

Test Report C-3600C

Equipment Under Test: DCE042

Requirement(s): FCC 1.1310
ISED RSS-102

Test Date(s): 8/8/2022

Prepared for: Stanley Black & Decker
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Towson, MD 21286

Report Issued by: Anthony Smith, EMC Engineering Specialist

Signature: 

Date: 10/21/2022

Report Reviewed by: Adam Alger, Laboratory Manager

Signature: 

Date: 10/21/2022

Report Constructed by: Anthony Smith, EMC Engineering Specialist

Signature: 

Date: 10/21/2022

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Report: TR3600C		Model: DCE042
Quote: NBO-01-2022-004577-2		Serial: Engineering Sample

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Laird Connectivity Test Services in Review

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



A2LA – American Association for Laboratory Accreditation

Accreditation based on ISO/IEC 17025:2017 with Electrical (EMC) Scope

A2LA Certificate Number: 1255.01

Scope of accreditation includes all test methods listed herein unless otherwise noted



Federal Communications Commission (FCC) – USA

Accredited Test Firm Registration Number: 953492

Recognition of two 3 meter Semi-Anechoic Chambers



Innovation, Science and Economic Development Canada

Accredited U.S. Identification Number: US0218

Recognition of two 3 meter Semi-Anechoic Chambers

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1 TEST REPORT SUMMARY

On **8/8/2022** the Equipment Under Test (EUT), **DCE042**, as provided by **Stanley Black & Decker** was tested to the following requirements:

Portable Device

Requirements	Description	Method	Result
FCC: 1.1310	Radiofrequency Radiation Exposure Limits	Distance \leq 5mm 1g-SAR	Reported
IC: RSS-102	Radiofrequency Radiation Exposure Limits	Distance 10mm 1g-SAR	Reported

Notice:

The results relate only to the item tested as configured and described in this report. Any additional configurations, modes of operation, or modifications made to the equipment under test after the specified test date(s) are at the decision of the client and may not apply to the data seen in this test report.

The decision rule for Pass / Fail assessment to the specification or standard listed in this test report has been agreed upon by the client and laboratory to be as follows:

Measurement Type	Rule
Emissions – Amplitude	1 dB below specified limit
Emissions – Frequency	1% less than the specification
Immunity	Tested at specified level

2 CLIENT INFORMATION

Company Name	Stanley Black & Decker
Contact Person	Kirwan Magdamo
Address	701 East Joppa Road Towson, MD 21286

2.1 Equipment Under Test (EUT) Information

The following information has been supplied by the client

Product Name	DCE042
Model Number	DCE042
Serial Number	Engineering Sample
Additional Information	FCC ID: YJ7DCE042 IC ID: 9082A-DCE042

2.2 Product Description

The DCE042 Bluetooth Audit Chip is designed to be inserted into the foot of a DEWALT tool and retained by two screws fitted into the housing.

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

Device is powered via 3VDC coin cell battery. Device is programmed via a FTDI-USB cable, with the USB end connected to a programming laptop. Programming software used is nRF Connect for Desktop v3.11.1. Within the nRF Connect software the Direct Test Mode v.2.0.2 utility is used. Channels tested were 37 (2402 MHz), 17 (2440 MHz), and 39 (2480 MHz) with a 1M Data Rate. Transmit Power Settings used in the device are +4 dBm and -40 dBm.

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3 REFERENCES

Publication	Edition	Date	AMD 1
FCC eCFR	-	2022	-
RSS-102	5	2015	2021
KDB 447498	-	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
CISPR 16-4-1
CISPR 16-4-2
CISPR 32
ANSI C63.23
A2LA P103
A2LA P103c
ETSI TR 100-028

Measurement Type	Configuration	Uncertainty \pm
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

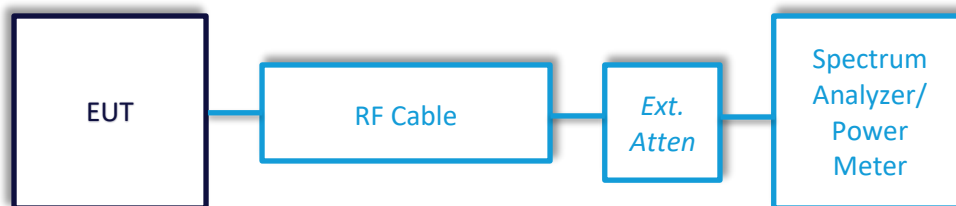
Parameter	ETSI U.C. \pm	U.C. \pm
Radio Frequency, from F0	1×10^{-7}	0.55×10^{-7}
Occupied Channel Bandwidth	5 %	2 %
RF conducted Power (Power Meter)	1.5 dB	1.2 dB
RF conducted emissions (Spectrum Analyzer)	3.0 dB	1.7 dB
All emissions, radiated	6.0 dB	5.3 dB
Temperature	1° C	0.65° C
Humidity	5 %	2.9 %
Supply voltages	3 %	1 %

5 TEST DATA

5.1 Antenna Port Conducted Emissions

Description of Measurement	<p>The direct measurement of emissions at the antenna port of the EUT is achieved by use of a RF connection to a spectrum analyzer or power meter.</p> <p>The cable and attenuator factors are loaded into the analyzer or power meter allowing for direct measurement readings without the need for further corrections.</p>
Example Calculations	<p>Measurement (dBm) + Cable factor (dB) + External Attenuator (dB) = Corrected Reading (dBm)</p> <p>Margin (dB) = Limit (dBm) – Corrected Reading (dBm)</p>

Block Diagram



5.1.1 Peak Output Power

Operator	Anthony Smith	QA	Adam Alger
Temperature	22.3°C	R.H. %	48.4%
Test Date	8/8/2022	Location	Conducted RF Bench
Requirement	FCC: 15.247 (b)(3) IC: RSS-247 5.4 (d)	Method	ANSI C63.10 §11.9

Limits: 30 dBm

Test Parameters

Frequency	2402, 2440, 2480 MHz	Setup	Conducted
RBW	3 MHz	VBW	50 MHz
Detector(s)	Max Peak Hold	Sweep Time	Auto

EUT Parameters

Input Power	3VDC Battery	Mode	BLE Transmit
Frequency	2402, 2440, 2480 MHz	Channel	37, 17, 39
Data Rate/Modulation	BLE 1Mbps		

Instrumentation

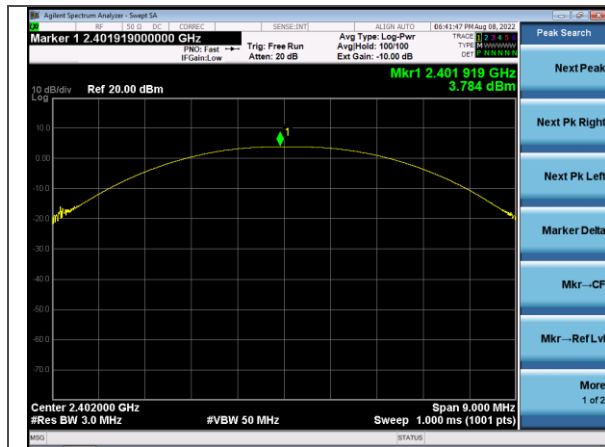
Asset #	Description	Manufacturer	Model #	Serial #	Date	Due Date	Status
AA 960143	Cable	Gore	EKD01D01048.0	5546519	3/22/2022	3/22/2023	Active Verification
EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	4/12/2022	4/12/2023	Active Calibration

Data Table

Channel	Data Rate	Transmit Power Setting	Peak Output Power (dBm)	Limit (dBm)	Margin (dB)
37	BLE 1Mbps	4	3.8	30	26.2
17	BLE 1Mbps	4	4.1	30	25.9
39	BLE 1Mbps	4	3.8	30	26.2

Plots

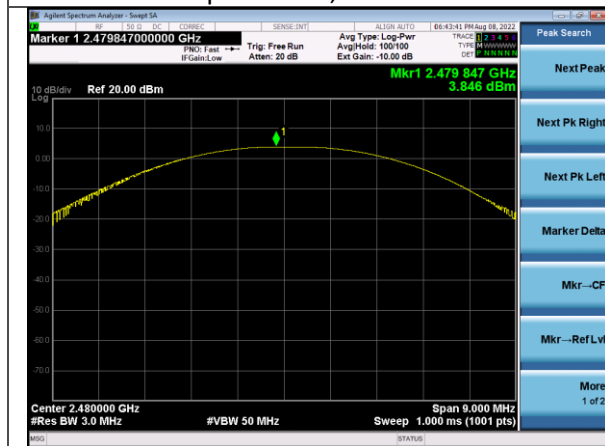
Transmit Power Setting: +4



Output Power, Channel 37



Output Power, Channel 17



Output Power, Channel 39

6 FCC 1-G SAR TEST EXCLUSION CALCULATIONS

6.1 Power Calculations

Max Power of Channel = 4.1 dBm

Tune Up Tolerance = 1 dB

Total Channel Power = 5.1 dBm = 3.2 mW = 3 mW

6.2 Distance

≤5 mm

6.3 SAR Test Exclusion Calculation

[(Maximum power of channel, including tune-up tolerance, mW) / (Minimum test separation distance, mm)] * [vf(GHz)] ≤ 3 for 1-g SAR

Where:

- F(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- The value 3.0 is referred to as numeric thresholds

$$\left(\frac{3 \text{ mW}}{5 \text{ mm}}\right) \times (\sqrt{2.48}) \leq 3.0$$

$$0.6 \times 1.562 \leq 3.0$$

$$0.9 \leq 3.0$$

6.4 Result

The EUT is excluded from routine SAR testing as 0.9 is less than 3.0.

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7 IC EXEMPTION CALCULATION FOR ROUTINE SAR EVALUATION

7.1 Power Calculations

Max Power of Channel = 4.1 dBm

Tune Up Tolerance = 1 dB

Peak Antenna Gain = 2.9 dBi

Total Channel Power = 8 dBm = 6.3 mW EIRP

7.2 Distance

10 mm

7.3 Exemption Limits

Table 1: SAR evaluation — Exemption limits for routine evaluation based on frequency and separation distance^{4,5}

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

Interpolated Limit at 2480 MHz

$$7 + (2480 - 2450) \times \left(\frac{6 - 7}{3500 - 2450} \right) = 7.0$$

At 2480 and 10 mm the exemption limit is 7.0 mW

7.4 SAR Test Exclusion Calculation

6.3 mW ≤ 7.0 mW

7.5 Result

The EUT is excluded from routine SAR testing at 10mm as 6.3 mW is less than 7.0 mW.

8 REVISION HISTORY

Version	Date	Notes	Person
0.0	10/20/2022	Initial Draft	Anthony Smith
1.0	10/21/2022	Revised Draft	Anthony Smith
2.0	10/21/2022	Final Draft	Anthony Smith

END OF REPORT