

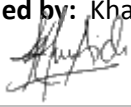
Test Report # 317126 RFx

Equipment Under Test: IQvitals Zone

Test Date(s): 10/3/2017 to 10/10/2017

Prepared for: Midmark
Attn: Carlos Castillo
690 Knox ST.
Torrence, CA 90502

Report Issued by: Khairul Aidi Zainal, Laboratory Manager

Signature: 

Date: 11/14/17

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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:



A2LA – American Association for Laboratory Accreditation

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

A2LA Certificate Number: 1255.01

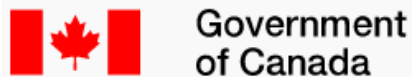
Scope of accreditation includes all test methods listed herein, unless otherwise noted.



Federal Communications Commission (FCC) – USA

Accredited recognition of two 3 meter Semi-Anechoic Chambers

Accredited Test Firm Registration Number: 953492



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

Company: Midmark	Page 3 of 15	Name: IQvitals Zone
Report: TR 317126 RFx		Model: 5-200-0253
Job: C-2848		Serial: 17190017

1 TEST REPORT SUMMARY

The Equipment Under Test (EUT), IQvitals Zone , as provided by Midmark was evaluated 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	Exemption Limits for Routine Evaluation — SAR Evaluation	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	Midmark
Contact Person	Carlos Castillo
Address	690 Knox Street

2.1 Equipment Under Test (EUT) Information

The following information has been supplied by the client

Product Name	IQvitals Zone
Model Number	5-200-0253
Serial Number	17190017 (Conducted measurements),

2.2 Product Description

Bluetooth Low Energy module utilizing PCB trace antenna

2.3 Modifications Incorporated for Compliance

N/A

2.4 Deviations and Exclusions from Test Specifications

N/A

2.5 Additional Information

The module was put into the specific test modes and channels using a program called *EverestBootloaderTestApplication.exe* which was provided by the customer. The program provided control for both BLE radio on the module. In this report, the BLE radios are named (as it is addressed in the test mode program):

1. Wireless_BLE
2. Wireless_BLE2

In addition, the BLE radios have an adjustable power setting, hence testing was performed for both radios at maximum and minimum power setting. Only Maximum setting of output power is presented in this report.

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 \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 Fundamental Measurements

Operator	Aidi
QA	Coty
Test Date	10/5/2017
Location	Conducted measurement area
Temp. / R.H.	70/60
Requirement	15.247 (b) (3)
Method	FCC KDB 558074 D01 DTS Meas Guidance V04, section 9.1.1

Test Parameters

Frequency	2402, 2440, 2480 MHz
Settings	Channel mode = Modulated
Settings	RBW=3MHz
Settings	VBW=8MHz
Notes	All measurements made over max power setting (min attenuation) and lowest power setting (max attenuation)

Table

A. Wireless_BLE

1MBPS, Wireless_BLE Max power				
Channel	Frequency (MHz)	Peak Output power (dBm)	Limit (dBm)	Margin (dB)
0	2402.0	-12.1	30.0	42.1
19	2440.0	-12.9	30.0	42.9
39	2480.0	-13.8	30.0	43.8

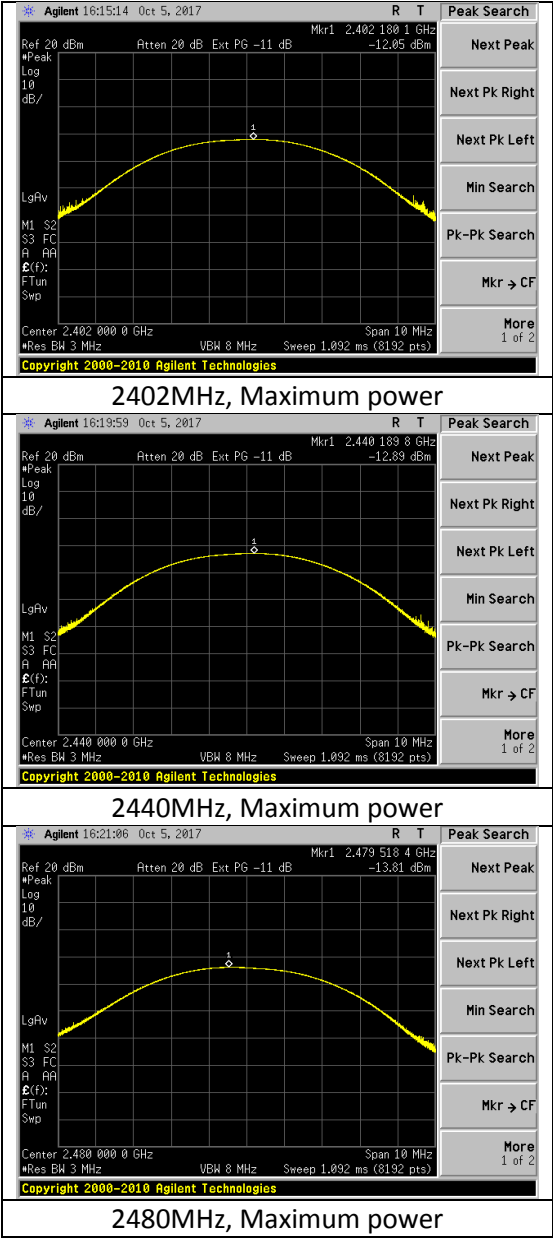
B. Wireless_BLE2

1MBPS, Wireless_BLE2 Max power				
Channel	Frequency (MHz)	Peak Output power (dBm)	Limit (dBm)	Margin (dB)
0	2402.0	-11.4	30.0	41.4
19	2440.0	-12.1	30.0	42.1
39	2480.0	-13.0	30.0	43.0

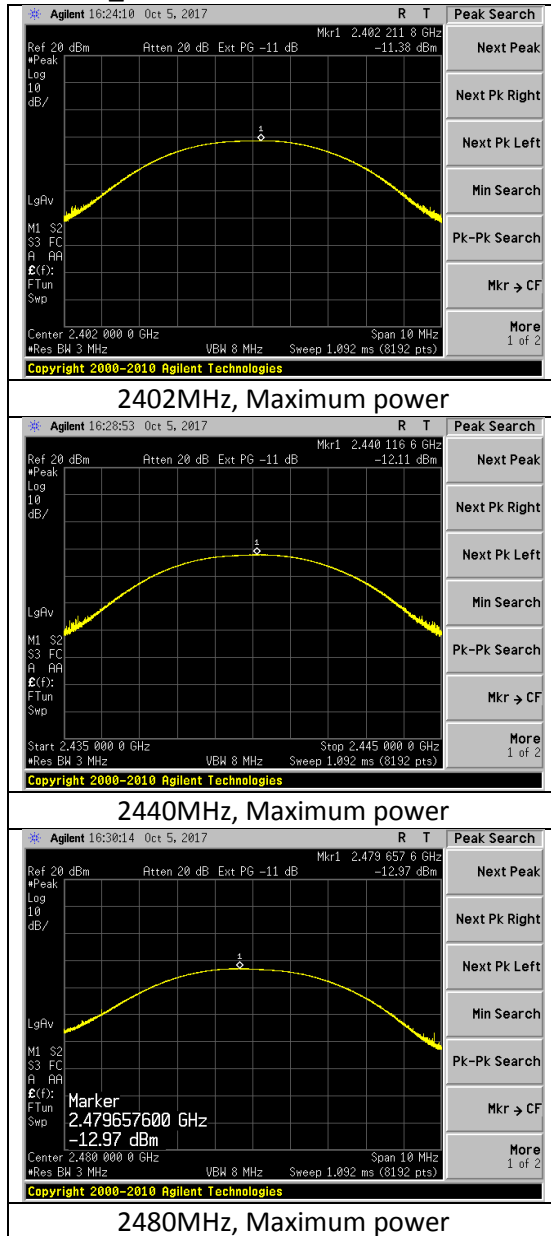
Plot

Output power

A. Wireless_BLE



B. Wireless_BLE2



6 EXEMPTION CALCULATION

6.1 FCC

Limit/Equation:

For 100 MHz to 6 GHz and *test separation distances* ≤ 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [v_{f(\text{GHz})}] \leq 3.0$ for 1-g SAR, and ≤ 7.5 for 10-g extremity SAR

SAR limit for general population/uncontrolled environment (CFR 47 part 2.1093 (d) (2)) = **1.6 W/kg** averaged over any 1 gram of tissue and **4.0 W/kg** averaged over any 10grams of tissue.

Simultaneous transmission SAR test exclusion:

When the sum of 1-g or 10-g SAR of all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the SAR limit, SAR test exclusion applies to that simultaneous transmission configuration.

When an antenna qualifies for the standalone SAR test exclusion of 4.3.1 and also transmits simultaneously with other antennas, the standalone SAR value must be estimated according to the following to determine the simultaneous transmission SAR test exclusion criteria:

1) $[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [v_{f(\text{GHz})}/x] \text{ W/kg}$, for *test separation distances* ≤ 50 mm;
where $x = 7.5$ for 1-g SAR and $x = 18.75$ for 10-g SAR.

2) 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the *test separation distance* is > 50 mm.

Calculations:

1. Wireless_BLE

Maximum Conducted output power = -12.1 dBm

Frequency/Channel = 2402 MHz

Tune-up tolerance = 1.9dB

Test separation distance: **$< 5\text{mm}$**

Channel power = Output power + tune-up tolerance

= -12.1dBm + 1.9dB = **-10.2dBm**

= **0.095mW = 1.0mW** (rounding to nearest mW)

$(1.0/5) * (\sqrt{2.402}) = 0.3 < 3.0$

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2. Wireless_BLE2

Maximum Conducted output power = -11.4 dBm

Frequency/Channel = 2402 MHz

Tune-up tolerance = 1.9dB

Test separation distance: < 5mm

Channel power = Output power + tune-up tolerance

= -11.4dBm + 1.9dB = -9.5dBm

= 0.112mW = 1.0mW (rounding to nearest mW)

$$\underline{(1.0/5) * (\sqrt{2.402}) = 0.3 < 3.0}$$

3. Simultaneous transmission

a. Wireless_BLE:

Channel power = Output power + tune-up tolerance

= -12.1dBm + 1.9dB = -10.2dBm

= 0.095mW=1.0mW (rounding to nearest mW)

Frequency = 2.402 GHz

SAR estimate = (1.0/5mm)*[(√2.402)/7.5]

= 0.113W/kg

b. Wireless_BLE2:

Channel power = Output power + tune-up tolerance

= -11.4dBm + 1.9dB = -9.5dBm

=0.112mW=1.0mW (rounding to nearest mW)

Frequency = 2.402 GHz

SAR estimate = (1.0/5mm)*[(√2.402)/7.5]

= 0.113W/kg

Sum of SAR estimate = Wireless_BLE SAR estimate + Wireless_BLE2 SAR estimate

= 0.113 + 0.113 = 0.226W/kg < 1.6W/kg

Conclusion:

The **IQvitals zone** is exempt from SAR evaluation when used at a distance of ≤ 5mm in cases where each radio is transmitting on its own and when both are simultaneously transmitting.

6.2 Industry Canada

6.2.1 RSS 102 Compliance

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

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

For 2402MHz, at separation distance ≤ 5 mm, using linear interpolation the

Exemption limit = **4.3mW**

Calculations:

Conducted output power = -11.4 dBm (Wireless_BLE2)

Frequency/Channel = 2402MHz

Tune-up tolerance = 1.9dB

Antenna gain = 0dBi

Test separation distance: **≤ 5mm**

EIRP = Source based time averaged power + tune-up tolerance + antenna gain

= -11.4+1.9+0

= -9.5dBm

= 0.112mW < 4.3mW

Simultaneous transmission case:

Frequency/Channel = 2402MHz

Tune-up tolerance = 1.9dB

Antenna gain = 0dBi

Test separation distance: **≤ 5mm**

Wireless_BLE2 EIRP = (-11.4dBm+1.9dB+0dBi) = **-9.5dBm = 0.112mW**

Wireless_BLE2 EIRP = (-12.1dBm+1.9dB+0dBi) = **-10.2dBm = 0.095mW**

Combined EIRP = 0.112mW+0.095mW = **0.207mW = 1.0mW (rounding to nearest mW)**

= 0.207mW < 4.3mW and **1.0mW** < 4.3mW

Conclusion:

The **IQvitals zone** is exempt from SAR evaluation when used at a distance of ≤ 5mm.

7 REVISION HISTORY

Version	Date	Notes	Person
0	11/4/2017	Initial Draft	Aidi Zainal
0a	8/1/2018	With TCB response modifications	Aidi Zainal

END OF REPORT