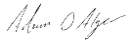
# Test Report # 317254

| | |
|---|---|
| **Equipment Under Test:** | DEWALT Bluetooth Tool Module |
| **Test Date(s):** | 3/22/17 – 4/17/17 |
| **Prepared for:** | Stanley Black & Decker<br>Attn: Kirwan Magdamo<br>701 E Joppa Road |

**Report Issued by:** Coty Hammerer, EMC Engineer I

Signature:  Date: 9/06/17

**Report Reviewed by:** Adam Alger, Quality Systems Engineer

Signature:  Date: 6/26/2017

**Report Constructed by:** Michael Hintzke, EMC Engineer III

Signature:  Date: 6/26/17

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## Laird Technologies Test Services in Review

The Laird Technologies, Inc. laboratory located at W66 N220 Commerce Court Cedarburg, Wisconsin, 53012 USA is recognized through the following organizations:

TESTING CERT #1255.01

**A2LA – American Association for Laboratory Accreditation**

*Accreditation based on ISO/IEC 17025: 2005 with Electrical (EMC) Scope*
*A2LA Certificate Number: 1255.01*
*Scope of accreditation includes all test methods listed herein, unless otherwise noted.*

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**Federal Communications Commission (FCC) – USA**

*Accredited recognition of two 3 meter Semi-Anechoic Chambers*

*Accredited Test Firm Registration Number: 953492*

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Government of Canada

**Innovation, Science and Economic Development Canada**

*ISED Site listing of two 3 meter Semi-Anechoic Chambers based on RSS-GEN – Issue 4*
*File Number: IC 3088A-2*
*File Number: IC 3088A-3*

# 1 TEST REPORT SUMMARY

On 3/22/17 – 4/17/16, the Equipment Under Test (EUT), DEWALT Bluetooth Tool Module, as provided by Stanley Black & Decker was evaluated for the following requirements:

| Requirement | Description | Specification | Method | Result |
|---|---|---|---|---|
| FCC Part 1.1307, 2.1091, 2.1093 | RF Exposure and equipment authorization requirements | Reported | FCC KDB 447498 | Reported |
| ISED Canada RSS-102 | Exemption Limits for Routine Evaluation — SAR Evaluation | Reported | RSS-102 Section 2.5.1 | Reported |

**Notice:**

The results relate only to the item tested and described in this report. Any modifications made to the equipment under test after the specified test date(s) may invalidate the data herein.

If the resulting measurement margin is seen to be within the uncertainty value, as listed in this report, the possibility exists that this unit may not meet the required limit specification if subsequently tested.

# 2 CLIENT INFORMATION

| | |
|---|---|
| **Company Name** | Stanley Black & Decker |
| **Contact Person** | Kirwan Magdamo |
| **Address** | 701 E. Joppa Road, Towson, MD 21286 |

## 2.1 Equipment Under Test (EUT) Information

*The following information has been supplied by the client*

| | |
|---|---|
| **Product Name** | Bluetooth Tool Module |
| **Model Numbers** | N471440(02) |
| **Serial Number** | Engineering Sample |
| **Host (Impact Drill Model) Model Numbers** | DCF896 & DCF896H |

## 2.2 Product Description

The DEWALT Bluetooth Tool Module permits a User to connect their DEWALT power tool to their mobile device giving them the ability to:

- Provide tool tracking & inventory management
- Provide security by enabling/disabling the tool or sending alerts when tool is out of range
- Customize tool performance
- Provide diagnostic and technical information to the User

The DEWALT Bluetooth Tool Module was tested in the following tools:

- DCF896 – Impact Driver

## 2.3 Modifications Incorporated for Compliance

None noted at time of test

## 2.4 Deviations and Exclusions from Test Specifications

None noted at time of test

## 2.5 Additional Information

The EUT was powered via a 20 VDC benchtop supply for Conducted Radio measurements while for Radiated Measurements a 20VDC rechargeable battery was attached the tool. The radio module was programmed at 2402, 2440 and 2480 MHz (low, middle and high channels, respectively) with an Android device using the Nordic Semiconductor nRF Connect Version 4.10 application. For radiated measurements the EUT was tested in 3 orientations.

**Note:** Stanley Black & Decker states that the Host (Impact Drill) sample tested for Radiated measurements was the DCF896 model which is identical to the DCF896H model, except for some mechanical configuration of the impactor drive. Therefore, both host model numbers are being listed within this report, with the specific model tested highlighted herein.

# 3 REFERENCES

| Publication | Edition | Date |
|---|---|---|
| CFR 47 Part 1 | - | 2017 |
| CFR 47 Part 2 | - | 2017 |
| RSS-102 | Issue 5 | 2015 |

# 4 UNCERTAINTY SUMMARY

Using the guidance of the following publications the calculated measurement uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level, using a coverage factor of k = 2.

| References | Version / Date |
|---|---|
| CISPR 16-4-1 | Ed. 2 (2009-02) |
| CISPR 16-4-2 | Ed. 2 (2011-06) |
| CISPR 32 | Ed. 1 (2012-01) |
| ANSI C63.23 | 2012 |
| A2LA P103 | February 4, 2016 |
| A2LA P103c | August 10, 2015 |
| ETSI TR 100-028 | V1.3.1 (2001-03) |

| Measurement Type | Configuration | Uncertainty ± |
|---|---|---|
| Radiated Emissions | Biconical Antenna | 5.0 dB |
| Radiated Emissions | Log Periodic Antenna | 5.3 dB |
| Radiated Emissions | Horn Antenna | 4.7 dB |
| AC Line Conducted Emissions | Artificial Mains Network | 3.4 dB |
| Telecom Conducted Emissions | Asymmetric Artificial Network | 4.9 dB |
| Disturbance Power Emissions | Absorbing Clamp | 4.1 dB |
| Radiated Immunity | 3 Volts/meter | 2.2 dB |
| Conducted Immunity | CDN/EM/BCI | 2.4/3.5/3.4 dB |
| EFT Burst/Surge | Peak pulse voltage | 164 volts |
| ESD Immunity | 15 kV level | 1377 Volts |

| Parameter | ETSI U.C. ± | U.C. ± |
|---|---|---|
| Radio Frequency, from F0 | $1x10^{-7}$ | $0.55x10^{-7}$ |
| Occupied Channel Bandwidth | 5 % | 2 % |
| RF conducted Power (Power Meter) | 1.5 dB | 1.2 dB |
| RF conducted emissions (Spectrum Analyzer) | 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 % |

# 5 TEST DATA

## 5.1 Fundamental Emission

| | |
|---|---|
| **Operator** | Michael Hintzke |
| **QA** | Aidi Zainal |
| **Test Date** | 4/2/17 |
| **Location** | Bench |
| **Temp. / R.H.** | 70°F / 54% |
| **Requirement** | CFR 47 Part 15.247 (b)(3)<br>RSS-247 section 5.4 d) |
| **Method** | FCC KDB 558074 D01 Meas Guidance v04 section 9.2.2.4 |

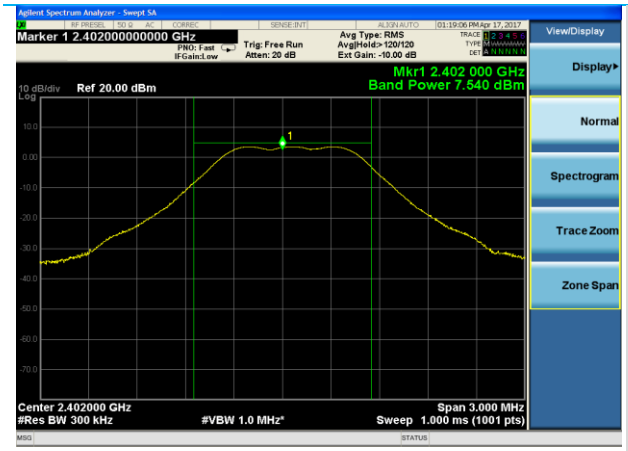
**Test Parameters**

| | |
|---|---|
| **Frequency** | 2402 MHz, 2440 MHz, 2480 MHz |
| **Maximum Conducted Output Power Measurement Settings** | • 300 kHz RBW / 1 MHz VBW<br>• RMS Detector |
| **EUT Power Input** | 20 VDC |

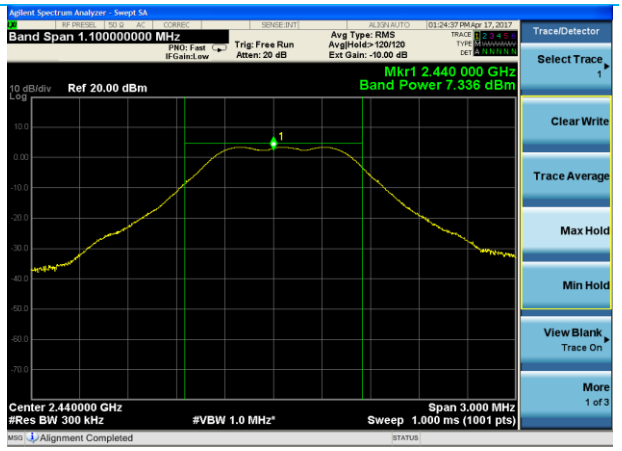
**Table**

| Channel Frequency (MHz) | Max Conducted (Average)Output Power (dBm) | Power Limit (dBm) | Margin (MHz) |
|---|---|---|---|
| 2402 | 7.740 | 30 | 22.260 |
| 2440 | 7.556 | 30 | 22.444 |
| 2480 | 7.451 | 30 | 22.549 |

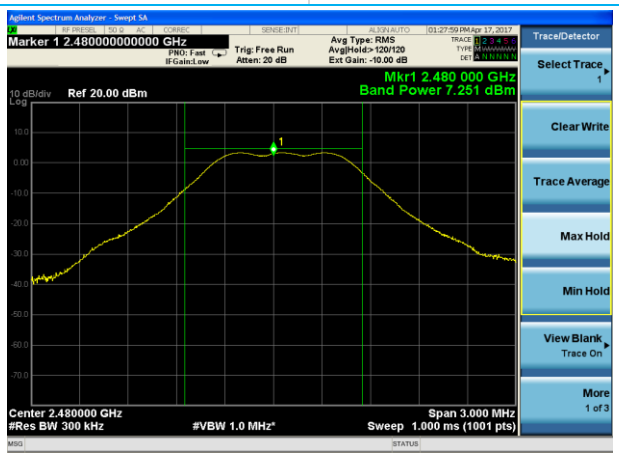
## Plots




*Low Channel*




*Middle Channel*




*High Channel*

# 6 EXCLUSION CALCULATION

## 6.1 FCC

| Maximum EIRP (adjusted for tune-up tolerance) | |
|---|---|
| Conducted (Average) Output Power | 7.740 dBm @ 2402 MHz |
| Antenna Gain | -3.4 dBi |
| Tune-up Tolerance | ±3 dBm |
| $P_{out}$ including tune-up tolerance | 7.34 dBm = 5.42 mW |

### 6.1.1 1-g Head or Body Minimum Separation Distance

$$\frac{max.power\ of\ channel, including\ tune-up\ tolerance, mW}{min.test\ separation\ distance, mm} \times \sqrt{f_{(GHz)}} \leq 3.0$$

$$\frac{5.42}{5} \times \sqrt{2.402} \leq 3.0$$

$$\underline{2.80 \leq 3.0}$$

Note: KDB 447498 states that if the minimum separation distance calculated above is less than 5 mm, a distance of 5mm is applied to determine SAR test exclusion

## 6.2 Industry Canada

### 6.2.1 RSS 102 Compliance

| 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 |

Note: Table 1 from RSS 102. The exemption limits represented in this table apply to 1-gram tissue, head and body, evaluation (uncontrolled). A linear extrapolation has been applied since the operating frequency is between two frequencies in Table 1.

Interpolating between 1900 MHz and 2450 MHz for 2402 MHz at a separation distance of **10 mm** yields the exemption limit of 7.3 mW for limb-worn devices.

When evaluated against RSS 102 issue 5 section 2.5, table 1:

**5.42 mW ≤ 7.3 mW**

# 7 REVISION HISTORY

| Version | Date | Notes | Person |
|---|---|---|---|
| 0 | 6/23/17 | Initial Draft | Mike Hintzke |
| 1 | 6/26/17 | Draft Revision | Mike Hintzke |
| 2 | 7/21/17 | Change of Model Number | Mike Hintzke |
| 3 | 9/6/17 | Host Model Number Change, Contact At SBD Changed | Coty Hammerer |

**END OF REPORT**