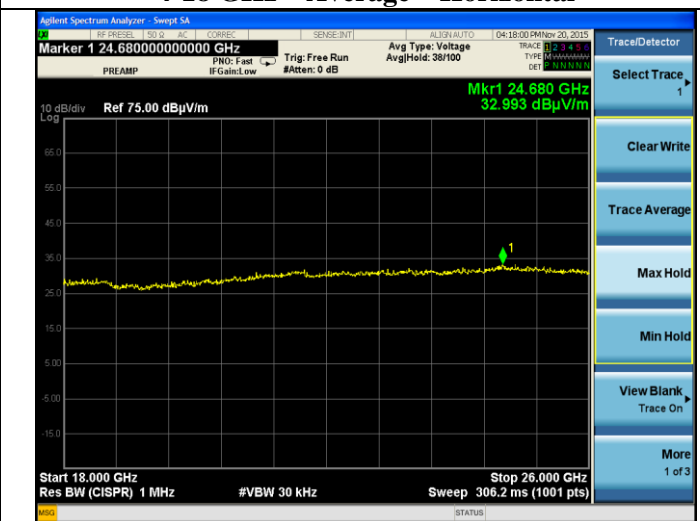
4-18 GHz – Average – Vertical



4-18 GHz – Average – Horizontal



18-25 GHz – Average - Vertical



18-25 GHz – Average - Horizontal

Prepared For: Stanley Black and Decker

Report: TR 315131

LSR: C-2290

Name: 1DX0JB0AX

Model: See section 3.1

Serial: See Section 3.1

B.3 – AC Mains Conducted Emissions

Rule Part(s)	FCC: 15.207 IC: RSS-247 / RSS-GEN
Measurement Procedure	ANSI C63.4 - 2014 ANSI C63.10 – 2013
Test Location	LS Research, LLC – Conducted Emissions Area
Test Voltage	120 VAC 60 Hz
EUT Placement	80 cm height non-conductive table above reference ground plane; 40 cm to horizontal plane
Frequency Range of Measurement	150 kHz – 30 MHz
Measurement Detectors	Peak, Quasi-Peak, Average RBW: 9 kHz VBW: At least 27 kHz
Description of Measurement	<p>1) The LISN, cable, limiter, and other necessary measurement system correction factors are loaded onto the EMI receiver / spectrum analyzer when the measurements are performed. The data is gathered and reported as the corrected values.</p> <p>2) The EUT is placed on a non-conductive pedestal at appropriate distance from ground planes and plugged into LISN. The LISN used has the ability to terminate the unused port with a 50Ω (ohm) load when switched to either L1 (line) or L2 (neutral).</p> <p>3) Maximum emissions are determined with peak detector and measurements at select points are made with quasi-peak and average detectors. Results are recorded and compared to limit.</p>
Example Calculations	Reported Measurement data = Raw receiver measurement + LISN Factor + Cable factor (dB) + Additional factor (when applicable)

Limits of Conducted Emissions at the AC Mains Ports:

Frequency Range (MHz)	Class B Limits (dBμV)	
	Quasi-Peak	Average
0.150 -0.50 *	66-56	56-46
0.5 – 5.0	56	46
5.0 – 30	60	50
* The limit decreases linearly with the logarithm of the frequency in this range.		

Prepared For: Stanley Black and Decker	Name: 1DX0JB0AX
Report: TR 315131	Model: See section 3.1
LSR: C-2290	Serial: See Section 3.1

B.3.1 – AC Mains Conducted Emissions

Manufacturer	Stanley Black and Decker
Date	12-23-15
Operator	Adam A
Temp. / R.H.	20 - 25° C / 30-60% R.H.
Rule Part	15.207 / RSS-GEN
Measurement Procedure	ANSI C63.4 - 2014 ANSI C63.10 - 2013 Section 6.2
Test Voltage	120 VAC 60 Hz
EUT Placement	80 cm height non-conductive table, 40 cm from vertical ground plane
Detectors	Peak; RBW 9 kHz Quasi-Peak and Average
Additional Notes	1) Tested in continuous transmit with no significant difference between operating channels.

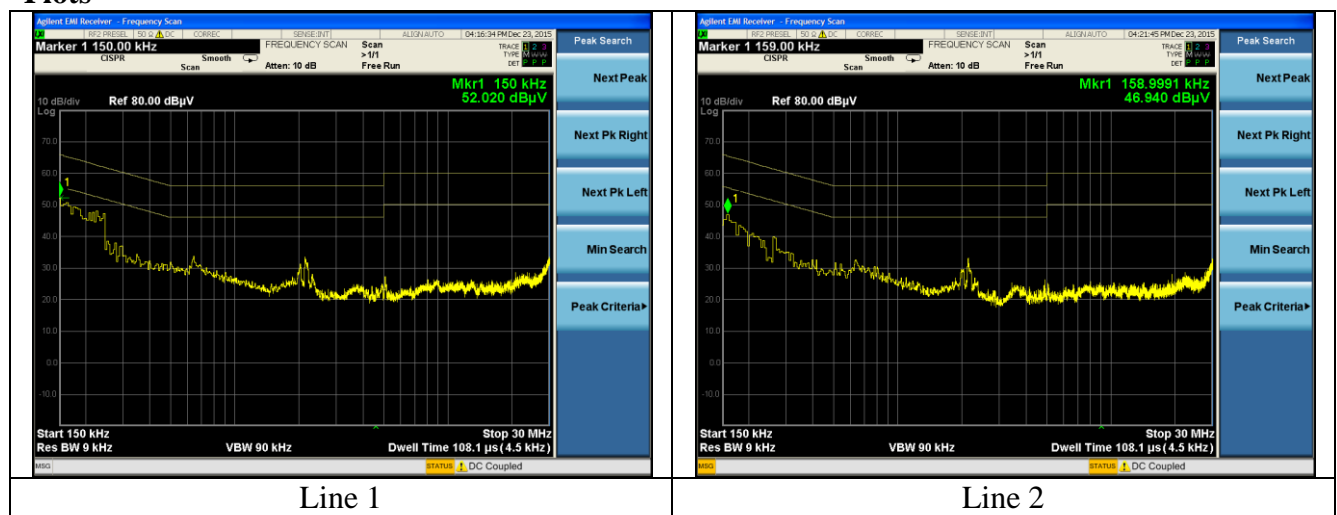
Example Calculation:

Margin (dB) = Limit (dBμV) – Reading (dBμV)

Table

Frequency (MHz)	Line	Peak Reading (dBμV)	Quasi-Peak Reading (dBμV)	Average Reading (dBμV)	Q-Peak Limit (dBμV)	Quasi-Peak Margin (dB)	Average Limit (dBμV)	Average Margin (dB)
0.150	1	53.5	45.2	33.1	66.0	20.8	56.0	22.9
0.245	1	46.2	39.4	29.7	61.9	22.5	51.9	22.2
2.134	1	33.9	30.2	18.1	56.0	25.8	46.0	27.9
0.159	2	48.0	40.5	22.3	65.5	25.0	55.5	33.2
0.262	2	39.2	31.7	23.0	61.4	29.7	51.4	28.4
2.130	2	34.5	29.3	16.9	56.0	26.7	46.0	29.1

Plots



Prepared For: Stanley Black and Decker

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Name: 1DX0JB0AX

Model: See section 3.1

Serial: See Section 3.1

Appendix C - Uncertainty Summary

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level, using a coverage factor of $k=2$.

Table of Expanded Uncertainty Values, ($K=2$) for Specified Measurements

Measurement Type	Particular Configuration	Uncertainty Values
Radiated Emissions	3 – Meter chamber, Biconical Antenna	4.82 dB
Radiated Emissions	3-Meter Chamber, Log Periodic Antenna	4.88 dB
Radiated Emissions	3-Meter Chamber, Horn Antenna	4.85 dB
Absolute Conducted Emissions	Agilent PSA/ESA Series	1.38 dB
AC Line Conducted Emissions	Shielded Room/EMCO LISN	3.20 dB
Radiated Immunity	3 Volts/Meter in 3-Meter Chamber	2.05 Volts/Meter
Conducted Immunity	3 Volts level	2.33 V
EFT Burst, Surge, VDI	230 VAC	54.4 V
ESD Immunity	Discharge at 15kV	3200 V
Temperature/Humidity	Thermo-hygrometer	0.64° / 2.88 %RH

Appendix D - References

Publication	Year	Title
FCC CFR Parts 0-15	2015	Code of Federal Regulations – Telecommunications
RSS-247 Issue 1	2015	Digital Transmissions Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
RSS-GEN Issue 4	2014	General Requirements and Information for the Certification of Radio Apparatus
ANSI C63.4	2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
ANSI C63.10	2013	American National Standard of Procedures for Compliance Testing Unlicensed Wireless Devices

Prepared For: Stanley Black and Decker

Name: 1DX0JB0AX

Report: TR 315131

Model: See section 3.1

LSR: C-2290

Serial: See Section 3.1

END OF REPORT

Date	Version	Comments	Person
12-22-15	V0	Initial Draft Release	Kim B
12-23-15	V1	Final	Adam A

Prepared For: Stanley Black and Decker

Name: 1DX0JB0AX

Report: TR 315131

Model: See section 3.1

LSR: C-2290

Serial: See Section 3.1