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CERTIFICATION TEST REPORT

Manufacturer: Infinite Biomedical Technologies, LLC
1101 East 33rd Street, Suite E305
Baltimore, Maryland 21218 USA

Applicant: Same As Above

Product Name: morph2

Product Description: RFID Tag Reader with Bluetooth

Model: morph2-45LC*

**Denotes actual model tested as worst case of product family that includes the following models: morph2-45LC, morph2-50LC, morph2-54LC and morph2-MCLC.*

FCC ID: O7Q-MORPH2

Testing Commenced: April 12, 2016

Testing Ended: Sept. 1, 2016

Summary of Test Results: In Compliance*

**In compliance with modifications per Section 2 of this Test Report.*

Standards:

- FCC Part 15 Subpart C, Section 15.209



Order Nos.: F2LQ8149B, -C1

Client: Infinite Biomedical Technologies, LLC

Model: morph2-45LC

Evaluation Conducted by:

Joe Knepper, EMC Proj. Eng.

Report Reviewed by:

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TABLE OF CONTENTS

| Section | Title | Page |
|---------|---------------------------------------|------|
| 1 | ADMINISTRATIVE INFORMATION | 3 |
| 2 | SUMMARY OF TEST RESULTS/MODIFICATIONS | 5 |
| 3 | ENGINEERING STATEMENT | 6 |
| 4 | EUT INFORMATION AND DATA | 6 |
| 5 | LIST OF MEASUREMENT INSTRUMENTATION | 7 |
| 6 | RADIATED EMISSIONS | 8 |
| 7 | Photographs/Exhibits | 13 |



1 ADMINISTRATIVE INFORMATION

1.1 Measurement Location:

F2 Labs in Middlefield, Ohio. Site description and attenuation data are on file with the FCC's Sampling and Measurement Branch at the FCC Laboratory in Columbia, MD.

1.2 Measurement Procedure:

All measurements were performed according to the 2013 version of ANSI C63.10 and recommended FCC procedure of measurement of equipment operating under Section 15.209. A list of the measurement equipment can be found in Section 6.

1.3 Uncertainty Budget:

The uncertainty in EMC measurements arises from several factors which affect the results, some associated with environmental conditions in the measurement room, the test equipment being used and the measurement techniques adopted.

The measurement uncertainty budgets detailed below are calculated from the test and calibration data, and are expressed with a 95% confidence factor. Note: Only measurements listed below which relate to tests included in this Test Report are applicable to it.

| Measurement Range | Expanded Uncertainty | Combined Uncertainty |
|-----------------------------------------------------|----------------------|----------------------|
| Radiated Emissions <1 GHz @ 3m | $\pm 5.07\text{dB}$ | ± 2.54 |
| Radiated Emissions <1 GHz @ 10m | $\pm 5.09\text{dB}$ | ± 2.55 |
| Radiated Emissions 1 GHz to 2.7 GHz | $\pm 3.62\text{dB}$ | ± 1.81 |
| Radiated Emissions 2.7 GHz to 18 GHz | $\pm 3.10\text{dB}$ | ± 1.55 |
| AC Power Line Conducted Emissions, 150kHz to 30 MHz | $\pm 2.76\text{dB}$ | ± 1.38 |

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

1.4 Document History

| Document Number | Description | Issue Date | Approved By |
|-----------------|-------------|---------------|-------------|
| F2LQ8149B-06E | First Issue | Sept. 6, 2016 | K. Littell |
| | | | |
| | | | |

**2 SUMMARY OF TEST RESULTS**

| Test Name | Standard(s) | Results |
|--------------------------|------------------------------------------|----------|
| Radiated Emissions | FCC Part 15 Subpart C 15.209 | Complies |
| Variation of input power | 15.31(e) was met by using new batteries. | Complies |

| Modifications Made to the Equipment |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>The following modifications were made to the EUT by the manufacturer:</p> <ol style="list-style-type: none">1) Changed the 3.3V regulator from TPS62142RGTT to LM53600NQDSXTQ1. The latter has spread spectrum capabilities.2) Added the following surface mount ferrite beads:<ol style="list-style-type: none">a. BLM15PX330SN1D to B+, B-, H+ and H-, which are the power inputs and outputs of the board.b. BLM15PX331SN1D to Tx and Rx, which are the battery (FlexCell2) communication input of the board.3) In the ARM embedded system, enabled clock spread spectrum.4) In the ARM embedded system, increased the period of the RFID antenna from 50ms to 100ms, so that the antenna is OFF (no voltage) for a longer period of time. |



3 **ENGINEERING STATEMENT**

This report has been prepared on behalf of Infinite Biomedical Technologies, LLC to provide documentation for the testing described herein. This equipment has been tested and found to comply with Part 15.209 of the FCC Rules using ANSI C63.10 2013 and Part 15 standards. The test results found in this test report relate only to the items tested.

4 **EUT INFORMATION AND DATA**

4.1 **Equipment Under Test:**

Product: morph2 RFID Tag Reader with Bluetooth

Model: morph2-45LC*

Part Number: 60201-0-1

FCC ID: O7Q-MORPH2

**Denotes actual model tested as worst case of product family that includes the following models: morph2-45LC, morph2-50LC, morph2-54LC and morph2-MCLC. Tests were performed to determine the worst case antenna and this was used for the testing.*

4.2 **Trade Name:**

Infinite Biomedical Technologies, LLC

4.3 **Power Supply:**

Battery-operated

4.4 **Applicable Rules:**

CFR 47, Part 15.209, subpart C

4.5 **Equipment Category:**

RFID

4.6 **Antenna:**

External Loop Antenna

4.7 **Accessories:**

N/A

4.8 **Test Item Condition:**

The equipment to be tested was received in good condition.

4.9 **Testing Algorithm:**

The EUT was set up in a normal testing manner, powered by batteries. The EUT checked for RFID tag and vibrated a short pulse when nearby. EUT also had electrodes that would produce a signal and had Bluetooth capabilities. The highest emissions were recorded in the data tables.

**5 LIST OF MEASUREMENT INSTRUMENTATION**

| Equipment Type | Asset Number | Manufacturer | Model | Serial Number | Calibration Due Date |
|---------------------------------|------------------------|--------------------|----------------------------------|---------------|----------------------|
| Shielded Chamber | CL166-E | AlbatrossProjects | B83117-DF435-T261 | US140023 | May 12, 2017 |
| Spectrum Analyzer | CL147 | Agilent | E7402A | MY45101241 | Dec. 3, 2016 |
| Temp/Hum. Recorder | CL137 | Extech | RH520 | CH16992 | June 3, 2017 |
| Receiver | CL151 | Rohde & Schwarz | ESU40 | 100319 | Nov. 25, 2016 |
| Antenna Combination, JB3 | CL175 | Sunol Sciences | JB3 | A030315 | April 1, 2017 |
| Horn Antenna | CL098 | Emco | 3115 | 9809-5580 | Dec. 10, 2016 |
| Amplifier w/Monopole & 18" Loop | CL163 | A.H. Systems, Inc. | EHA-52B | 100 | May 2, 2017 |
| Software: | Tile Version 1.0 | | Software Verified: Sept. 1, 2016 | | |
| Software: | EMC 32, Version 5.20.2 | | Software Verified: Sept. 1, 2016 | | |
| Temp/Hum. Rec. | CL119 | Extech | RH520 | H005869 | Jan. 29, 2017 |



6 RADIATED EMISSIONS

6.1 Requirements

Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequency (MHz) | Field Strength (microvolts/meter) | Measurement Distance (meters) |
|-----------------|-----------------------------------|-------------------------------|
| 0.009-0.490 | 2400/F(kHz) | 300 |
| 0.490-1.705 | 24000/F(kHz) | 30 |
| 1.705-30.0 | 30 | 30 |
| 30-88 | 100** | 3 |
| 88-216 | 150** | 3 |
| 216-960 | 200** | 3 |
| Above 960 | 500 | 3 |

6.2 Test Procedure

The EUT was tested at a distance of 3 meters. The limits shown are extrapolated from the above table. The emissions were maximized by rotating the table and raising/lowering the antenna mounted on a 4 meter mast. Cable and peripheral positions were also varied to produce maximum emissions. Both horizontal and vertical polarities were measured for frequencies above 30MHz, and all three orientations of the loop antenna were scanned to determine worst case emission. The output of the antenna was connected to the input of the receiver and emissions were measured in the range 9 kHz to 13 GHz. The values up to 13 GHz with a resolution bandwidth of 1, 9, and 120 kHz are quasi-peak readings made at 3 meters. The values from 1 to 13 GHz with a resolution bandwidth of 1 MHz are peak and average readings. The raw measurements were corrected to allow for antenna factor and cable loss.



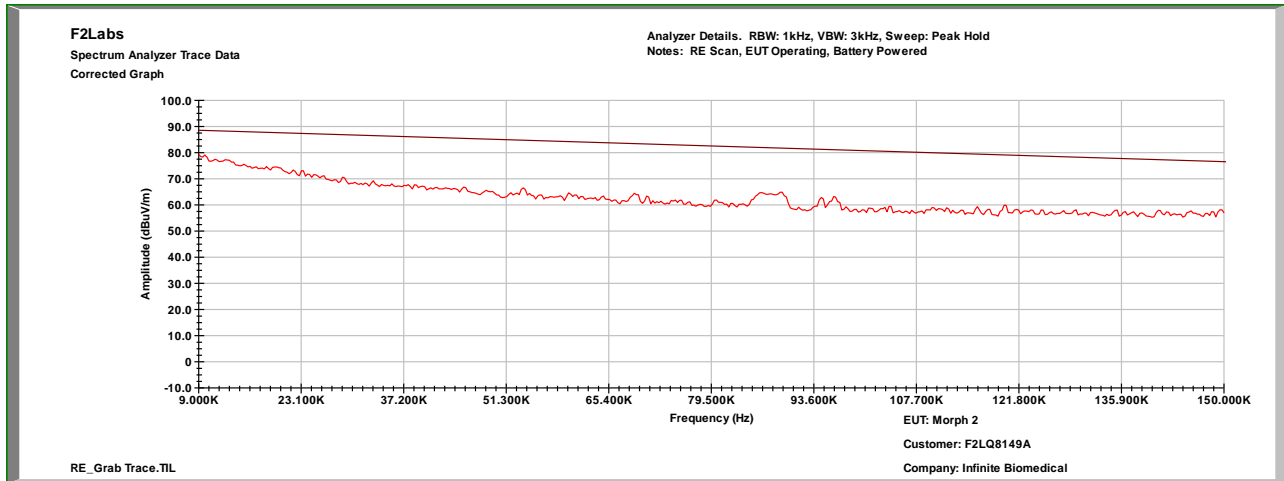
6.3 Test Data

| | | | |
|----------------------|-------------------|---------------------------|------------|
| Test Date(s): | Sept. 1, 2016 | Test Engineer: | J. Knepper |
| Standards: | FCC CFR 47 15.209 | Air Temperature: | 21.0°C |
| | | Relative Humidity: | 48% |

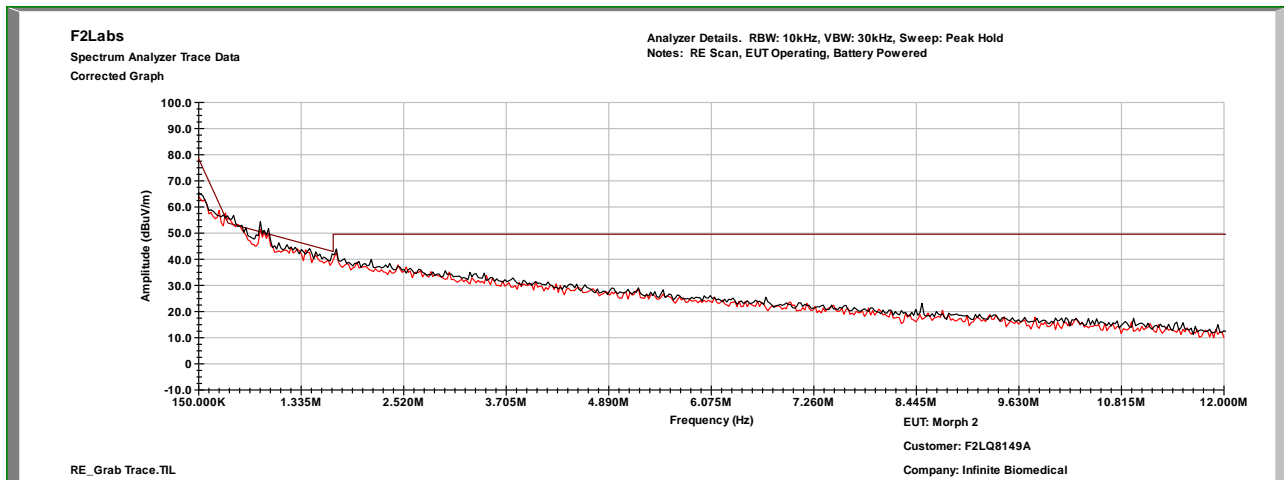
| Frequency (MHz) | Antenna Polarization | Reading (dBμV) | Cable Loss & Antenna Factor (dB) | Emission (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|-----------------|----------------------|----------------|----------------------------------|-------------------|----------------|-------------|
| 13.560000 | Parallel | 49.1 | -40.8 | 8.32 | 29.5 | -21.2 |
| 30.780000 | V | -1.7 | 22.4 | 20.70 | 40.0 | -19.3 |
| 40.480000 | V | -2.7 | 15.1 | 12.40 | 40.0 | -27.6 |
| 64.920000 | V | -2.5 | 10.4 | 7.90 | 40.0 | -32.1 |
| 121.960000 | V | -2.4 | 17.1 | 14.70 | 40.0 | -25.3 |
| 198.390000 | V | -0.7 | 17.3 | 16.60 | 40.0 | -23.4 |
| 284.530000 | V | -1.3 | 19.0 | 17.70 | 47.0 | -29.3 |
| 712.880000 | V | 0.1 | 28.9 | 29.00 | 47.0 | -18.0 |
| 943.350000 | V | 0.6 | 32.5 | 33.10 | 47.0 | -13.9 |
| 256.980000 | H | 2.2 | 17.5 | 19.70 | 47.0 | -27.3 |
| 274.760000 | H | 3.3 | 19.0 | 22.30 | 47.0 | -24.7 |
| 289.940000 | H | -1.7 | 19.1 | 17.40 | 47.0 | -29.6 |
| 298.310000 | H | 21.9 | 19.3 | 41.20 | 47.0 | -5.8 |



Characterization Scan, 9kHz to 150 kHz

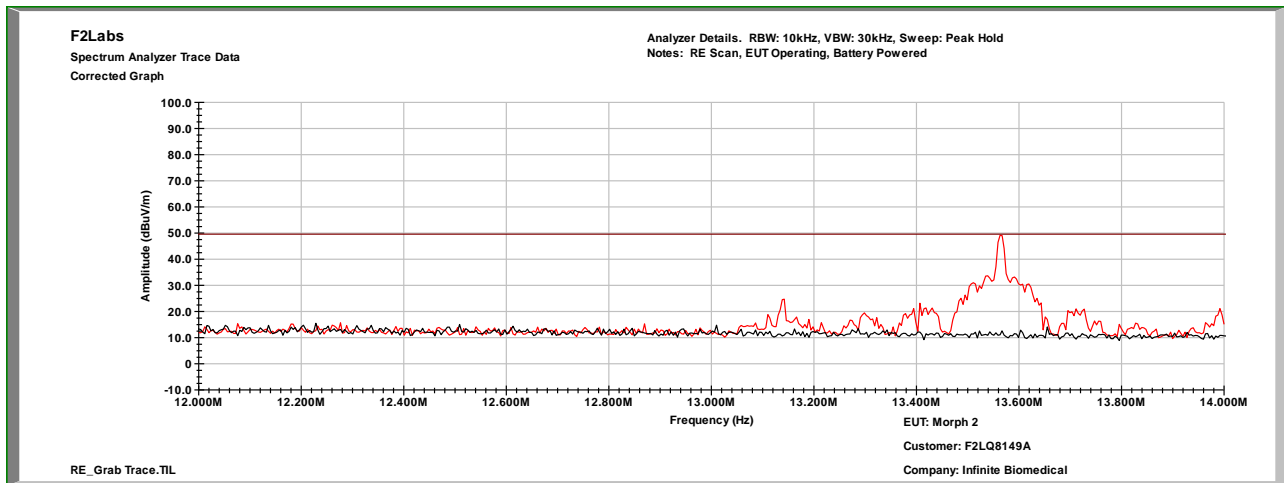


Characterization Scan, 0.15 MHz to 12 MHz

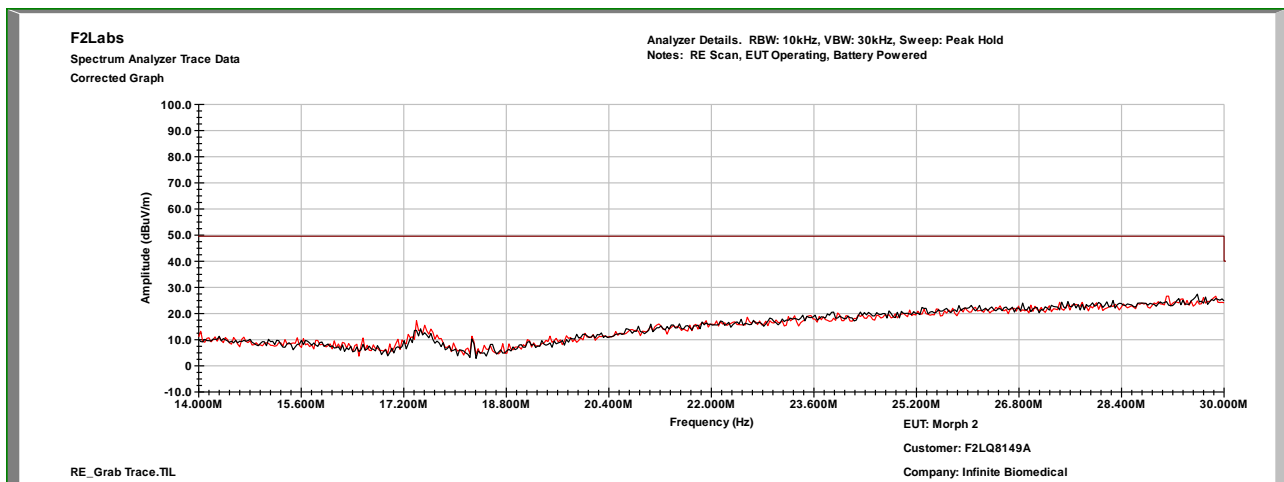




Characterization Scan, 12 MHz to 14 MHz

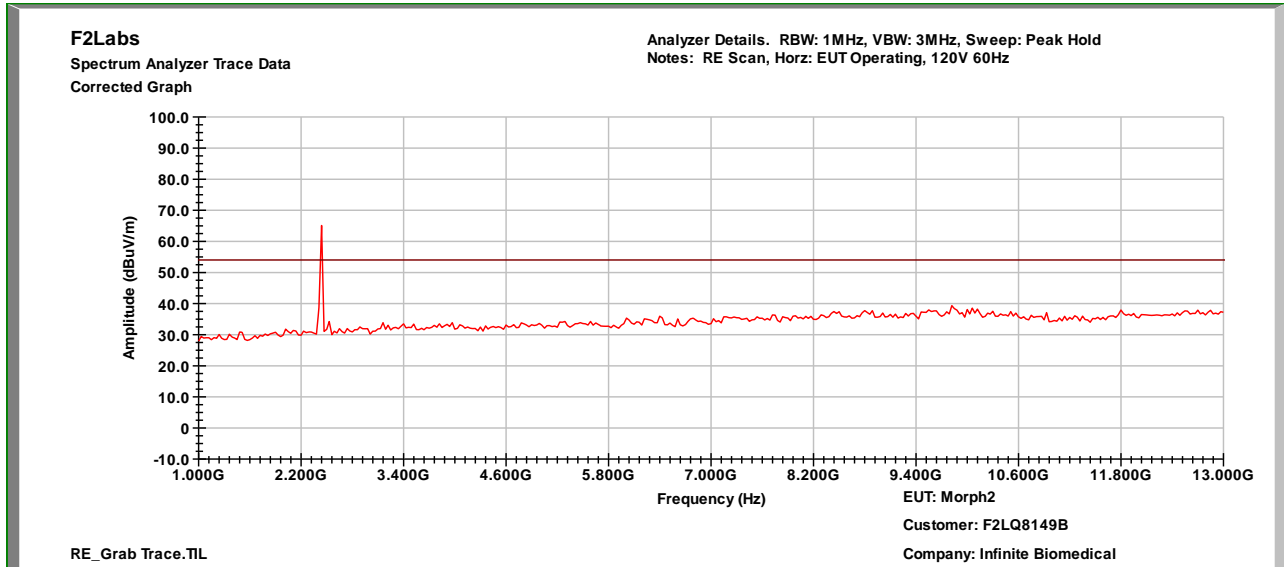


Characterization Scan, 14 MHz to 30 MHz

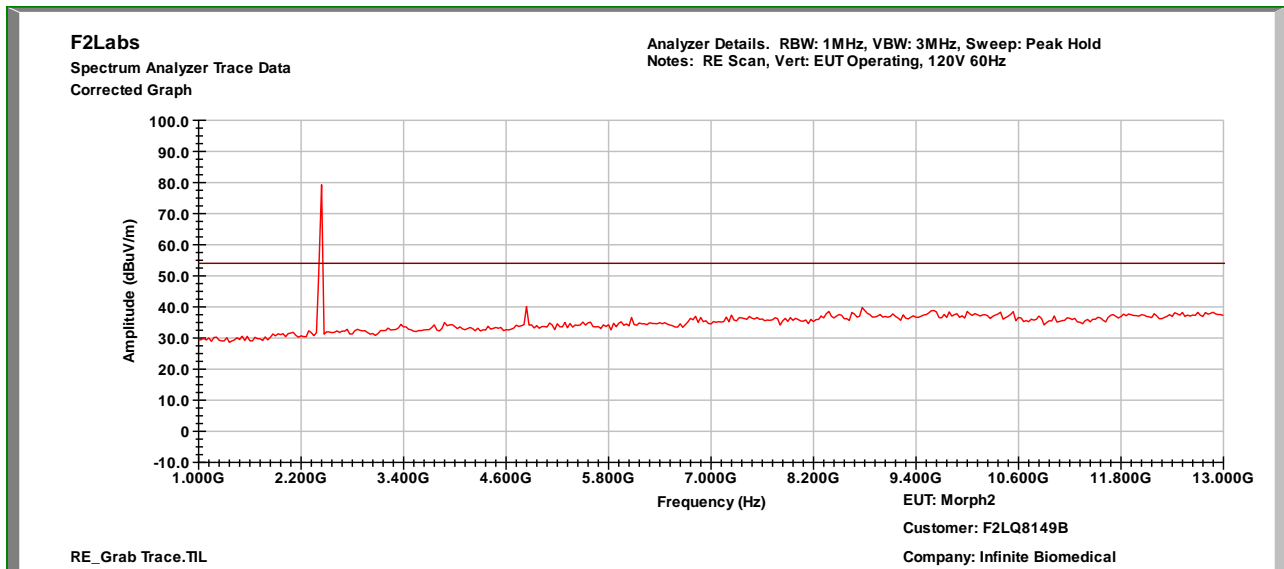




Characterization Scan, 1 GHz to 13 GHz - Horizontal



Characterization Scan, 1 GHz to 13 GHz - Vertical





7 PHOTOGRAPHS/EXHIBITS

