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TEST REPORT # 316161 B
LSR Job #: C-2635

Compliance Testing of:
DeWalt Bluetooth Tag

Test Date(s):
1/16/17 – 1/26/17

Prepared For:
Attn: Kirwan Magdamo
Sr Project Engineer
Stanley Black & Decker, Inc.
701 East Joppa Rd.
Towson, MD 21286
410-716-3563
Kirwan.Magdamo@sbdinc.com
www.stanleyblackanddecker.com

This Test Report is issued under the Authority of:
Shane Dock, EMC Engineer

Signature: 

Date: 3-23-17

Test Report Reviewed by:
Adam Alger, Quality Systems Engineer

Signature:  ate: 3-23-17

Project Engineer:
Shane Dock, EMC Engineer

Signature:  Date: 3-23-17

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EXHIBIT 1. INTRODUCTION

1.1 -Laird Technologies, Inc. Test Lab in Review

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



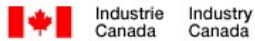
A2LA – American Association for Laboratory Accreditation

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 two 3 Meter Semi-Anechoic Chambers based on Title 47 CFR – Part 2.948
FCC Registration Number: 90756



Industry Canada

On file, 3 Meter Semi-Anechoic Chamber based on RSS-GEN – Issue 4
File Number: IC 3088A-2
On file, 3 Meter Semi-Anechoic Chamber based on RSS-GEN – Issue 4
File Number: IC 3088A-3

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1.2 - Location of Testing

All testing was performed at the following location utilizing the facilities listed below, unless otherwise noted.

Laird Technologies Inc.
W66 N220 Commerce Court
Cedarburg, Wisconsin, 53012 USA,

List of Facilities Located at Laird Technologies, Inc.:

Semi-Anechoic Chamber

1.3 - Test Equipment Utilized

A complete list of equipment utilized in testing is provided in Appendix A of this test report. Calibration dates are indicated in Appendix A. All test equipment is calibrated by a calibration laboratory accredited to the requirements of ISO/IEC 17025, and traceable to the SI standard.

1.4 - Scope

Purpose of Test:	RF Exposure Evaluation
Test Procedures:	FCC KDB 447498 v06 RSS-102 Issue 5

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EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1 - Client Information

Manufacturer Name:	Stanley Black and Decker
Address:	701 East Joppa Rd., Towson, MD 21286 410-716-3563
Contact Name:	Kirwan Magdamo

2.2 - Equipment Under Test (EUT) Information

The following information has been supplied by the applicant.

Product Name:	DeWalt Bluetooth Tag
Model Number:	Engineering FCC Test Sample
Serial Number:	Engineering FCC Test Sample

2.3 - Associated Antenna Description

The antenna is a PCB-printed PIFA antenna. This antenna has a peak gain of 0 dBi.

2.4 - Product Description

The Bluetooth DeWalt Tag is designed for tracking and locating professional power tools, equipment, and machines using the DeWalt Tool Connect app which is capable of connecting with mobile devices that support Bluetooth Smart technology. The features of the Tag include a sealed enclosure with an IP68 rating, an over molded push button to initiate pairing to a mobile device, a blue LED to locate which Tag is currently connected to the mobile device, and various mounting options. The Tag is powered by a 3.0V CR2450 coin cell with an expected battery life of 3 years.

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2.5 - EUT'S Technical Specifications

EUT Frequency Range (in MHz)	2402 – 2480 MHz
Type of Modulation	Gaussian Shift Frequency
Transmitter Spurious (worst case) at 3 meters	62.2 dBuV/m (Peak) at 7320 MHz (42.2 dBuV/m with relaxation for duty cycle (Average))
Frequency Tolerance %, Hz, ppm	Better than 100 ppm
Microprocessor Model # (if applicable)	-
Antenna Information	
Detachable/non-detachable	Non-Detachable
Type	PIFA
Gain	0 dBi
EUT will be operated under FCC Rule Part(s)	Title 47 part 15.247
Modular Filing	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

Radio Characteristics

	BLE
Maximum Conducted Output Power (dBm)	3.67
Maximum Conducted Output Power (mW)	2.33
Minimum Conducted Output Power (dBm)	3.28
Minimum Conducted Output Power (mW)	2.12
99% Bandwidth (MHz)	1.06
6 dB Bandwidth (kHz)	735.90

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EXHIBIT 3. EUT OPERATING CONDITIONS & CONFIGURATIONS DURING TESTS

3.1 - Climate Test Conditions

Temperature:	70 -74° F
Humidity:	30-42%
Pressure:	728-741mmHg

3.2 - Modifications Incorporated In The EUT For Compliance Purposes

None Yes (explain below)

3.3 - Deviations & Exclusions From Test Specifications

None Yes (explain below)

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EXHIBIT 4. CONFORMANCE SUMMARY

When tested between September 2nd and October 26 of 2016, it was determined that the EUT, the Dewalt Bluetooth Tag, was found to meet the minimum distance and is exclude from SAR evaluation using the following guidance:

FCC KDB 447498 v06
RSS-102 Issue 5

Any modifications made to the EUT after the specified test date(s) will invalidate the data herein.

If some emissions measurements are seen to be within the uncertainty value, as listed in Appendix C there is a possibility that this unit may not meet the required limit specification if subsequently tested.

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EXHIBIT 5. POWER OUTPUT (CONDUCTED): 15.247(b)

Test Engineer(s): Shane Dock

5.1 - Method of Measurements

The conducted RF output power of the EUT was measured at the antenna port using a short RF cable along with an attenuator as protection for the spectrum analyzer. The loss from the cable and the attenuator were added on the analyzer as gain offset settings thereby allowing direct measurements without the need for any further corrections. The unit was configured to run in a continuous transmit mode, while being supplied with typical data as a modulation source.

Measurement procedure used was FCC OET KDB 558074 D01 Measurement Guidance v03r05 section 9.1.1.

Peak Conducted Output Power Limit = 1 Watt (30 dBm).

5.2 - Test Data

Frequency (MHz)	2402	2440	2480
Conducted Pout (dBm)	3.28	3.67	3.54

The data reported includes all necessary correction factors. These correction factors are loaded onto the EMI receiver when measurements are performed.

Reported Measurement data = Raw receiver measurement (dBm) + Cable factor (dB) + Miscellaneous factors when applicable (dB).

Generic example of reported data at 2440 MHz:

Reported Measurement data = 8.55 (raw receiver measurement in dBm) + 0.85 (cable factor in dB) = 9.4 (dBm).

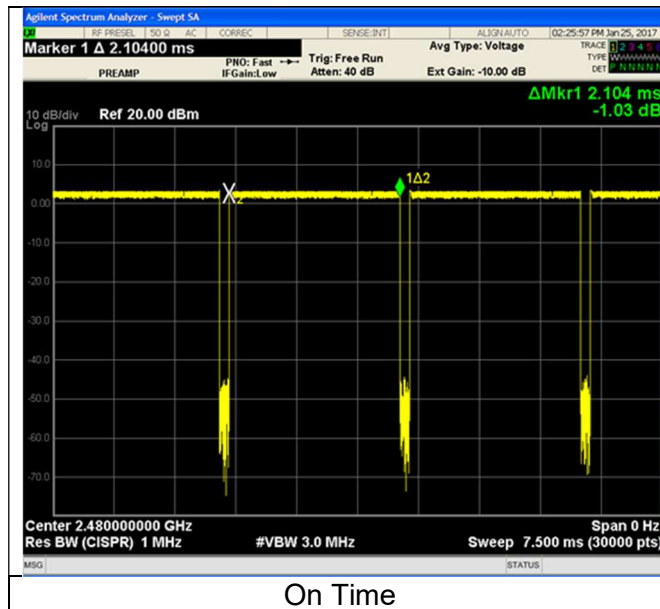
Prepared For: Stanley Black and Decker	Model #: Engineering FCC Test Sample	Report #: 316161
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5.2.1. Maximum conducted peak power:

5.2.1.1 Duty cycle:

Measurement procedure: **FCC OET KDB 558074 D01 Measurement Guidance v03r05.**

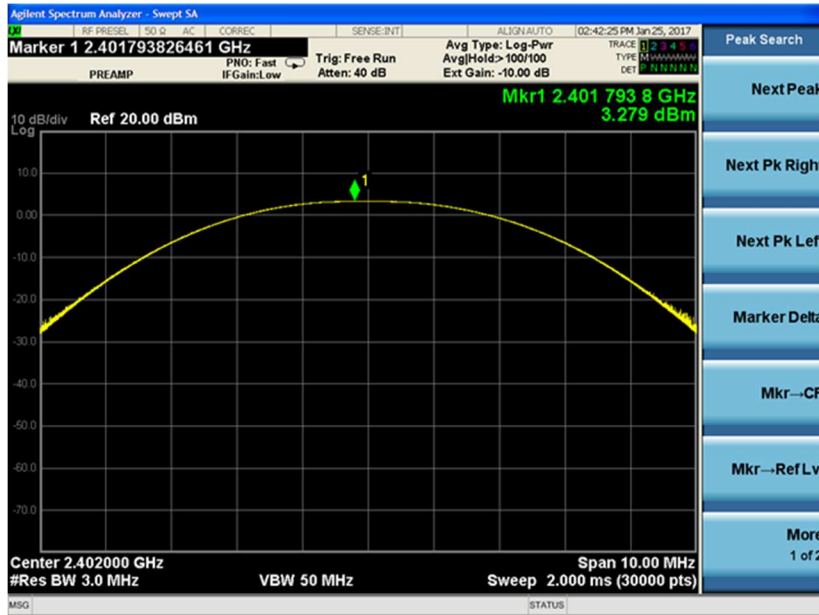
Screen captures:



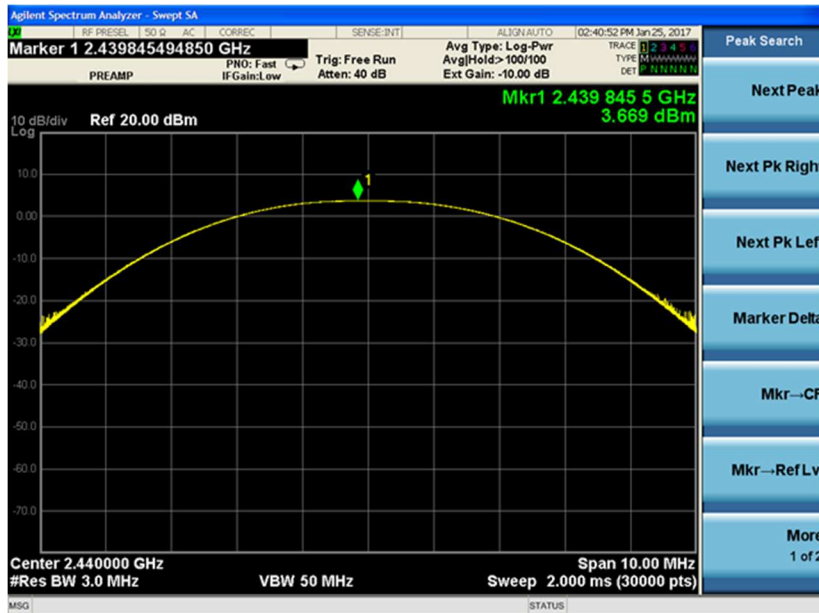
Duty cycle is 94.6%

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9.2.1.2 Maximum conducted (peak) output power:

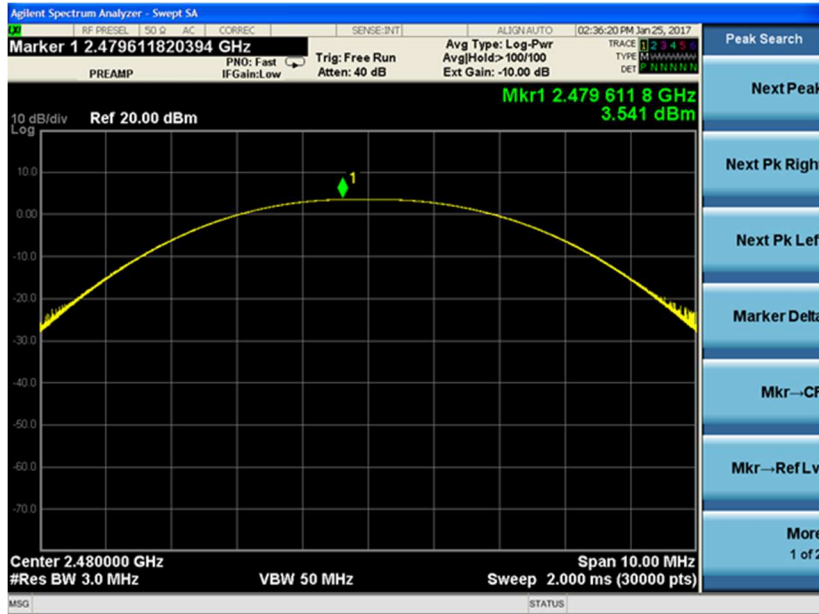


Low Channel



Mid Channel

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High Channel

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EXHIBIT 6. RF Exclusion Calculation

Test Engineer(s): Shane Dock

6.1 - Exemption equation & limits

FCC:

SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 20 cm

1-g SAR test exclusion threshold equation:

$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] * [\sqrt{f(\text{GHz})}] \leq 3.0$$

10-g SAR test exclusion threshold equation:

$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] * [\sqrt{f(\text{GHz})}] \leq 7.5$$

RSS 102:

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of ≤ 5 mm	At separation distance of 10 mm	At separation distance of 15 mm	At separation distance of 20 mm	At separation distance of 25 mm
≤ 300	71 mW	101 mW	132 mW	162 mW	193 mW
450	52 mW	70 mW	88 mW	106 mW	123 mW
835	17 mW	30 mW	42 mW	55 mW	67 mW
1900	7 mW	10 mW	18 mW	34 mW	60 mW
2450	4 mW	7 mW	15 mW	30 mW	52 mW
3500	2 mW	6 mW	16 mW	32 mW	55 mW
5800	1 mW	6 mW	15 mW	27 mW	41 mW

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of 30 mm	At separation distance of 35 mm	At separation distance of 40 mm	At separation distance of 45 mm	At separation distance of ≥ 50 mm
≤ 300	223 mW	254 mW	284 mW	315 mW	345 mW
450	141 mW	159 mW	177 mW	195 mW	213 mW
835	80 mW	92 mW	105 mW	117 mW	130 mW
1900	99 mW	153 mW	225 mW	316 mW	431 mW
2450	83 mW	123 mW	173 mW	235 mW	309 mW
3500	86 mW	124 mW	170 mW	225 mW	290 mW
5800	56 mW	71 mW	85 mW	97 mW	106 mW

Note:

- Table above if for 1-gram tissue, head and body, evaluation (uncontrolled). Limb-worn devices where 10-gram tissue applies, multiply limit by a factor of 2.5

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6.1 - Exemption calculation

FCC:

Frequency = 2440MHz

Output Power = 5.67 dBm (3.67 + 2 dB for tune up tolerance)

Antenna gain = 0 dBi

EIRP = 5.67 dBm = 3.69 mW

Minimum separation distance (5mm) for SAR test exclusion (1g tissue) = $(3.69 / 5) * [\sqrt{2.44}] = 1.15 \leq 3.0$

RSS 102:

Frequency = 2440MHz

Output Power = 5.67 dBm (3.67 + 2 dB for tune up tolerance)

Antenna gain = 0 dBi

EIRP = 5.67 dBm = 3.69 mW

Minimum separation distance for SAR test Exclusion (1g tissue) **< 5mm** (based on table 1 of RSS 102)

Limit interpolated at 2440 MHz = 4.41 mW

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APPENDIX A - Test Equipment List



Date : 16-Jan-2017 Test : Conducted Radio Job # : C-2635
 PE : _____ Customer : Stanley Black and Decker Quote # : 316161

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	AA 960143	Phaseflex	Gore	EKD01D01048.0	5546519	6/28/2015	6/25/2017	Active Calibration
2	EE 960085	N9038A MXE 26.5GHz Receiver	Agilent	N9038A	MY 51210148	5/12/2016	5/12/2017	Active Calibration

Tested By: *Sameer* Quality Assurance: *[Signature]*

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APPENDIX B – Test Standards: CURRENT PUBLICATION DATES RADIO

STANDARD #	DATE	Am. 1	Am. 2
ANSI C63.4	2014		
ANSI C63.10	2013		
FCC 47 CFR, Parts 0-15, 18, 90, 95	2016		
RSS GEN	2014		
RSS 247	2017		
RSS 102	2015		
FCC KDB 447498 v06	2015		

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APPENDIX C - Uncertainty Statement

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

Measurement Type	Configuration	Uncertainty Values
<i>Radiated Emissions</i>	<i>Biconical Antenna</i>	<i>5.0 dB</i>
<i>Radiated Emissions</i>	<i>Log Periodic Antenna</i>	<i>5.3 dB</i>
<i>Radiated Emissions</i>	<i>Horn Antenna</i>	<i>4.7 dB</i>
<i>AC Line Conducted Emissions</i>	<i>AMN</i>	<i>3.4 dB</i>
<i>Telecom Conducted Emissions</i>	<i>AAN</i>	<i>4.9 dB</i>
<i>Disturbance Power (Emissions)</i>	<i>Absorbing Clamp</i>	<i>4.1 dB</i>
<i>Radiated Immunity</i>	<i>3 Volts/Meter</i>	<i>2.2 dB</i>
<i>Conducted Immunity</i>	<i>CDN/EM/BCI</i>	<i>2.4/3.5/3.4 dB</i>
<i>EFT Burst / Surge</i>	<i>Peak pulse voltage</i>	<i>164 volts</i>
<i>ESD Immunity</i>	<i>15 kV level</i>	<i>1377 Volts</i>

Parameter	ETSI U.C.+/-	U.C.+/-
Radio Frequency, from F0	1x10 ⁻⁷	0.55x10 ⁻⁷
Occupied Channel Bandwidth	5 %	2 %
RF conducted Power (PM)	1.5 dB	1.2 dB
RF conducted emissions (SA)	3.0 dB	1.7 dB
All emissions, radiated	6.0 dB	5.3 dB
Temperature	1° C	0.65° C
Humidity	5 %	2.9 %
Supply voltages	3 %	1 %

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