Test Report # 318196 C

Equipment Under Test:	Digilance V
Test Date(s):	9/19/18 – 10/31/18
Prepared for:	Jason Black Heraeus Electro-Nite 541 Industrial Drive Hartland, WI 53029

Report Issued by: Shane Dock, EMC Engineer

Signature:

Date: 12/20/2018

Report Reviewed by: Adam Alger, Quality Manager

Signature:

Date: 11/14/2018

Report Constructed by: Shane Dock, EMC Engineer

Signature:

Date: 12/20/2018

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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.

Federal Communications Commission (FCC) – USA

Accredited recognition of two 3 meter Semi-Anechoic Chambers

Accredited Test Firm Registration Number: 953492

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

During **11/13/18** the Equipment Under Test (EUT), **Digilance V**, as provided by **Heraeus Electro-Nite** was tested to 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	Radiofrequency Radiation Exposure Evaluation: Portable	Reported	RSS-102 Section 2.5.2	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	Heraeus Electro-Nite
Contact Person	Jason Black
Address	541 Industrial Drive Hartland, WI 53029

2.1 Equipment Under Test (EUT) Information

The following information has been supplied by the client

Product Name	Digilance V
Model Number	DL5W
Serial Number	DL5WTDA24180006
FCC/IC ID	FCC: OSW-DL5W IC: 24510-DL5W

2.2 Product Description

The Digilance V is a hand-held instrument for the measurement of molten metal temperatures. Used with disposable thermocouples the instrument can measure temperatures from 300°C to 2300°C. Housed in a robust Aluminum case, the precision electronics are protected from the difficult environmental conditions encountered in the molten metals industry. The instrument has the option to connect to a wireless receiver box, which enables communication and data storage possibilities using Heraeus Electro-Nite software. The instrument also stores measurement results internally for downloading via the wireless interface.

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

EUT programmed via button presses to switch channel and mode. Low, Mid, and High Channels set to approximately 2404 MHz, 2435.5, and 2466.9 MHz, respectively. RM024 set to Tx or Rx Mode by switching between a "Server" and "Client" module (the former for Tx, the latter for Rx). EUT uses the firmware file "DL5FCC_01.PAC". EUT powered by a 7.2V battery, and can be charged

with a charger powered by 120 VAC, 60 Hz. Antenna used is an ANT-2.4-WRT-MON-RPS monopole antenna with a peak gain of 0.8 dBi.

3 REFERENCES

Publication	Edition	Date
CFR 47 Part 15	-	2018
ANSI C63.10	-	2013
RSS-247	2	2017
RSS GEN	5	2018
RSS-102	5	2015
CFR 47 Part 1 and 2	-	2017
FCC KDB 447498	6	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

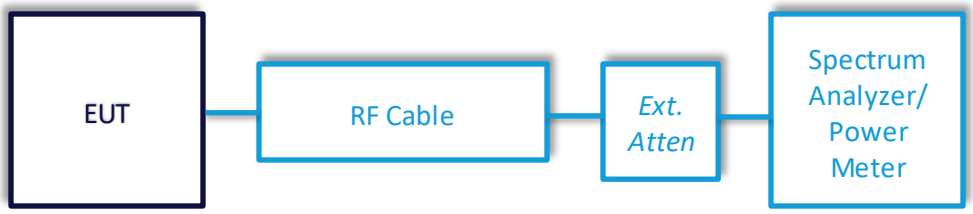
Parameter	ETSI U.C. ±	U.C. ±
Radio Frequency, from F0	$1x10^{-7}$	$0.55x10^{-7}$
Occupied Channel Bandwidth	5 %	2 %
RF conducted Power (Power Meter)	1.5 dB	1.2 dB
RF conducted emissions (Spectrum Analyzer)	3.0 dB	1.7 dB
All emissions, radiated	6.0 dB	5.3 dB
Temperature	1° C	0.65° C
Humidity	5 %	2.9 %
Supply voltages	3 %	1 %

5 TEST DATA

5.1 Antenna Port Conducted Emissions

Description of Measurement	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. The cable and attenuator factors are loaded into the analyzer or power meter allowing for direct measurement readings without the need for further corrections.
Example Calculations	Measurement (dBm) + Cable factor (dB) + External Attenuator (dB) = Corrected Reading (dBm) Margin (dB) = Limit (dBm) – Corrected Reading (dBm)

Block Diagram



5.1.1 Antenna Port Conducted Emissions – Maximum Conducted Output Power

Operator	Shane Dock
Test Date	9/23/18
Location	Conducted RF Area
Temp. / R.H.	20.2 deg C/ 55.4% RH
Requirement	FCC: 15.247 (b)(1) IC: RSS-247 5.4 (b)
Method	ANSI C63.10 Section 7.8.5

Limits:

Maximum Conducted Output Power (watts)	Maximum Conducted Output Power (dBm)
1	30

Test Parameters

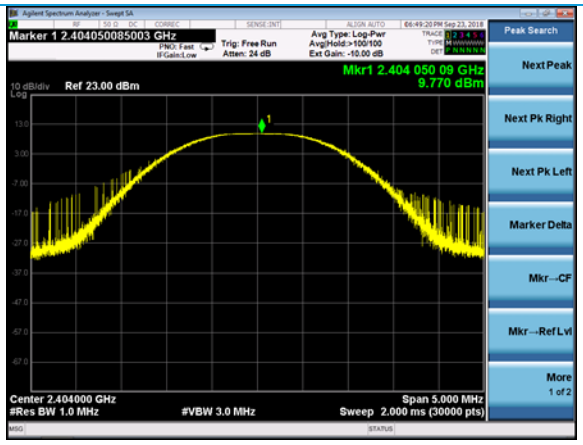
Channels	Low, Mid, High

Table

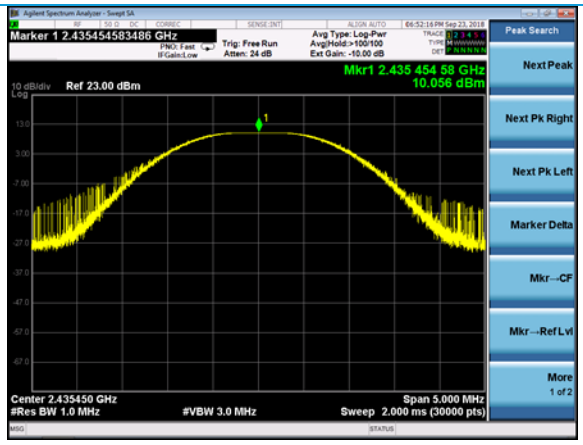
Channel	Low	Mid	High
Pout Conducted (dBm)	10.256	10.056	9.770

Worst Case Margin = 30.000 dBm – (10.256 dBm) = 19.744 dB

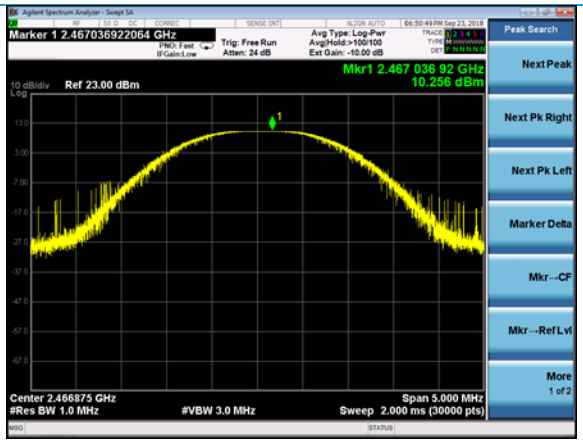
Plots



Low



Mid



High

6 EXCLUSION CALCULATION

6.1 Test Case

Worst Case Power: 10.3 dBm + Tune-Up Tolerance (dB) + Antenna Gain (dBi)

= 10.3 dBm + 2.0 dB + .8 dBi = 13.1 dBm at 2466.9 MHz = 20.4 mW

Test Separation Distance: 3 cm

6.2 FCC

(20.4 mW/30 mm) * sqrt(2.4669 GHz) = 1.1

The unit is excluded from routine SAR evaluation as 1.1 is less than 3.0 and 7.5 (1-g and 10-g respectively, per KDB 447498).

6.3 Industry Canada

RSS-102 Limit at 2466.9 MHz Section 2.5.1: 83.0 mW at a separation distance of 30 mm.

The unit is excluded from routine SAR evaluation as 20.4 mW < 83.0 mW.

7 Revision History

Version	Date	Notes	Person
V0	11/13/18	First Draft	Shane Dock
V1	11/20/18	Updated Draft	Shane Dock
V2	12/18/18	Final Draft	Shane Dock

END OF REPORT