

**EMC Test Report****Application for FCC Grant of Equipment Authorization  
Canada Certification****Innovation, Science and Economic Development Canada  
RSS-Gen Issue 5 / RSS-247 Issue 2  
FCC Part 15 Subpart C****Model: A0001707**

IC CERTIFICATION #: 24335-A0001707  
FCC ID: 2AQ9D-A0001707

APPLICANT: Enovate Medical  
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Murfreesboro, TN 37129

TEST SITE(S): National Technical Systems  
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IC SITE REGISTRATION #: 2845B-3; 2845B-4, 2845B-5, 2845B-7

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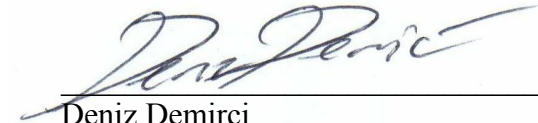
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**VALIDATING SIGNATORIES**

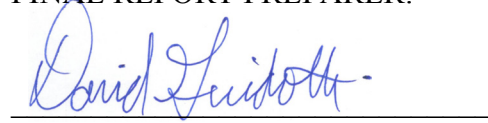
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**REVISION HISTORY**

| Rev# | Date             | Comments      | Modified By |
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| -    | October 18, 2019 | First release |             |

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## **SCOPE**

An electromagnetic emissions test has been performed on the Enovate Medical model A0001707, pursuant to the following rules:

RSS-Gen Issue 5 “General Requirements for Compliance of Radio Apparatus”

RSS 247 Issue 2 “Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSS) and Licence-Exempt Local Area Network (LE-LAN) Devices”

FCC Part 15 Subpart C

Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in the following reference standards and as outlined in National Technical Systems test procedures:

ANSI C63.10-2013

FCC DTS Measurement Guidance KDB558074

The intentional radiator above has been tested in a simulated typical installation to demonstrate compliance with the relevant Industry Canada performance and procedural standards.

Final system data was gathered in a mode that tended to maximize emissions by varying orientation of EUT, orientation of power and I/O cabling, antenna search height, and antenna polarization.

Every practical effort was made to perform an impartial test using appropriate test equipment of known calibration. All pertinent factors have been applied to reach the determination of compliance.

National Technical Systems is accredited by the A2LA, certificate number 0214.26, to perform the test(s) listed in this report, except where noted otherwise.

## **OBJECTIVE**

The primary objective of the manufacturer is compliance with the regulations outlined in the previous section.

Prior to marketing in the USA, all unlicensed transmitters and transceivers require certification. Receive-only devices operating between 30 MHz and 960 MHz are subject to either certification or a manufacturer’s declaration of conformity, with all other receive-only devices exempt from the technical requirements.

Prior to marketing in Canada, Class I transmitters, receivers and transceivers require certification. Class II devices are required to meet the appropriate technical requirements but are exempt from certification requirements.

Certification is a procedure where the manufacturer submits test data and technical information to a certification body and receives a certificate or grant of equipment authorization upon successful completion of the certification body's review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units, which are subsequently manufactured.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

### **STATEMENT OF COMPLIANCE**

The tested sample of Enovate Medical model A0001707 complied with the requirements of the following regulations:

RSS-Gen Issue 5 "General Requirements for Compliance of Radio Apparatus"

RSS 247 Issue 2 "Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSS) and Licence-Exempt Local Area Network (LE-LAN) Devices"

FCC Part 15 Subpart C

Maintenance of compliance is the responsibility of the manufacturer. Any modifications to the product should be assessed to determine their potential impact on the compliance status of the device with respect to the standards detailed in this test report.

The test results recorded herein are based on a single type test of Enovate Medical model A0001707 and therefore apply only to the tested sample. The sample was selected and prepared by Steven Godbey of Enovate Medical.

### **DEVIATIONS FROM THE STANDARDS**

No deviations were made from the published requirements listed in the scope of this report.

## TEST RESULTS SUMMARY

### DIGITAL TRANSMISSION SYSTEMS (2400 – 2483.5MHz)

| FCC Rule Part                                                                        | RSS Rule Part   | Description                                   | Measured Value / Comments                                      | Limit / Requirement                                                          | Result   |
|--------------------------------------------------------------------------------------|-----------------|-----------------------------------------------|----------------------------------------------------------------|------------------------------------------------------------------------------|----------|
| 15.247(a)                                                                            | RSS 247 5.2     | Digital Modulation                            | Systems uses GFSK modulation                                   | System must utilize a digital transmission technology                        | Complies |
| 15.247 (a) (2)                                                                       | RSS 247 5.2 (1) | 6 dB Bandwidth                                | 0.717 MHz                                                      | >500 kHz                                                                     | Complies |
| 15.247 (b) (3)                                                                       | RSS 247 5.4 (4) | Output Power (multipoint systems)             | 4.5 dBm (0.0028 Watts)<br>EIRP = 0.002 W <small>Note 1</small> | 1 Watt, EIRP limited to 4 Watts.                                             | Complies |
| 15.247(e)                                                                            | RSS 247 5.2 (2) | Power Spectral Density                        | -0.6 dBm/30 kHz                                                | 8 dBm/3 kHz                                                                  | Complies |
| 15.247(d)                                                                            | RSS 247 5.5     | Antenna Port Spurious Emissions               | margin >20 dBc                                                 | < -20 dBc                                                                    | Complies |
| 15.247(d) / 15.209                                                                   | RSS 247 5.5     | Radiated Spurious Emissions<br>9 kHz – 25 GHz | 53.9 dBμV/m @ 2312.2 MHz (-0.1 dB)                             | Refer to the limits section (p17) for restricted bands, all others < -20 dBc | Complies |
| Note 1: EIRP calculated using antenna gains of -1.5 dBi for the highest EIRP system. |                 |                                               |                                                                |                                                                              |          |

### GENERAL REQUIREMENTS APPLICABLE TO ALL BANDS

| FCC Rule Part         | RSS Rule part       | Description              | Measured Value / Comments                                                                      | Limit / Requirement                            | Result (margin) |
|-----------------------|---------------------|--------------------------|------------------------------------------------------------------------------------------------|------------------------------------------------|-----------------|
| 15.203                | -                   | RF Connector             | Integral antenna                                                                               | Unique or integral antenna required            | Complies        |
| 15.407 (b) (6)        | RSS-Gen Table 4     | AC Conducted Emissions   | Testing was not performed as the EUT is battery powered.                                       |                                                |                 |
| 15.247 (i) 15.407 (f) | RSS 102             | RF Exposure Requirements | Refer to MPE calculations in separate exhibit, RSS 102 declaration and User Manual statements. | Refer to OET 65, FCC Part 1 and RSS 102        | Complies        |
| -                     | RSS-Gen 6.8         | User Manual              |                                                                                                | Statement for products with detachable antenna | Complies        |
| -                     | RSS-Gen 8.4         | User Manual              |                                                                                                | Statement for all products                     | Complies        |
| -                     | RSP-100 RSS-Gen 6.7 | Occupied Bandwidth       |                                                                                                | Information only                               | N/A             |

**MEASUREMENT UNCERTAINTIES**

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level and were calculated in accordance with UKAS document LAB 34.

| Measurement Type                           | Measurement Unit | Frequency Range   | Expanded Uncertainty |
|--------------------------------------------|------------------|-------------------|----------------------|
| RF power, conducted<br>(power meter)       | dBm              | 25 to 7000 MHz    | $\pm 0.5$ dB         |
| RF power, conducted<br>(Spectrum analyzer) | dBm              | 25 to 7000 MHz    | $\pm 0.7$ dB         |
| Conducted emission of transmitter          | dBm              | 25 to 26500 MHz   | $\pm 0.7$ dB         |
| Radiated emission<br>(substitution method) | dBm              | 25 to 26500 MHz   | $\pm 2.5$ dB         |
| Radiated emission<br>(field strength)      | dB $\mu$ V/m     | 9 kHz to 1000 MHz | $\pm 3.6$ dB         |
|                                            |                  | 1000 to 40000 MHz | $\pm 6.0$ dB         |

**EQUIPMENT UNDER TEST (EUT) DETAILS****GENERAL**

The Enovate Medical model A0001707 is a coin cell powered bluetooth low energy transceiver. EUT was treated as tabletop equipment during testing to simulate the end-user environment. The electrical rating of the EUT is 3 Volts (CR2477 battery).

The sample was received on May 21, 2019 and tested on May 21 and 22, 2019. The EUT consisted of the following component(s):

| Company         | Model    | Description     | Serial Number | FCC ID         |
|-----------------|----------|-----------------|---------------|----------------|
| Enovate Medical | A0001707 | BLE transceiver | B823730001    | 2AQ9D-A0001707 |
| Enovate Medical | A0001707 | BLE transceiver | B823730007    | 2AQ9D-A0001707 |

**ANTENNA SYSTEM**

PCB trace antenna

**ENCLOSURE**

The EUT enclosure is primarily constructed of non-coated plastic. It measures approximately 2.0 cm height by 4.0 cm diameter.

**MODIFICATIONS**

No modifications were made to the EUT during the time the product was at NTS Silicon Valley.

**SUPPORT EQUIPMENT**

No local support equipment was used during testing.

The following equipment was used as remote support equipment for testing:

| Company      | Model  | Description        | Serial Number |
|--------------|--------|--------------------|---------------|
| Agilent      | E3610A | AC/DC power supply | -             |
| Raspberry PI | PI 3   | Support computer   |               |

**EUT INTERFACE PORTS**

The I/O cabling configuration during testing was as follows:

| Port | Connected To | Cable(s)    |                        |           |
|------|--------------|-------------|------------------------|-----------|
|      |              | Description | Shielded or Unshielded | Length(m) |
| None | -            | -           | -                      | -         |

**EUT OPERATION**

During testing, the EUT was continuously transmitting at the rated RF power and the frequencies required.

**TEST SITE****GENERAL INFORMATION**

Final test measurements were taken at the test sites listed below. Pursuant to section 2.948 of the FCC's Rules and section 6.2 of RSS-GEN, NTS has been recognized as an accredited test laboratory by the Commission and Innovation, Science and Economic Development Canada. A description of the facilities employed for testing is maintained by NTS.

| Site      | Designation / Registration Numbers |        | Location                                      |
|-----------|------------------------------------|--------|-----------------------------------------------|
|           | FCC                                | Canada |                                               |
| Chamber 4 | US1031                             | US0027 | 41039 Boyce Road<br>Fremont,<br>CA 94538-2435 |

ANSI C63.4 recommends that ambient noise at the test site be at least 6 dB below the allowable limits. Ambient levels are below this requirement. The test site(s) contain separate areas for radiated and conducted emissions testing. Results from testing performed in this chamber have been correlated with results from an open area test site. Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent requirements of ANSI C63.4.

**RADIATED EMISSIONS CONSIDERATIONS**

The FCC has determined that radiation measurements made in a shielded enclosure are not suitable for determining levels of radiated emissions. Radiated measurements are performed in an open field environment or in a semi-anechoic chamber. The test sites are maintained free of conductive objects within the CISPR defined elliptical area incorporated in ANSI C63.4 guidelines and meet the Normalized Site Attenuation (NSA) requirements of ANSI C63.4.

## **MEASUREMENT INSTRUMENTATION**

### **RECEIVER SYSTEM**

An EMI receiver as specified in CISPR 16-1-1 is used for emissions measurements. The receivers used can measure over the frequency range of 9 kHz up to 2000 MHz. These receivers allow both ease of measurement and high accuracy to be achieved. The receivers have Peak, Average, and CISPR (Quasi-peak) detectors built into their design so no external adapters are necessary. The receiver automatically sets the required bandwidth for the CISPR detector used during measurements. If the repetition frequency of the signal being measured is below 20 Hz, peak measurements are made in lieu of Quasi-Peak measurements.

For measurements above the frequency range of the receivers, a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis. Average measurements above 1000 MHz are performed on the spectrum analyzer using the linear-average method with a resolution bandwidth of 1 MHz and a video bandwidth of 10 Hz, unless the signal is pulsed in which case the average (or video) bandwidth of the measuring instrument is reduced to onset of pulse desensitization and then increased.

### **INSTRUMENT CONTROL COMPUTER**

Software is used to view and convert receiver measurements to the field strength at an antenna or voltage developed at the LISN measurement port, which is then compared directly with the appropriate specification limit. This provides faster, more accurate readings by performing the conversions described under Sample Calculations within the Test Procedures section of this report. Results are printed in a graphic and/or tabular format, as appropriate. A personal computer is used to record all measurements made with the receivers. The software used for radiated and conducted emissions measurements is NTS EMI Test Software (rev 2.10)

### **FILTERS/ATTENUATORS**

External filters and precision attenuators are often connected between the receiving antenna or LISN and the receiver. This eliminates saturation effects and non-linear operation due to high amplitude transient events.

### **ANTENNAS**

A loop antenna is used below 30 MHz. For the measurement range 30 MHz to 1000 MHz either a combination of a biconical antenna and a log periodic or a bi-log antenna is used. Above 1000 MHz, horn antennas are used. The antenna calibration factors to convert the received voltage to an electric field strength are included with appropriate cable loss and amplifier gain factors to determine an overall site factor, which is then programmed into the test receivers or incorporated into the test software.

**ANTENNA MAST AND EQUIPMENT TURNTABLE**

The antennas used to measure the radiated electric field strength are mounted on a non-conductive antenna mast equipped with a motor-drive to vary the antenna height. Measurements below 30 MHz are made with the loop antenna at a fixed height of 1m above the ground plane.

ANSI C63.10 specifies that the test height above ground for table mounted devices shall be 80 cm for testing below 1 GHz and 1.5 m for testing above 1 GHz. During radiated measurements, the EUT is positioned on a motorized turntable in conformance with this requirement.

**INSTRUMENT CALIBRATION**

All test equipment is regularly checked to ensure that performance is maintained in accordance with the manufacturer's specifications. All antennas are calibrated at regular intervals with respect to tuned half-wave dipoles. An exhibit of this report contains the list of test equipment used and calibration information.

## **TEST PROCEDURES**

### **EUT AND CABLE PLACEMENT**

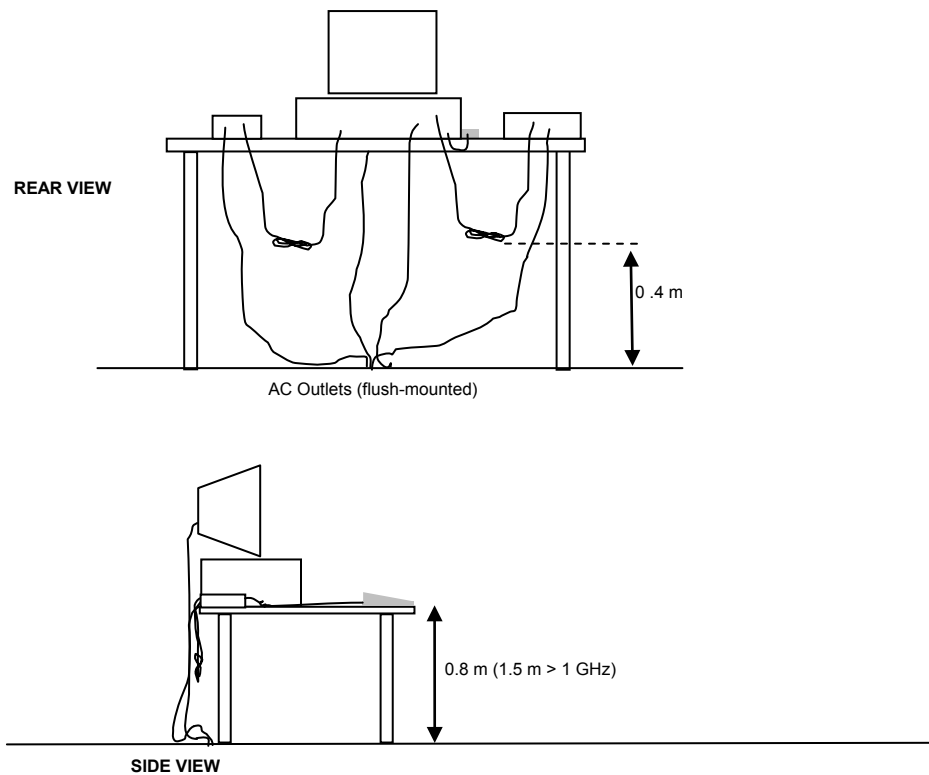
The regulations require that interconnecting cables be connected to the available ports of the unit and that the placement of the unit and the attached cables simulate the worst case orientation that can be expected from a typical installation, so far as practicable. To this end, the position of the unit and associated cabling is varied within the guidelines of ANSI C63.10, and the worst-case orientation is used for final measurements.

### **RADIATED EMISSIONS**

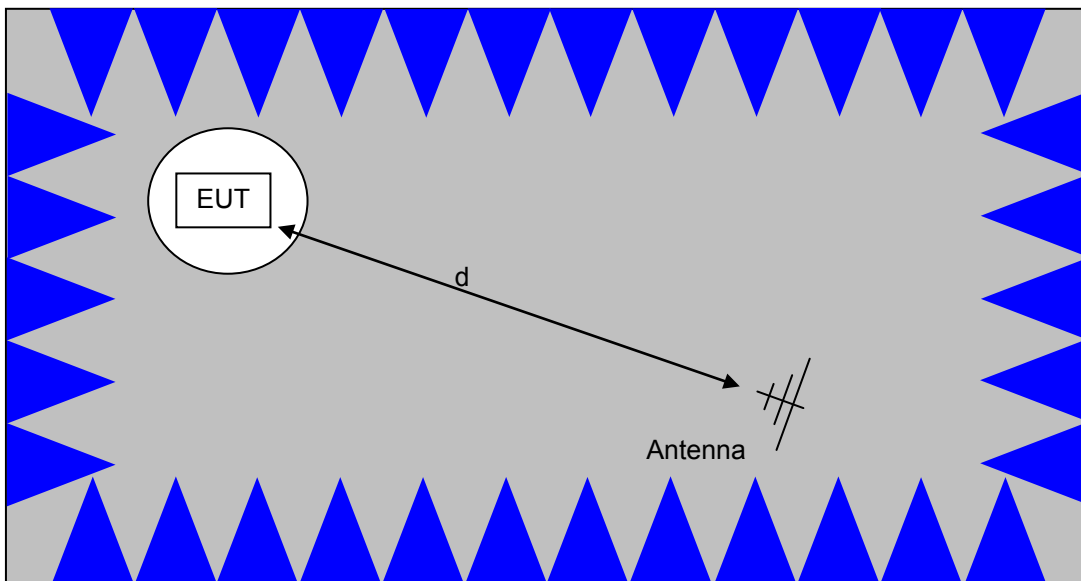
A preliminary scan of the radiated emissions is performed in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed, one scan for each antenna polarization (horizontal and vertical; loop parallel and perpendicular to the EUT). During the preliminary scans, the EUT is rotated through 360°, the antenna height is varied (for measurements above 30 MHz) and cable positions are varied to determine the highest emission relative to the limit. Preliminary scans may be performed in a fully anechoic chamber for the purposes of identifying the frequencies of the highest emissions from the EUT.

A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

Final maximization is a phase in which the highest amplitude emissions identified in the spectral search are viewed while the EUT azimuth angle is varied from 0 to 360 degrees relative to the receiving antenna. The azimuth, which results in the highest emission is then maintained while varying the antenna height from one to four meters (for measurements above 30 MHz, measurements below 30 MHz are made with the loop antenna at a fixed height of 1 m). The result is the identification of the highest amplitude for each of the highest peaks. Each recorded level is corrected in the receiver using appropriate factors for cables, connectors, antennas, and preamplifier gain.

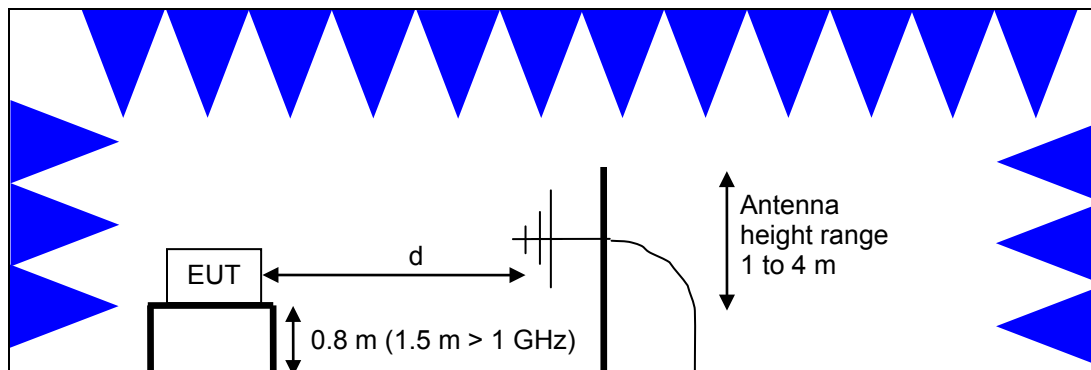


Typical Test Configuration for Radiated Field Strength Measurements



The anechoic materials on the walls and ceiling ensure compliance with the normalized site attenuation requirements of CISPR 16 / CISPR 22 / ANSI C63.4 for an alternate test site at the measurement distances used.

Floor-standing equipment is placed on the floor with insulating supports between the unit and the ground plane.



Test Configuration for Radiated Field Strength Measurements  
Semi-Anechoic Chamber, Plan and Side Views

**BANDWIDTH MEASUREMENTS**

The 6 dB, 20 dB, 26 dB and/or 99% signal bandwidth are measured using the bandwidths recommended by ANSI C63.10 and RSS GEN.

**SPECIFICATION LIMITS AND SAMPLE CALCULATIONS**

The limits for conducted emissions are given in units of microvolts, and the limits for radiated emissions are given in units of microvolts per meter at a specified test distance. Data is measured in the logarithmic form of decibels relative to one microvolt, or dB microvolts (dB $\mu$ V). For radiated emissions, the measured data is converted to the field strength at the antenna in dB microvolts per meter (dB $\mu$ V/m). The results are then converted to the linear forms of  $\mu$ V and  $\mu$ V/m for comparison to published specifications.

For reference, converting the specification limits from linear to decibel form is accomplished by taking the base ten logarithm, then multiplying by 20. These limits in both linear and logarithmic form are as follows:

**GENERAL TRANSMITTER RADIATED EMISSIONS SPECIFICATION LIMITS**

The table below shows the limits for the spurious emissions from transmitters that fall in restricted bands<sup>1</sup>.

| Frequency Range (MHz) | Limit ( $\mu\text{V/m}$ )             | Limit ( $\text{dB}\mu\text{V/m @ 3m}$ )             |
|-----------------------|---------------------------------------|-----------------------------------------------------|
| 0.009-0.490           | $2400/F_{\text{kHz}} @ 300 \text{ m}$ | $67.6-20*\log_{10}(F_{\text{kHz}}) @ 300 \text{ m}$ |
| 0.490-1.705           | $24000/F_{\text{kHz}} @ 30 \text{ m}$ | $87.6-20*\log_{10}(F_{\text{kHz}}) @ 30 \text{ m}$  |
| 1.705 to 30           | $30 @ 30 \text{ m}$                   | $29.5 @ 30 \text{ m}$                               |
| 30 to 88              | $100 @ 3 \text{ m}$                   | $40 @ 3 \text{ m}$                                  |
| 88 to 216             | $150 @ 3 \text{ m}$                   | $43.5 @ 3 \text{ m}$                                |
| 216 to 960            | $200 @ 3 \text{ m}$                   | $46.0 @ 3 \text{ m}$                                |
| Above 960             | $500 @ 3 \text{ m}$                   | $54.0 @ 3 \text{ m}$                                |

<sup>1</sup> The restricted bands are detailed in FCC 15.205 and RSS-Gen Table 7

**OUTPUT POWER LIMITS – DIGITAL TRANSMISSION SYSTEMS**

The table below shows the limits for output power and output power density. Where the signal bandwidth is less than 20 MHz the maximum output power is reduced to the power spectral density limit plus 10 times the log of the bandwidth (in MHz).

| Operating Frequency (MHz) | Output Power    | Power Spectral Density |
|---------------------------|-----------------|------------------------|
| 902 – 928                 | 1 Watt (30 dBm) | 8 dBm/3 kHz            |
| 2400 – 2483.5             | 1 Watt (30 dBm) | 8 dBm/3 kHz            |
| 5725 – 5850               | 1 Watt (30 dBm) | 8 dBm/3 kHz            |

The maximum permitted output power is reduced by 1 dB for every dB the antenna gain exceeds 6 dBi. Fixed point-to-point applications using the 5725 – 5850 MHz band are not subject to this restriction.

**TRANSMIT MODE SPURIOUS RADIATED EMISSIONS LIMITS – FHSS and DTS SYSTEMS**

The limits for unwanted (spurious) emissions from the transmitter falling in the restricted bands are those specified in the general limits sections of FCC Part 15 and RSS 210. All other unwanted (spurious) emissions shall be at least 20 dB below the level of the highest in-band signal level (30 dB if the power is measured using the sample detector/power averaging method).

**SAMPLE CALCULATIONS - RADIATED EMISSIONS**

Receiver readings are compared directly to the specification limit (decibel form). The receiver internally corrects for cable loss, preamplifier gain, and antenna factor. The calculations are in the reverse direction of the actual signal flow, thus cable loss is added and the amplifier gain is subtracted. The Antenna Factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

A distance factor, when used for electric field measurements above 30MHz, is calculated by using the following formula:

$$F_d = 20 * \text{LOG}_{10} (D_m/D_s)$$

where:

$F_d$  = Distance Factor in dB

$D_m$  = Measurement Distance in meters

$D_s$  = Specification Distance in meters

For electric field measurements below 30MHz the extrapolation factor is either determined by making measurements at multiple distances or a theoretical value is calculated using the formula:

$$F_d = 40 * \text{LOG}_{10} (D_m/D_s)$$

Measurement Distance is the distance at which the measurements were taken and Specification Distance is the distance at which the specification limits are based. The antenna factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

The margin of a given emission peak relative to the limit is calculated as follows:

$$R_c = R_r + F_d$$

and

$$M = R_c - L_s$$

where:

$R_r$  = Receiver Reading in dB $\mu$ V/m

$F_d$  = Distance Factor in dB

$R_c$  = Corrected Reading in dB $\mu$ V/m

$L_s$  = Specification Limit in dB $\mu$ V/m

$M$  = Margin in dB Relative to Spec

## Appendix A Test Equipment Calibration Data

**Radiated Emissions, 0.009 - 1,000 MHz, 21-May-19**

| <u>Manufacturer</u> | <u>Description</u>                  | <u>Model</u> | <u>Asset #</u> | <u>Calibrated</u> | <u>Cal Due</u> |
|---------------------|-------------------------------------|--------------|----------------|-------------------|----------------|
| Rohde & Schwarz     | EMI Test Receiver, 20 Hz-7 GHz      | ESIB 7       | 1538           | 2/9/2019          | 2/9/2020       |
| Sunol Sciences      | Biconilog, 30-3000 MHz              | JB3          | 1548           | 10/24/2018        | 1/9/2021       |
| Com-Power           | Preamplifier, 1-1000 MHz            | PAM-103      | 2885           | 8/21/2018         | 8/21/2019      |
| Rhode & Schwarz     | Magnetic Loop Antenna, 9 kHz-30 MHz | HFH2-Z2      | WC062 457      | 1/5/2018          | 1/5/2020       |

**Radiated Emissions, 1,000 - 25,000 MHz, 22-May-19**

| <u>Manufacturer</u>        | <u>Description</u>                         | <u>Model</u>       | <u>Asset #</u> | <u>Calibrated</u> | <u>Cal Due</u> |
|----------------------------|--------------------------------------------|--------------------|----------------|-------------------|----------------|
| National Technical Systems | NTS EMI Software (rev 2.10)                | N/A                | 0              |                   | N/A            |
| Hewlett Packard            | Microwave Preamplifier, 1-26.5GHz          | 8449B              | 785            | 9/5/2018          | 9/5/2019       |
| EMCO                       | Antenna, Horn, 1-18GHz                     | 3115               | 868            | 7/9/2018          | 7/9/2020       |
| Hewlett Packard            | Spectrum Analyzer (SA40) Red 30 Hz -40 GHz | 8564E (84125C)     | 1148           | 9/27/2018         | 9/27/2019      |
| Rohde & Schwarz            | EMI Test Receiver, 20 Hz-7 GHz             | ESIB 7             | 1538           | 2/9/2019          | 2/9/2020       |
| A. H. Systems              | Spare System Horn, 18-40 GHz               | SAS-574, p/n: 2581 | 2162           | 8/4/2017          | 8/4/2019       |
| Micro-Tronics              | High Pass Filter 2700 MHz                  | HPM50111           | 2326           | 12/20/2018        | 12/20/2019     |

**Antenna port measurements 28-May-19**

| <u>Manufacturer</u>  | <u>Description</u>                                                       | <u>Model</u> | <u>Asset #</u> | <u>Calibrated</u> | <u>Cal Due</u> |
|----------------------|--------------------------------------------------------------------------|--------------|----------------|-------------------|----------------|
| Rohde & Schwarz      | Power Meter, Dual Channel                                                | NRVD         | 1071           | 4/10/2019         | 4/10/2020      |
| Rohde & Schwarz      | Poweer sensor, 1 nW-20 mW, 10 MHz-18 GHz, 50 Ohms                        | NRV-Z1       | 2114           | 11/7/2019         | 11/7/2020      |
| Agilent Technologies | PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1SS, B7J, HYX | E4446A       | 2139           | 7/27/2018         | 7/27/2019      |

## ***Appendix B Test Data***

TL095459-RA Pages 22 – 49



## EMC Test Data

|                        |                     |                   |               |
|------------------------|---------------------|-------------------|---------------|
| Client:                | Enovate Medical     | PR Number:        | PR095459      |
| Product                | A0001707            | T-Log Number:     | TL095459-RA   |
| System Configuration:  |                     | Project Manager:  | Deepa Shetty  |
| Contact:               | Cameron Boone       | Project Engineer: | Deniz Demirci |
| Emissions Standard(s): | FCC 15.247, RSS-247 | Class:            | B             |
| Immunity Standard(s):  | -                   | Environment:      | -             |

## EMC Test Data

For The

## Enovate Medical

Product

**A0001707**

Date of Last Test: 5/22/2019



## EMC Test Data

|           |                     |                   |               |
|-----------|---------------------|-------------------|---------------|
| Client:   | Enovate Medical     | PR Number:        | PR095459      |
| Model:    | A0001707            | T-Log Number:     | TL095459-RA   |
| Contact:  | Cameron Boone       | Project Manager:  | Deepa Shetty  |
| Standard: | FCC 15.247, RSS-247 | Project Engineer: | Deniz Demirci |
|           |                     | Class:            | B             |

### RSS-247 and FCC 15.247 (DTS) Radiated Spurious Emissions

#### Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 5/21/2019  
Test Engineer: M. Birgani  
Test Location: FT Chamber #4

Config. Used: 1  
Config Change: None  
EUT Voltage: 3 Vdc battery powered.

#### General Test Configuration

The EUT was located on the turntable for radiated emissions testing. No support equipment was used  
The test distance and extrapolation factor (if used) are detailed under each run description.

#### Ambient Conditions:

Temperature: 19-21 °C  
Rel. Humidity: 38-42 %

#### Summary of Results

| Run # |                 | Test Performed  |              |               | Limit                                | Result          | Margin                                |
|-------|-----------------|-----------------|--------------|---------------|--------------------------------------|-----------------|---------------------------------------|
| Run # | Mode            | Channel         | Target Power | Power Setting | Test Performed                       | Limit           | Result / Margin                       |
| 1     | BLE<br>EUT Flat | 17-<br>2440 MHz | Max          | Max           | Radiated Emissions,<br>9 kHz - 1 GHz | FCC Part 15.209 | 16.4 dBµV/m @ 30.54<br>MHz (-23.6 dB) |

#### Modifications Made During Testing

No modifications were made to the EUT during testing

#### Deviations From The Standard

No deviations were made from the requirements of the standard.

#### Sample Notes

Sample S/N: B823730007  
Driver: Minicom  
Antenna: Integral



## EMC Test Data

|           |                     |                   |               |
|-----------|---------------------|-------------------|---------------|
| Client:   | Enovate Medical     | PR Number:        | PR095459      |
| Model:    | A0001707            | T-Log Number:     | TL095459-RA   |
| Contact:  | Cameron Boone       | Project Manager:  | Deepa Shetty  |
| Standard: | FCC 15.247, RSS-247 | Project Engineer: | Deniz Demirci |
|           |                     | Class:            | B             |

### Run #1: Radiated Emissions, 9 kHz - 1000 MHz, FCC 15.209

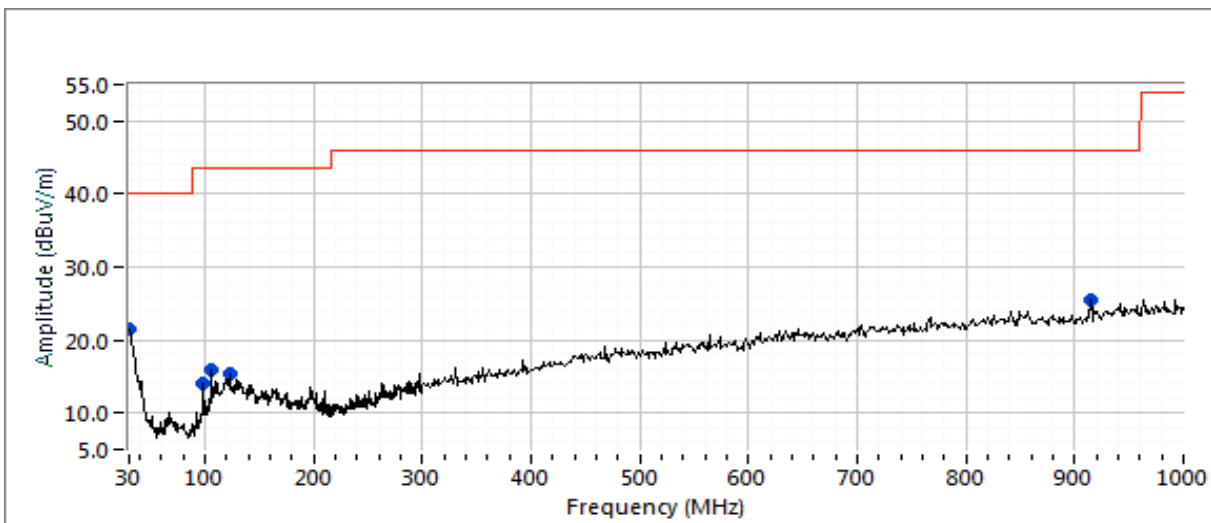
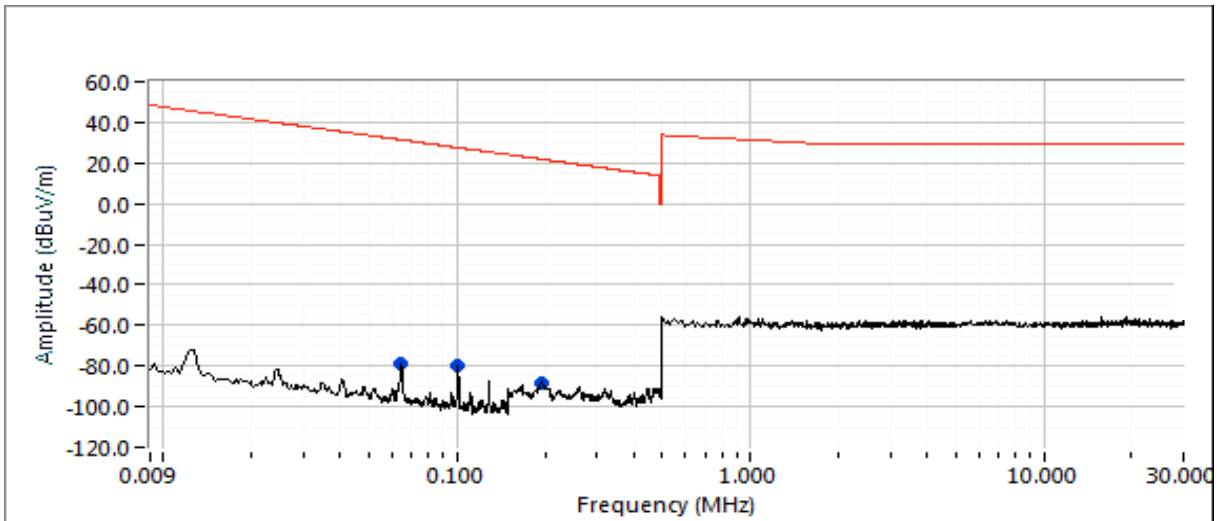
| Frequency Range   | Test Distance | Limit Distance | Extrapolation Factor |
|-------------------|---------------|----------------|----------------------|
| 0.009 - 0.490 MHz | 3             | 300            | -80.0                |
| 0.490 - 1.705 MHz | 3             | 30             | -40.0                |
| 1.705 - 30.0 MHz  | 3             | 30             | -40.0                |
| 30 - 1000 MHz     | 3             | 3              | 0.0                  |

| Frequency     | Level        | Pol | FCC 15.209 |              | Detector  | Azimuth | Height | Comments                   |
|---------------|--------------|-----|------------|--------------|-----------|---------|--------|----------------------------|
| MHz           | dB $\mu$ V/m | v/h | Limit      | Margin       | Pk/QP/Avg | degrees | meters |                            |
| <b>30.541</b> | <b>16.4</b>  | H   | 40.0       | <b>-23.6</b> | QP        | 354     | 3.5    | QP (1.00s)                 |
| 914.429       | 19.3         | V   | 46.0       | -26.7        | QP        | 260     | 1.0    | QP (1.00s)                 |
| 122.525       | 15.1         | H   | 43.5       | -28.4        | QP        | 199     | 1.4    | QP (1.00s)                 |
| 97.635        | 10.2         | H   | 43.5       | -33.3        | QP        | 109     | 4.0    | QP (1.00s)                 |
| 105.752       | 9.7          | V   | 43.5       | -33.8        | QP        | 291     | 1.9    | QP (1.00s)                 |
| 0.101         | -79.7        | V   | 27.5       | -107.2       | Peak      | 109     | 1.0    | Peak reading with QP limit |
| 0.064         | -78.4        | V   | 31.4       | -109.8       | Peak      | 109     | 1.0    | Peak reading with QP limit |
| 0.196         | -88.2        | V   | 21.8       | -110.0       | Peak      | 109     | 1.0    | Peak reading with QP limit |



## EMC Test Data

|           |                     |                   |               |
|-----------|---------------------|-------------------|---------------|
| Client:   | Enovate Medical     | PR Number:        | PR095459      |
| Model:    | A0001707            | T-Log Number:     | TL095459-RA   |
| Contact:  | Cameron Boone       | Project Manager:  | Deepa Shetty  |
| Standard: | FCC 15.247, RSS-247 | Project Engineer: | Deniz Demirci |
|           |                     | Class:            | B             |





## EMC Test Data

|           |                     |                      |               |
|-----------|---------------------|----------------------|---------------|
| Client:   | Enovate Medical     | Job Number:          | PR095459      |
| Model:    | A0001707            | T-Log Number:        | TL095459-RA   |
| Contact:  | Cameron Boone       | Project Manager:     | Deepa Shetty  |
| Standard: | FCC 15.247, RSS-247 | Project Coordinator: | Deniz Demirci |
|           |                     | Class:               | N/A           |

### RSS-247 and FCC 15.247 (DTS) Radiated Spurious Emissions

#### Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

#### General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing.

For radiated emissions testing the measurement antenna was located 3 meters from the EUT, unless otherwise noted.

#### Ambient Conditions:

Temperature: 19-22 °C

Rel. Humidity: 38-41 %

#### Summary of Results - Device Operating in the 2400-2483.5 MHz Band

| Run #                                                            | Mode          | Channel        | Target Power | Power Setting | Test Performed                    | Limit                           | Result / Margin                     |
|------------------------------------------------------------------|---------------|----------------|--------------|---------------|-----------------------------------|---------------------------------|-------------------------------------|
| 1                                                                | BLE EUT Flat  | 17<br>2440 MHz | Max          | Max           | Radiated Emissions,<br>1 - 25 GHz | FCC Part 15.209 /<br>15.247( c) | 53.9 dBµV/m @ 2312.2 MHz (-0.1 dB)  |
|                                                                  | BLE EUT Side1 |                |              |               |                                   |                                 | 51.9 dBµV/m @ 2312.0 MHz (-2.1 dB)  |
|                                                                  | BLE EUT Side2 |                |              |               |                                   |                                 | 53.2 dBµV/m @ 2312.0 MHz (-0.8 dB)  |
| Scans on low and high channel on the worst case EUT orientation. |               |                |              |               |                                   |                                 |                                     |
| 2                                                                | BLE EUT Flat  | 37<br>2402 MHz | Max          | Max           | Radiated Emissions,<br>1 - 25 GHz | FCC Part 15.209 /<br>15.247( c) | 51.6 dBµV/m @ 2530.0 MHz (-2.4 dB)  |
|                                                                  | BLE EUT Flat  | 39<br>2480 MHz |              |               |                                   |                                 | 52.6 dBµV/m @ 2352.1 MHz (-1.4 dB)  |
| 3                                                                | BLE EUT Flat  | 37<br>2402 MHz | Max          | Max           | Band Edge<br>2390 - 2483.5 MHz    | 15.247( c)                      | 39.7 dBµV/m @ 2353.8 MHz (-14.3 dB) |
|                                                                  | BLE EUT Flat  | 39<br>2480 MHz |              |               |                                   |                                 | 61.0 dBµV/m @ 2483.5 MHz (-13.0 dB) |

#### Modifications Made During Testing

No modifications were made to the EUT during testing

#### Deviations From The Standard

No deviations were made from the requirements of the standard.



## EMC Test Data

|           |                     |                      |               |
|-----------|---------------------|----------------------|---------------|
| Client:   | Enovate Medical     | Job Number:          | PR095459      |
| Model:    | A0001707            | T-Log Number:        | TL095459-RA   |
| Contact:  | Cameron Boone       | Project Manager:     | Deepa Shetty  |
| Standard: | FCC 15.247, RSS-247 | Project Coordinator: | Deniz Demirci |
|           |                     | Class:               | N/A           |

### Sample Notes

Sample S/N: B823730007

Driver: Minicom

Antenna: Integral

### Procedure Comments:

Measurements performed in accordance with FCC KDB 558074

Peak measurements performed with: RBW=1MHz, VBW=3MHz, peak detector, max hold, auto sweep time

Unless otherwise stated/noted, emission has duty cycle  $\geq 98\%$  and was measured using RBW=1MHz, VBW=10Hz, peak detector, linear average mode, auto sweep time, max hold.

2.4GHz band reject filter used

| Mode | Data Rate | Duty Cycle (x) | Constant DC? | T (ms) | Pwr Cor Factor* | Lin Volt Cor Factor** | Min VBW for FS (Hz) |
|------|-----------|----------------|--------------|--------|-----------------|-----------------------|---------------------|
| BLE  | 1 Mb/s    | 95.3%          | Yes          | 2.12   | 0.2             | 0.4                   | 472                 |

### Measurement Specific Notes:

|         |                                                                                                                                                                                                             |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Note 1: | Emission in non-restricted band, but limit of 15.209 used.                                                                                                                                                  |
| Note 2: | Emission in non-restricted band, the limit was set 30dB below the level of the fundamental and measured in 100kHz.                                                                                          |
| Note 6: | Emission has non constant duty cycle $< 98\%$ , average measurement performed: RBW=1MHz, VBW $> 1/T$ , peak detector, linear average mode, sweep time auto, max hold. Max hold for $50 \cdot (1/DC)$ traces |



## EMC Test Data

|           |                     |                      |               |
|-----------|---------------------|----------------------|---------------|
| Client:   | Enovate Medical     | Job Number:          | PR095459      |
| Model:    | A0001707            | T-Log Number:        | TL095459-RA   |
| Contact:  | Cameron Boone       | Project Manager:     | Deepa Shetty  |
| Standard: | FCC 15.247, RSS-247 | Project Coordinator: | Deniz Demirci |
|           |                     | Class:               | N/A           |

### Run #1a: Radiated Spurious Emissions, 1,000 - 25000 MHz. Operating Mode: BLE

Date of Test: 5/22/2019

Config. Used: 1

Test Engineer: D. Demirci & M. Birgani

Config Change: none

Test Location: FT Ch #4

EUT Voltage: 3.0 VDC

### Run #1a: Center Channel, EUT Flat

Channel: 17

Mode: BLE

Power Setting: Max

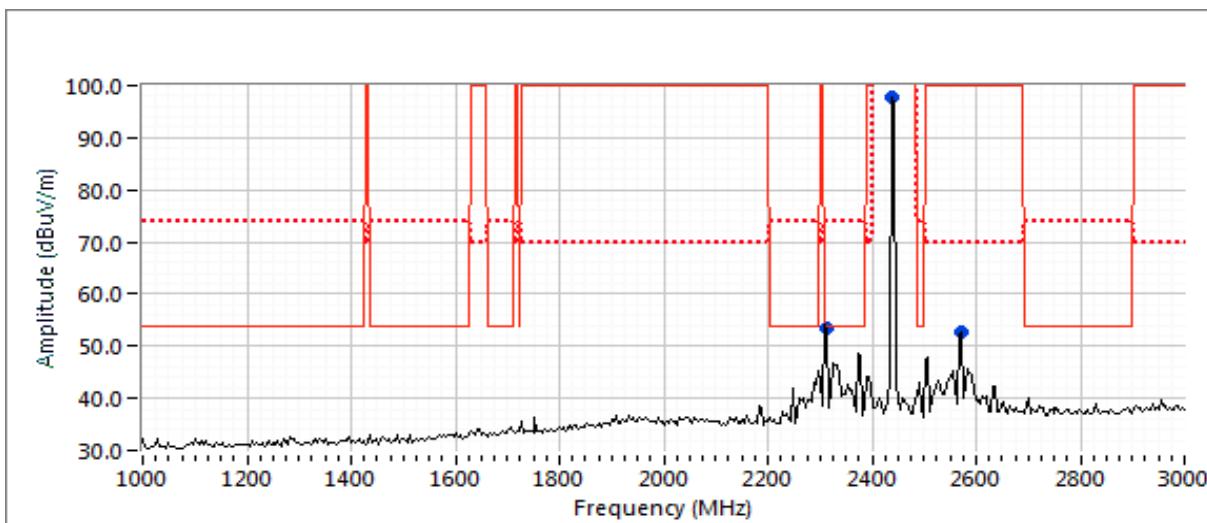
Tx Chain: Main

Data Rate: 1 Mbps

| Frequency | Level  | Pol | 15.209 / 15.247 |        | Detector  | Azimuth | Height | Comments                       |
|-----------|--------|-----|-----------------|--------|-----------|---------|--------|--------------------------------|
| MHz       | dBuV/m | v/h | Limit           | Margin | Pk/QP/Avg | degrees | meters |                                |
| 2312.150  | 53.9   | H   | 54.0            | -0.1   | AVG       | 332     | 1.5    | Note 6; RB 1 MHz; VB: 500 Hz   |
| 2312.300  | 56.7   | H   | 74.0            | -17.3  | PK        | 332     | 1.5    | RB 1 MHz; VB: 3 MHz            |
| 2568.070  | 49.8   | H   | 54.0            | -4.2   | AVG       | 232     | 1.52   | Note 1&6; RB 1 MHz; VB: 500 Hz |
| 2567.810  | 54.4   | H   | 74.0            | -19.6  | PK        | 232     | 1.52   | Note 1; RB 1 MHz; VB: 3 MHz    |
| 7320.500  | 45.1   | V   | 54.0            | -8.9   | Avg       | 94      | 1.05   | Note 6, RB 1 MHz; VB 1 kHz     |
| 7320.710  | 54.9   | V   | 74.0            | -19.1  | PK        | 94      | 1.05   | RB 1 MHz; VB 3 MHz             |
| 4880.100  | 34.6   | H   | 54.0            | -19.4  | Avg       | 131     | 1.92   | Note 6, RB 1 MHz; VB 1 kHz     |
| 4878.680  | 47.7   | H   | 74.0            | -26.3  | PK        | 131     | 1.92   | RB 1 MHz; VB 3 MHz             |
| 5131.550  | 34.0   | V   | 54.0            | -20.0  | Avg       | 347     | 1.95   | Note 6, RB 1 MHz; VB 1 kHz     |
| 5123.800  | 47.4   | V   | 74.0            | -26.6  | PK        | 347     | 1.95   | RB 1 MHz; VB 3 MHz             |
| 12199.070 | 34.0   | V   | 54.0            | -20.0  | AVG       | 331     | 1.78   | Note 6, RB 1 MHz; VB 1 kHz     |
| 12198.860 | 46.0   | V   | 74.0            | -28.0  | PK        | 331     | 1.78   | RB 1 MHz; VB 3 MHz             |

Note:

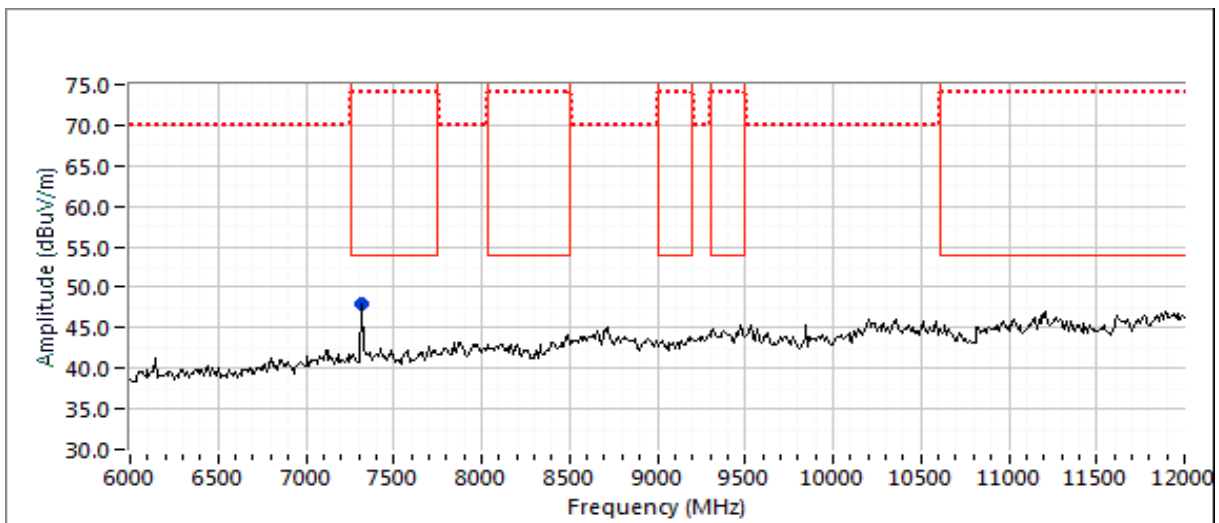
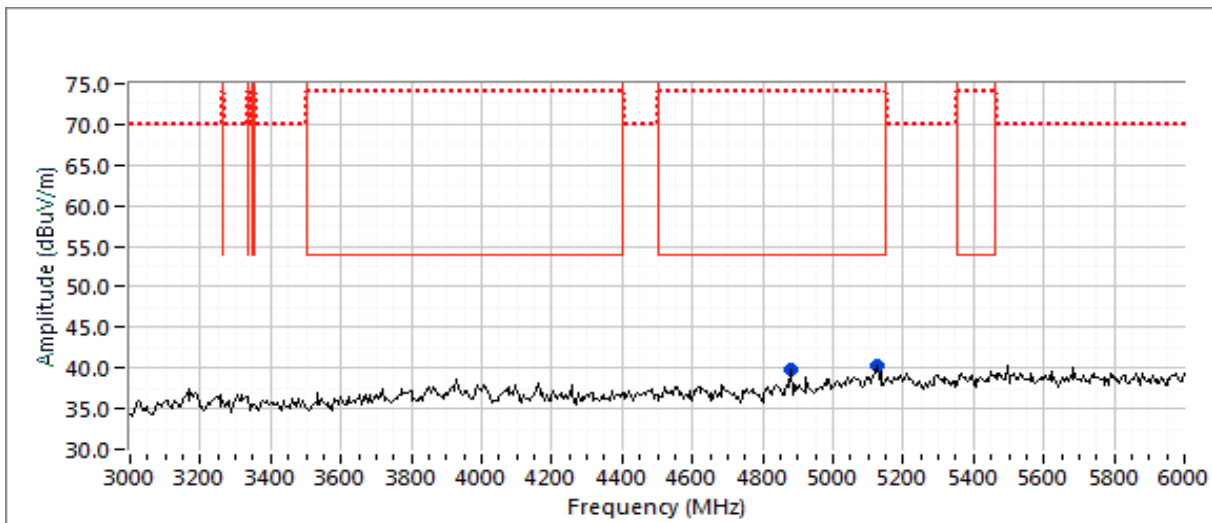
Scans made between 18 - 25 GHz with the measurement antenna moved around the card and its antennas 20-50cm from the device indicated there were no significant emissions in this frequency range





## EMC Test Data

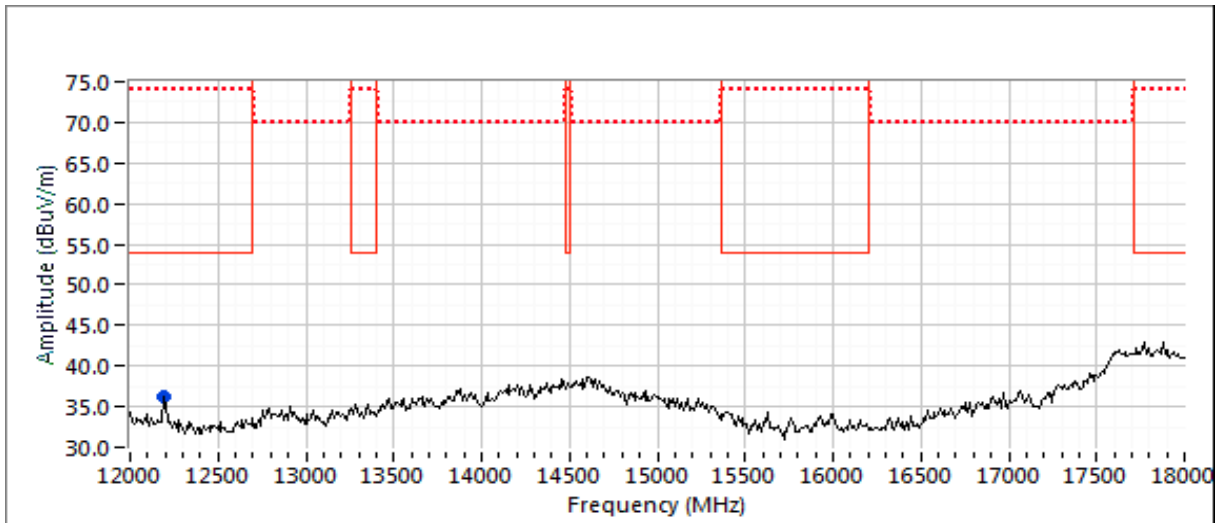
|           |                     |                      |               |
|-----------|---------------------|----------------------|---------------|
| Client:   | Enovate Medical     | Job Number:          | PR095459      |
| Model:    | A0001707            | T-Log Number:        | TL095459-RA   |
| Contact:  | Cameron Boone       | Project Manager:     | Deepa Shetty  |
| Standard: | FCC 15.247, RSS-247 | Project Coordinator: | Deniz Demirci |
|           |                     | Class:               | N/A           |





## EMC Test Data

|           |                     |                      |               |
|-----------|---------------------|----------------------|---------------|
| Client:   | Enovate Medical     | Job Number:          | PR095459      |
| Model:    | A0001707            | T-Log Number:        | TL095459-RA   |
| Contact:  | Cameron Boone       | Project Manager:     | Deepa Shetty  |
| Standard: | FCC 15.247, RSS-247 | Project Coordinator: | Deniz Demirci |
|           |                     | Class:               | N/A           |





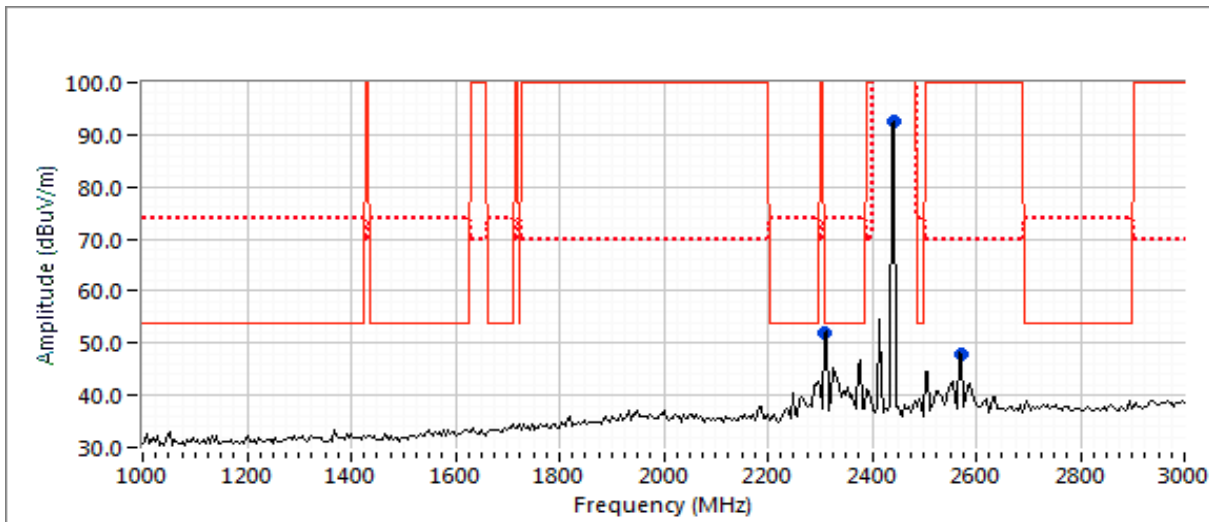
## EMC Test Data

|           |                     |                      |               |
|-----------|---------------------|----------------------|---------------|
| Client:   | Enovate Medical     | Job Number:          | PR095459      |
| Model:    | A0001707            | T-Log Number:        | TL095459-RA   |
| Contact:  | Cameron Boone       | Project Manager:     | Deepa Shetty  |
| Standard: | FCC 15.247, RSS-247 | Project Coordinator: | Deniz Demirci |
|           |                     | Class:               | N/A           |

### Run #1b: Center Channel, EUT Side 1

Channel: 17      Mode: BLE      Power Setting: Max  
 Tx Chain: Main      Data Rate: 1 Mbps

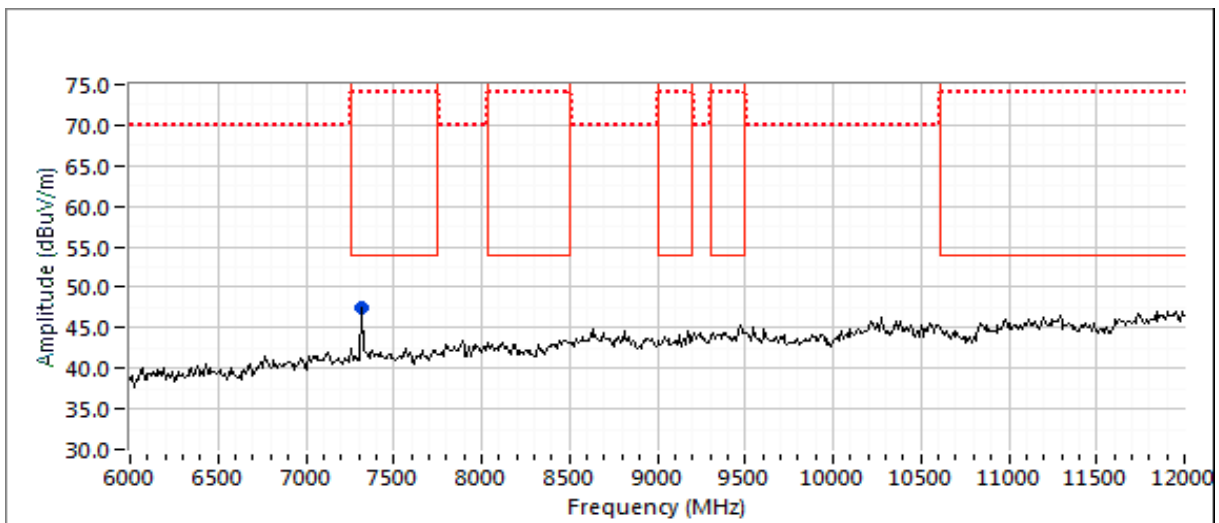
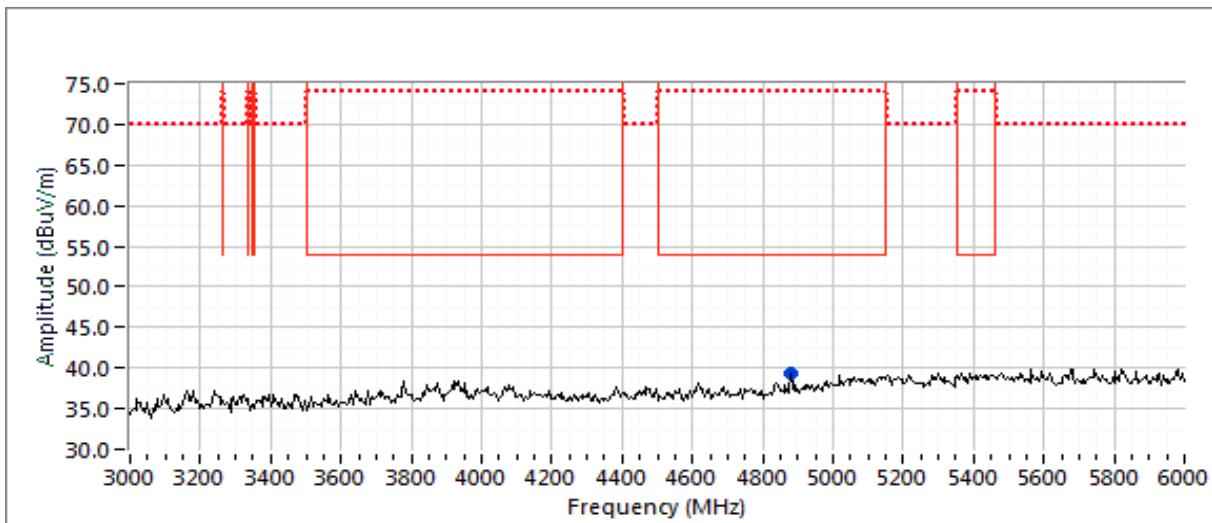
| Frequency | Level        | Pol | 15.209 / 15.247 |        | Detector  | Azimuth | Height | Comments                       |
|-----------|--------------|-----|-----------------|--------|-----------|---------|--------|--------------------------------|
| MHz       | dB $\mu$ V/m | v/h | Limit           | Margin | Pk/QP/Avg | degrees | meters |                                |
| 2312.020  | 51.9         | V   | 54.0            | -2.1   | Avg       | 183     | 2.0    | Note 6; RB 1 MHz; VB: 500 Hz   |
| 2311.730  | 55.0         | V   | 74.0            | -19.0  | PK        | 183     | 2.0    | RB 1 MHz; VB: 3 MHz            |
| 2568.040  | 46.7         | H   | 54.0            | -7.3   | Avg       | 127     | 1.0    | Note 1&6; RB 1 MHz; VB: 500 Hz |
| 2568.250  | 51.8         | H   | 74.0            | -22.2  | PK        | 127     | 1.0    | Note 1; RB 1 MHz; VB: 3 MHz    |
| 4880.160  | 36.4         | H   | 54.0            | -17.6  | Avg       | 230     | 1.9    | Note 6; RB 1 MHz; VB 1 kHz     |
| 4880.830  | 47.6         | H   | 74.0            | -26.4  | PK        | 230     | 1.9    | RB 1 MHz; VB 3 MHz             |
| 7320.920  | 43.9         | V   | 54.0            | -10.1  | Avg       | 224     | 2.1    | Note 6; RB 1 MHz; VB 1 kHz     |
| 7320.140  | 54.3         | V   | 74.0            | -19.7  | PK        | 224     | 2.1    | RB 1 MHz; VB 3 MHz             |





## EMC Test Data

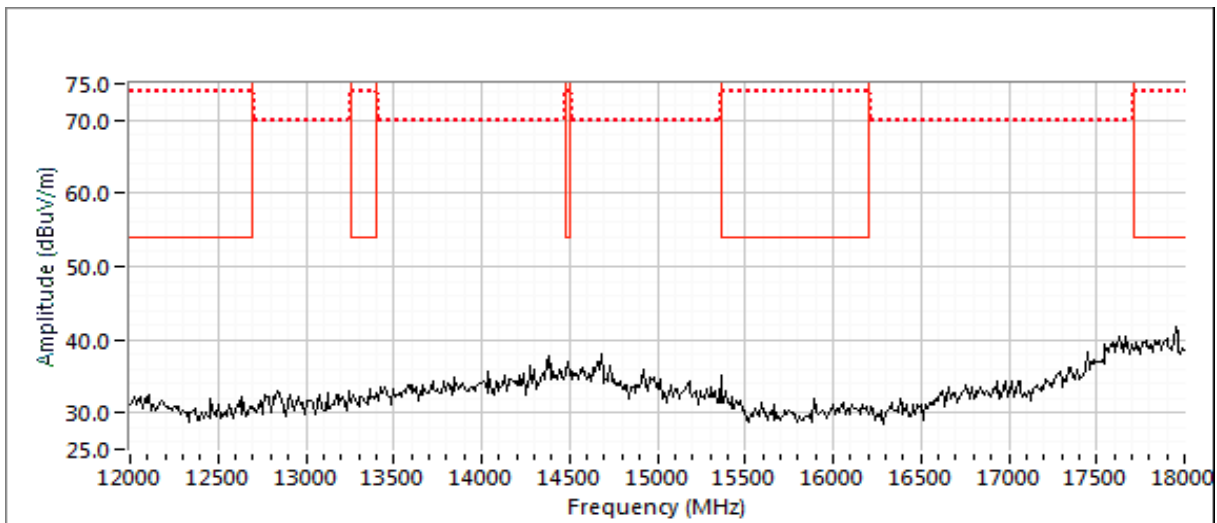
|           |                     |                      |               |
|-----------|---------------------|----------------------|---------------|
| Client:   | Enovate Medical     | Job Number:          | PR095459      |
| Model:    | A0001707            | T-Log Number:        | TL095459-RA   |
| Contact:  | Cameron Boone       | Project Manager:     | Deepa Shetty  |
| Standard: | FCC 15.247, RSS-247 | Project Coordinator: | Deniz Demirci |
|           |                     | Class:               | N/A           |





## EMC Test Data

|           |                     |                      |               |
|-----------|---------------------|----------------------|---------------|
| Client:   | Enovate Medical     | Job Number:          | PR095459      |
| Model:    | A0001707            | T-Log Number:        | TL095459-RA   |
| Contact:  | Cameron Boone       | Project Manager:     | Deepa Shetty  |
| Standard: | FCC 15.247, RSS-247 | Project Coordinator: | Deniz Demirci |
|           |                     | Class:               | N/A           |





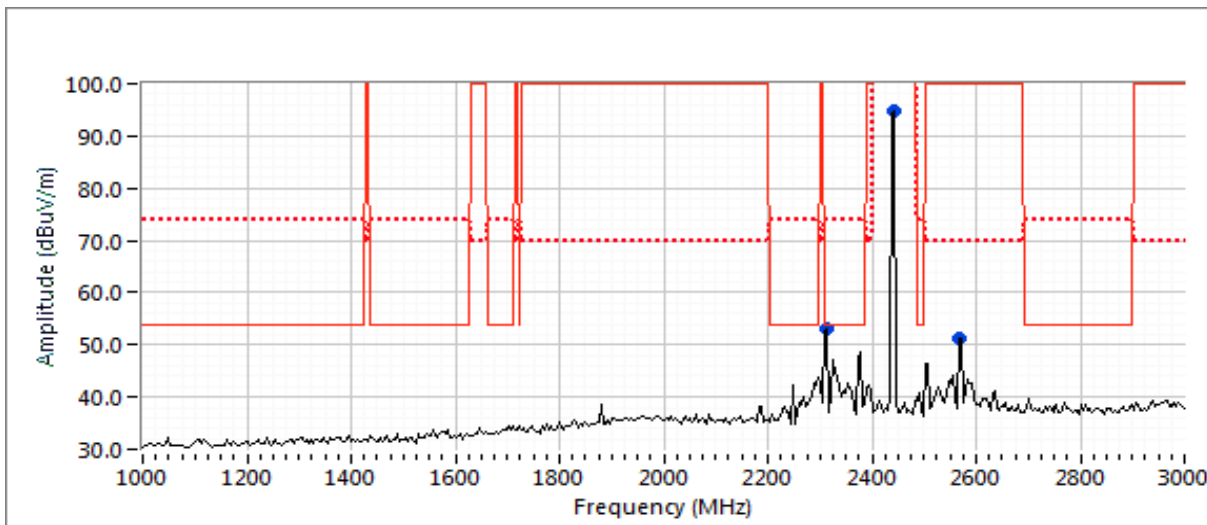
## EMC Test Data

|           |                     |                      |               |
|-----------|---------------------|----------------------|---------------|
| Client:   | Enovate Medical     | Job Number:          | PR095459      |
| Model:    | A0001707            | T-Log Number:        | TL095459-RA   |
| Contact:  | Cameron Boone       | Project Manager:     | Deepa Shetty  |
| Standard: | FCC 15.247, RSS-247 | Project Coordinator: | Deniz Demirci |
|           |                     | Class:               | N/A           |

### Run #1c: Center Channel, EUT Side 2

Channel: 17 Mode: BLE Power Setting: Max  
Tx Chain: Main Data Rate: 1 Mbps

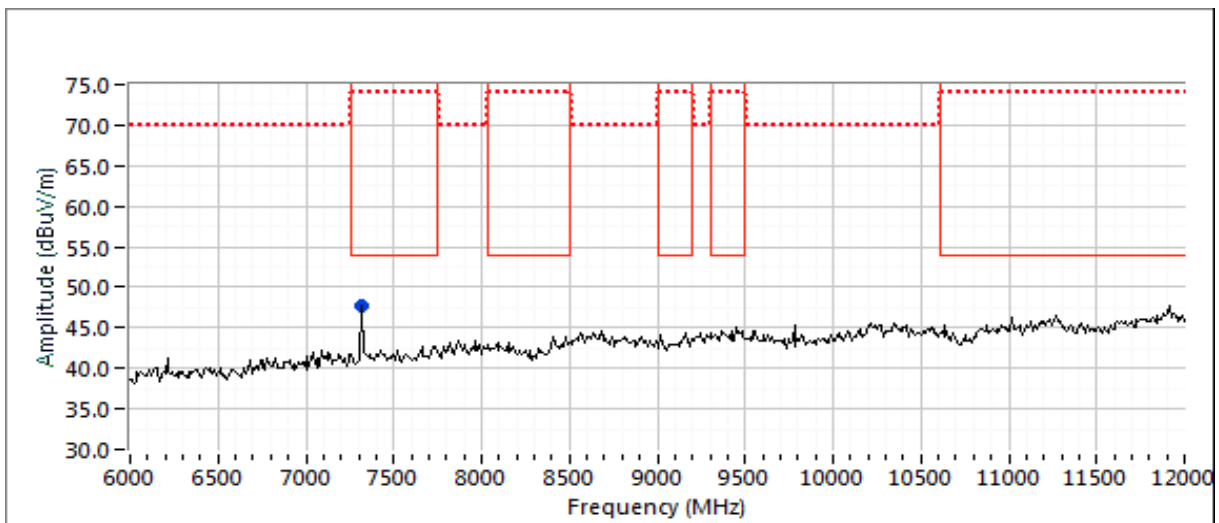
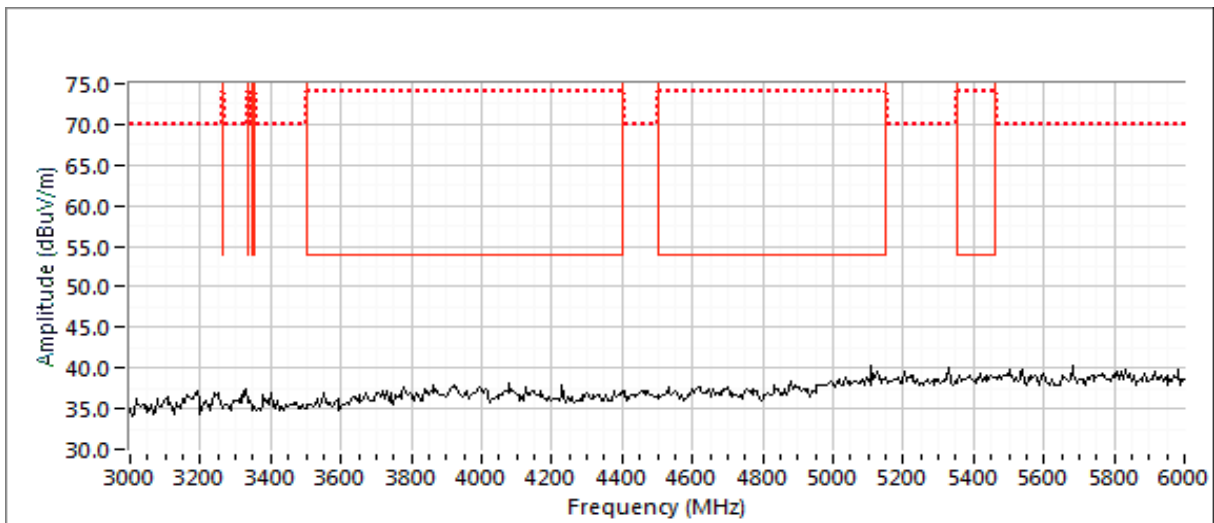
| Frequency | Level        | Pol | 15.209 / 15.247 |        | Detector  | Azimuth | Height | Comments                       |
|-----------|--------------|-----|-----------------|--------|-----------|---------|--------|--------------------------------|
| MHz       | dB $\mu$ V/m | v/h | Limit           | Margin | Pk/QP/Avg | degrees | meters |                                |
| 2312.010  | 53.2         | V   | 54.0            | -0.8   | AVG       | 40      | 1.5    | Note 6; RB 1 MHz; VB: 500 Hz   |
| 2311.790  | 56.4         | V   | 74.0            | -17.6  | PK        | 40      | 1.5    | RB 1 MHz; VB: 3 MHz            |
| 2568.080  | 50.4         | V   | 54.0            | -3.6   | AVG       | 48      | 1.5    | Note 1&6; RB 1 MHz; VB: 500 Hz |
| 2568.380  | 54.3         | V   | 74.0            | -19.7  | PK        | 48      | 1.5    | Note 1; RB 1 MHz; VB: 3 MHz    |
| 7319.550  | 41.8         | H   | 54.0            | -12.2  | AVG       | 128     | 1.1    | Note 6; RB 1 MHz; VB 1 kHz     |
| 7320.780  | 53.4         | H   | 74.0            | -20.6  | PK        | 128     | 1.1    | RB 1 MHz; VB 3 MHz             |





## EMC Test Data

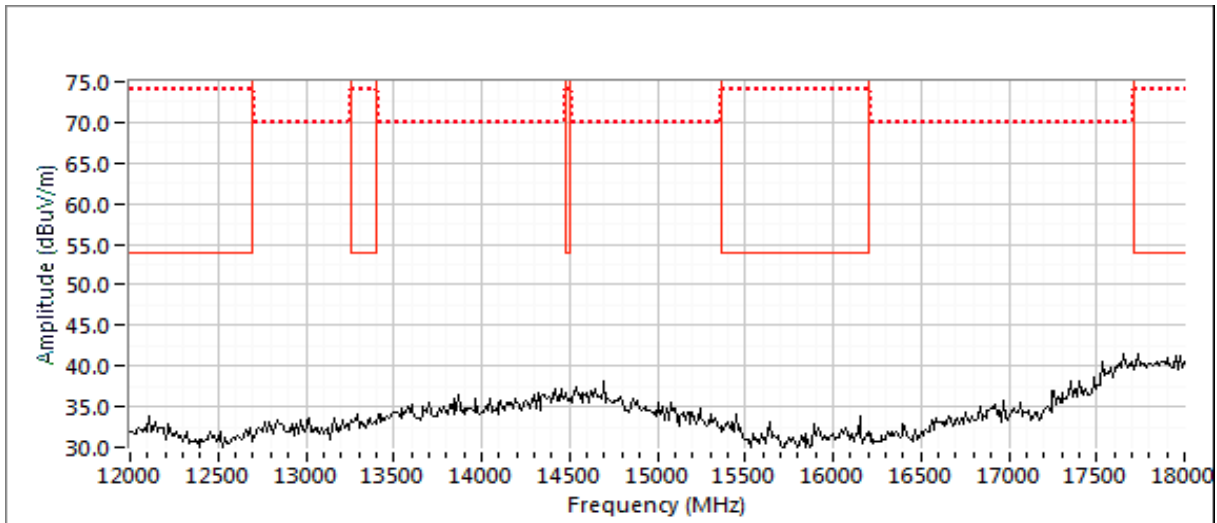
|           |                     |                      |               |
|-----------|---------------------|----------------------|---------------|
| Client:   | Enovate Medical     | Job Number:          | PR095459      |
| Model:    | A0001707            | T-Log Number:        | TL095459-RA   |
| Contact:  | Cameron Boone       | Project Manager:     | Deepa Shetty  |
| Standard: | FCC 15.247, RSS-247 | Project Coordinator: | Deniz Demirci |
|           |                     | Class:               | N/A           |





## EMC Test Data

|           |                     |                      |               |
|-----------|---------------------|----------------------|---------------|
| Client:   | Enovate Medical     | Job Number:          | PR095459      |
| Model:    | A0001707            | T-Log Number:        | TL095459-RA   |
| Contact:  | Cameron Boone       | Project Manager:     | Deepa Shetty  |
| Standard: | FCC 15.247, RSS-247 | Project Coordinator: | Deniz Demirci |
|           |                     | Class:               | N/A           |





## EMC Test Data

|           |                     |                      |               |
|-----------|---------------------|----------------------|---------------|
| Client:   | Enovate Medical     | Job Number:          | PR095459      |
| Model:    | A0001707            | T-Log Number:        | TL095459-RA   |
| Contact:  | Cameron Boone       | Project Manager:     | Deepa Shetty  |
| Standard: | FCC 15.247, RSS-247 | Project Coordinator: | Deniz Demirci |
|           |                     | Class:               | N/A           |

### Run #2: Radiated Spurious Emissions, 1,000 - 25000 MHz. Operating Mode: BLE, EUT Flat

Date of Test: 5/22/2019

Config. Used: 1

Test Engineer: M. Birgani

Config Change: None

Test Location: FT Ch #4

EUT Voltage: 3.0 VDC

### Run #2a: Low Channel

Channel: 37

Mode: BLE

Power Setting: Max

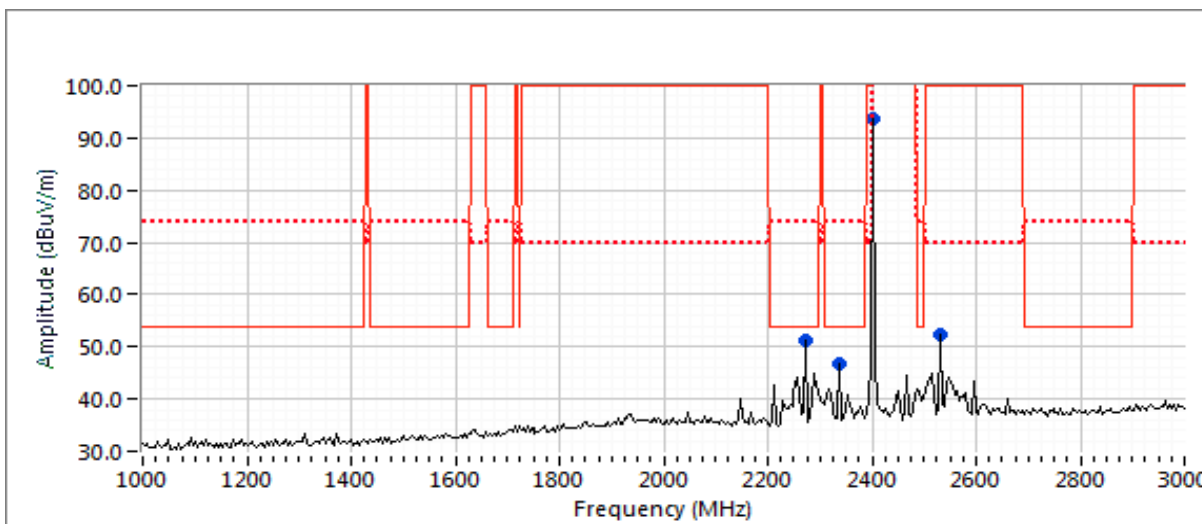
Tx Chain: Main

Data Rate: 1 Mbps

| Frequency | Level        | Pol | 15.209 / 15.247 |        | Detector  | Azimuth | Height | Comments                       |
|-----------|--------------|-----|-----------------|--------|-----------|---------|--------|--------------------------------|
| MHz       | dB $\mu$ V/m | v/h | Limit           | Margin | Pk/QP/Avg | degrees | meters |                                |
| 2530.020  | 51.6         | H   | 54.0            | -2.4   | AVG       | 161     | 1.0    | Note 1&6; RB 1 MHz; VB: 500 Hz |
| 2274.010  | 51.1         | H   | 54.0            | -2.9   | AVG       | 131     | 1.0    | Note 6; RB 1 MHz; VB: 500 Hz   |
| 2338.070  | 46.4         | H   | 54.0            | -7.6   | AVG       | 139     | 1.5    | Note 6; RB 1 MHz; VB: 500 Hz   |
| 4804.170  | 40.8         | V   | 54.0            | -13.2  | AVG       | 349     | 1.5    | Note 6; RB 1 MHz; VB 1 kHz     |
| 2530.110  | 55.2         | H   | 74.0            | -18.8  | PK        | 161     | 1.0    | Note 1; RB 1 MHz; VB: 3 MHz    |
| 2273.740  | 54.5         | H   | 74.0            | -19.5  | PK        | 131     | 1.0    | RB 1 MHz; VB: 3 MHz            |
| 2338.190  | 51.1         | H   | 74.0            | -22.9  | PK        | 139     | 1.5    | RB 1 MHz; VB: 3 MHz            |
| 4804.500  | 49.4         | V   | 74.0            | -24.6  | PK        | 349     | 1.5    | RB 1 MHz; VB 3 MHz             |

Note:

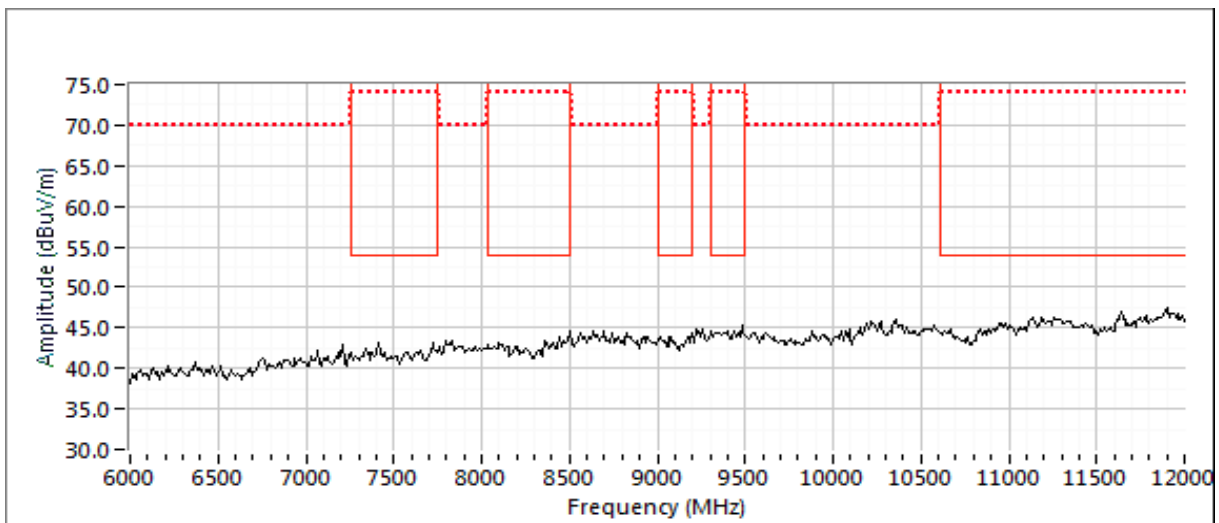
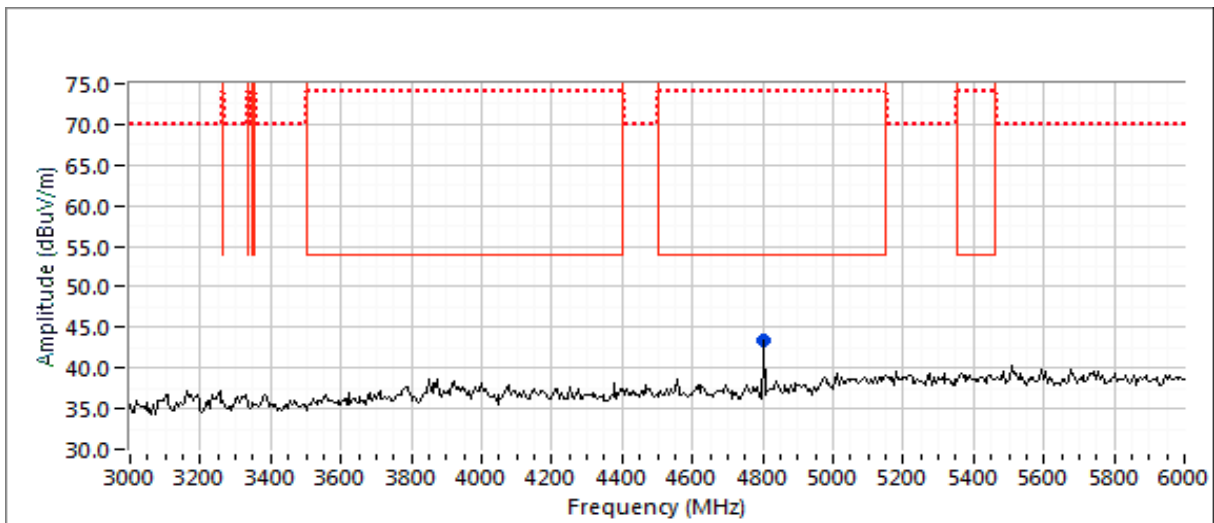
Scans made between 18 - 25 GHz with the measurement antenna moved around the card and its antennas 20-50cm from the device indicated there were no significant emissions in this frequency range





## EMC Test Data

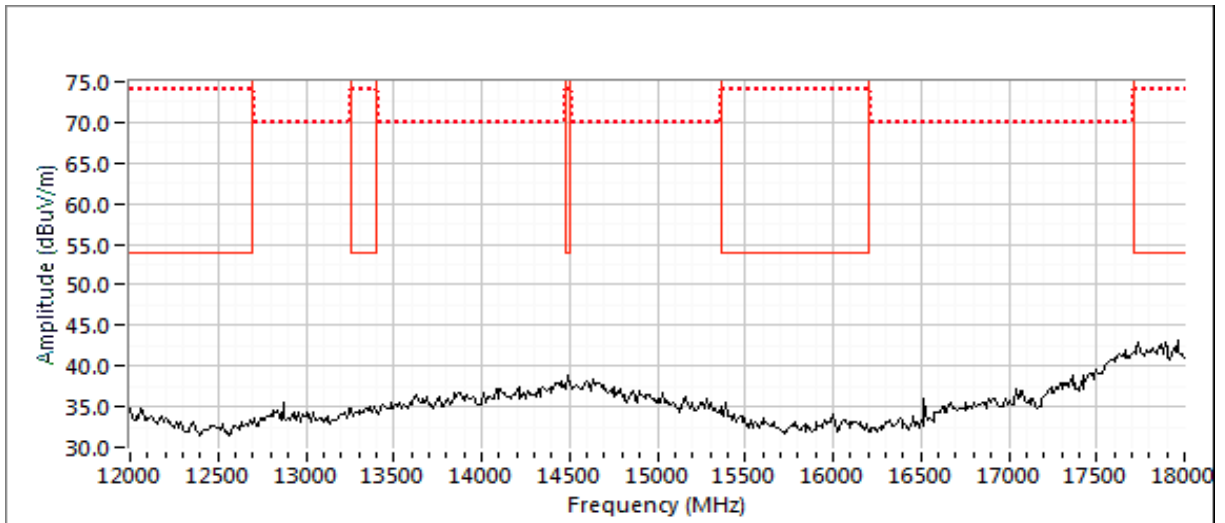
|           |                     |                      |               |
|-----------|---------------------|----------------------|---------------|
| Client:   | Enovate Medical     | Job Number:          | PR095459      |
| Model:    | A0001707            | T-Log Number:        | TL095459-RA   |
| Contact:  | Cameron Boone       | Project Manager:     | Deepa Shetty  |
| Standard: | FCC 15.247, RSS-247 | Project Coordinator: | Deniz Demirci |
|           |                     | Class:               | N/A           |





## EMC Test Data

|           |                     |                      |               |
|-----------|---------------------|----------------------|---------------|
| Client:   | Enovate Medical     | Job Number:          | PR095459      |
| Model:    | A0001707            | T-Log Number:        | TL095459-RA   |
| Contact:  | Cameron Boone       | Project Manager:     | Deepa Shetty  |
| Standard: | FCC 15.247, RSS-247 | Project Coordinator: | Deniz Demirci |
|           |                     | Class:               | N/A           |





## EMC Test Data

|           |                     |                      |               |
|-----------|---------------------|----------------------|---------------|
| Client:   | Enovate Medical     | Job Number:          | PR095459      |
| Model:    | A0001707            | T-Log Number:        | TL095459-RA   |
| Contact:  | Cameron Boone       | Project Manager:     | Deepa Shetty  |
| Standard: | FCC 15.247, RSS-247 | Project Coordinator: | Deniz Demirci |
|           |                     | Class:               | N/A           |

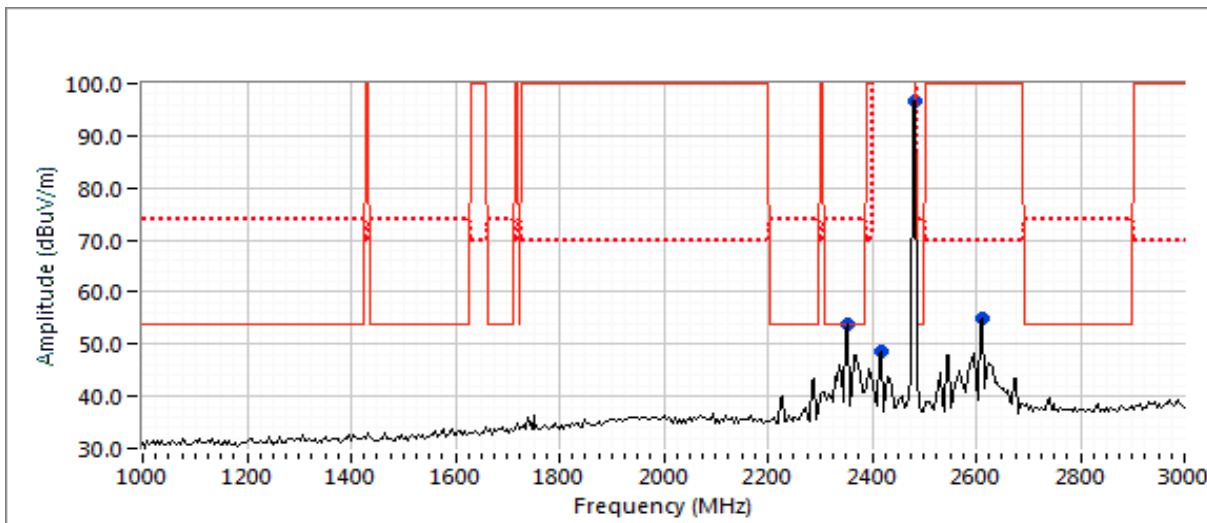
### Run #2b: High Channel

Channel: 39 Mode: BLE Power Setting: Max  
Tx Chain: Main Data Rate: 1 Mbps

| Frequency | Level        | Pol | 15.209 / 15.247 |        | Detector  | Azimuth | Height | Comments                       |
|-----------|--------------|-----|-----------------|--------|-----------|---------|--------|--------------------------------|
| MHz       | dB $\mu$ V/m | v/h | Limit           | Margin | Pk/QP/Avg | degrees | meters |                                |
| 2352.050  | 52.6         | H   | 54.0            | -1.4   | AVG       | 43      | 1.0    | Note 6; RB 1 MHz; VB: 500 Hz   |
| 2416.060  | 48.6         | H   | 54.0            | -5.4   | AVG       | 26      | 1.0    | Note 1&6; RB 1 MHz; VB: 500 Hz |
| 7439.580  | 43.1         | H   | 54.0            | -10.9  | AVG       | 225     | 1.0    | Note 6; RB 1 MHz; VB 1 kHz     |
| 2613.010  | 38.9         | H   | 54.0            | -15.1  | AVG       | 12      | 1.1    | Note 1&6; RB 1 MHz; VB: 500 Hz |
| 4960.100  | 38.8         | V   | 54.0            | -15.2  | AVG       | 115     | 1.5    | Note 6; RB 1 MHz; VB 1 kHz     |
| 2351.760  | 55.7         | H   | 74.0            | -18.3  | PK        | 43      | 1.0    | RB 1 MHz; VB: 3 MHz            |
| 7439.540  | 54.0         | H   | 74.0            | -20.0  | PK        | 225     | 1.0    | RB 1 MHz; VB 3 MHz             |
| 2416.300  | 53.0         | H   | 74.0            | -21.0  | PK        | 26      | 1.0    | Note 1; RB 1 MHz; VB: 3 MHz    |
| 4960.290  | 48.6         | V   | 74.0            | -25.4  | PK        | 115     | 1.5    | RB 1 MHz; VB 3 MHz             |
| 2613.180  | 48.5         | H   | 74.0            | -25.5  | PK        | 12      | 1.1    | RB 1 MHz; VB: 3 MHz            |

Note:

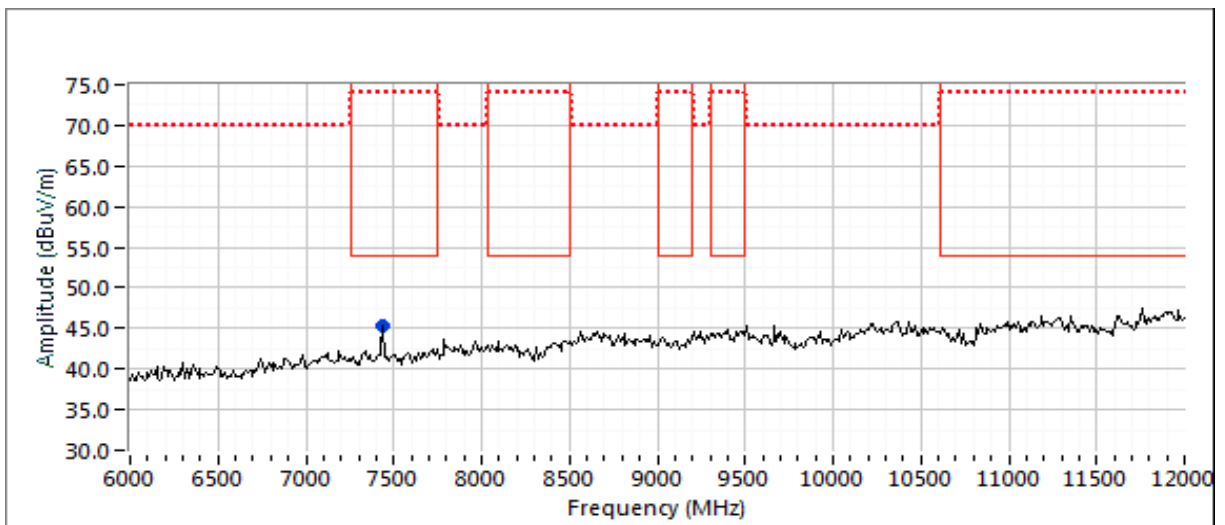
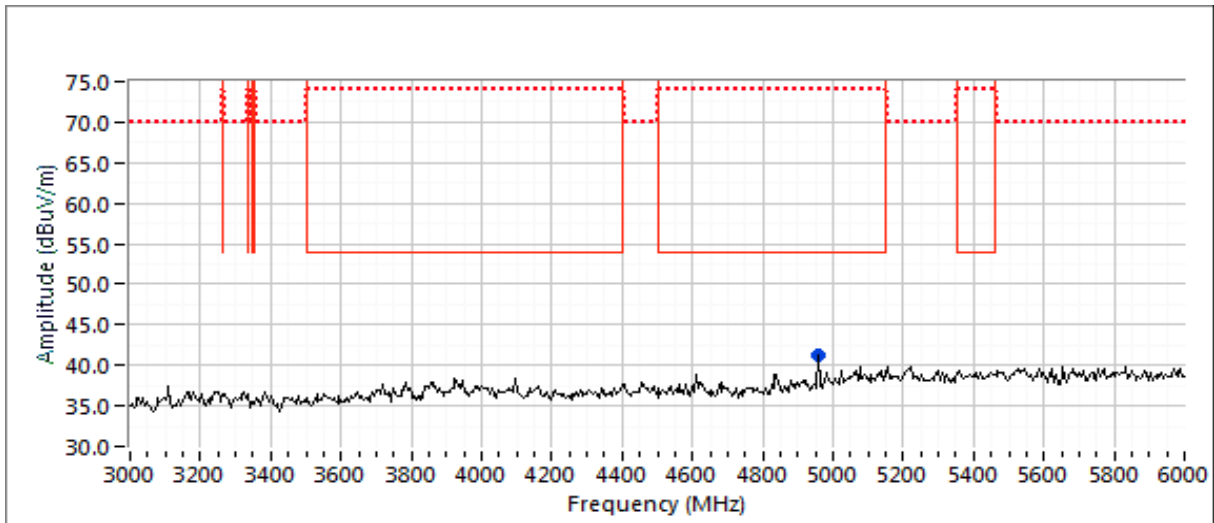
Scans made between 18 - 25 GHz with the measurement antenna moved around the card and its antennas 20-50cm from the device indicated there were no significant emissions in this frequency range





## EMC Test Data

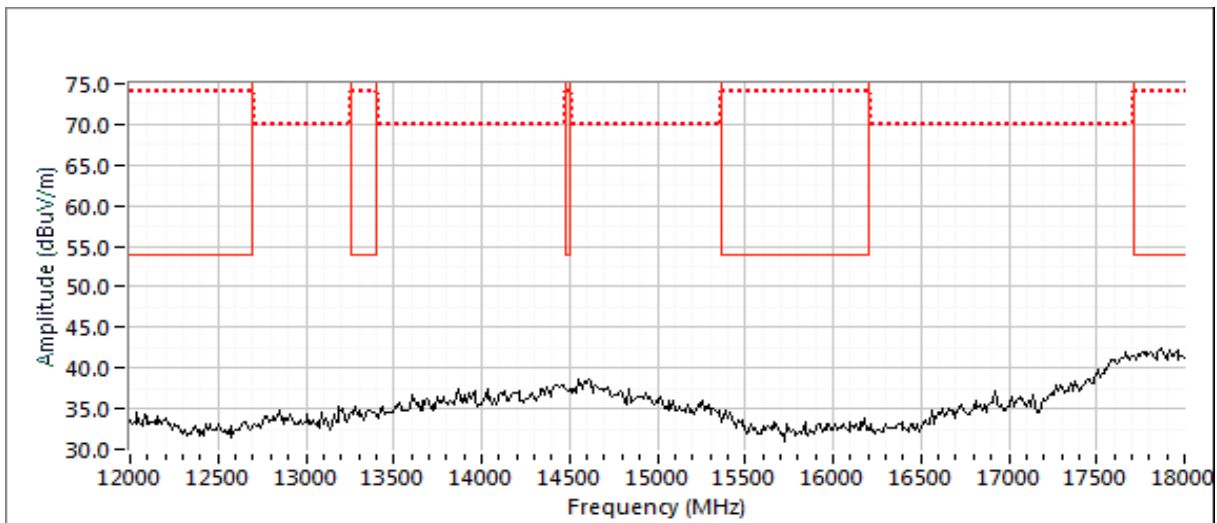
|           |                     |                      |               |
|-----------|---------------------|----------------------|---------------|
| Client:   | Enovate Medical     | Job Number:          | PR095459      |
| Model:    | A0001707            | T-Log Number:        | TL095459-RA   |
| Contact:  | Cameron Boone       | Project Manager:     | Deepa Shetty  |
| Standard: | FCC 15.247, RSS-247 | Project Coordinator: | Deniz Demirci |
|           |                     | Class:               | N/A           |





## EMC Test Data

|           |                     |                      |               |
|-----------|---------------------|----------------------|---------------|
| Client:   | Enovate Medical     | Job Number:          | PR095459      |
| Model:    | A0001707            | T-Log Number:        | TL095459-RA   |
| Contact:  | Cameron Boone       | Project Manager:     | Deepa Shetty  |
| Standard: | FCC 15.247, RSS-247 | Project Coordinator: | Deniz Demirci |
|           |                     | Class:               | N/A           |





## EMC Test Data

|           |                     |                      |               |
|-----------|---------------------|----------------------|---------------|
| Client:   | Enovate Medical     | Job Number:          | PR095459      |
| Model:    | A0001707            | T-Log Number:        | TL095459-RA   |
| Contact:  | Cameron Boone       | Project Manager:     | Deepa Shetty  |
| Standard: | FCC 15.247, RSS-247 | Project Coordinator: | Deniz Demirci |
|           |                     | Class:               | N/A           |

### Run #3: Radiated Spurious Emissions, band edge. Operating Mode: BLE, EUT Flat

Date of Test: 5/22/2019

Config. Used: 1

Test Engineer: M. Birgani

Config Change: None

Test Location: FT Ch #4

EUT Voltage: 3.0 VDC

### Run #3a: Low Channel

Channel: 37

Mode: BLE

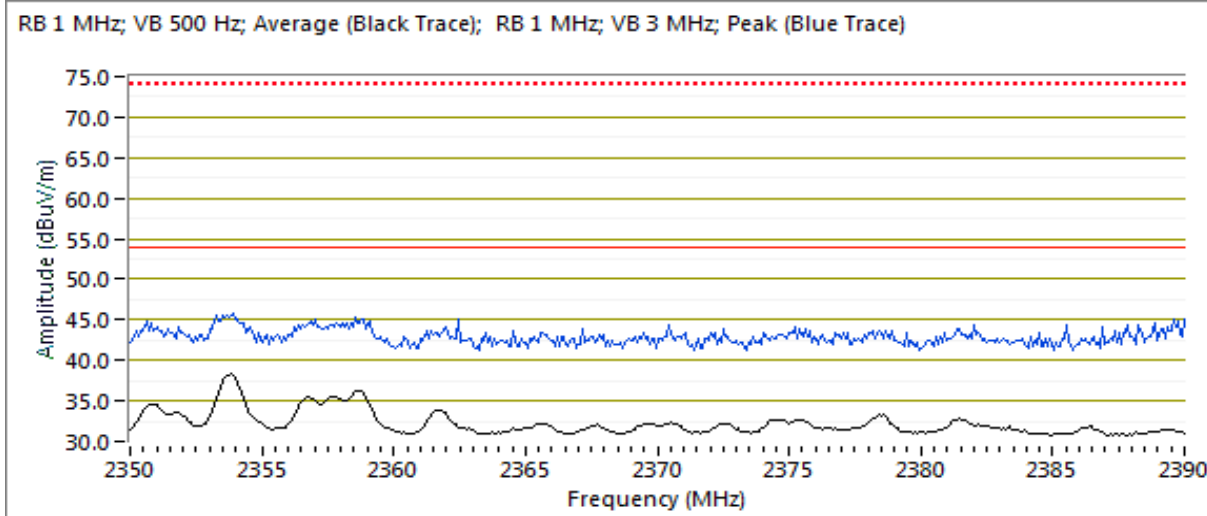
Power Setting: Max

Tx Chain: Main

Data Rate: 1 Mbps

### Band Edge

| Frequency | Level        | Pol | 15.209 / 15.247 |        | Detector  | Azimuth | Height | Comments                     |
|-----------|--------------|-----|-----------------|--------|-----------|---------|--------|------------------------------|
| MHz       | dB $\mu$ V/m | v/h | Limit           | Margin | Pk/QP/Avg | degrees | meters |                              |
| 2353.770  | 39.7         | V   | 54.0            | -14.3  | AVG       | 140     | 1.0    | Note 6; RB 1 MHz; VB: 500 Hz |
| 2353.690  | 38.1         | H   | 54.0            | -15.9  | AVG       | 142     | 1.5    | Note 6; RB 1 MHz; VB: 500 Hz |
| 2389.120  | 47.7         | V   | 74.0            | -26.3  | PK        | 140     | 1.0    | RB 1 MHz; VB: 3 MHz          |
| 2357.700  | 46.1         | H   | 74.0            | -27.9  | PK        | 142     | 1.5    | RB 1 MHz; VB: 3 MHz          |





## EMC Test Data

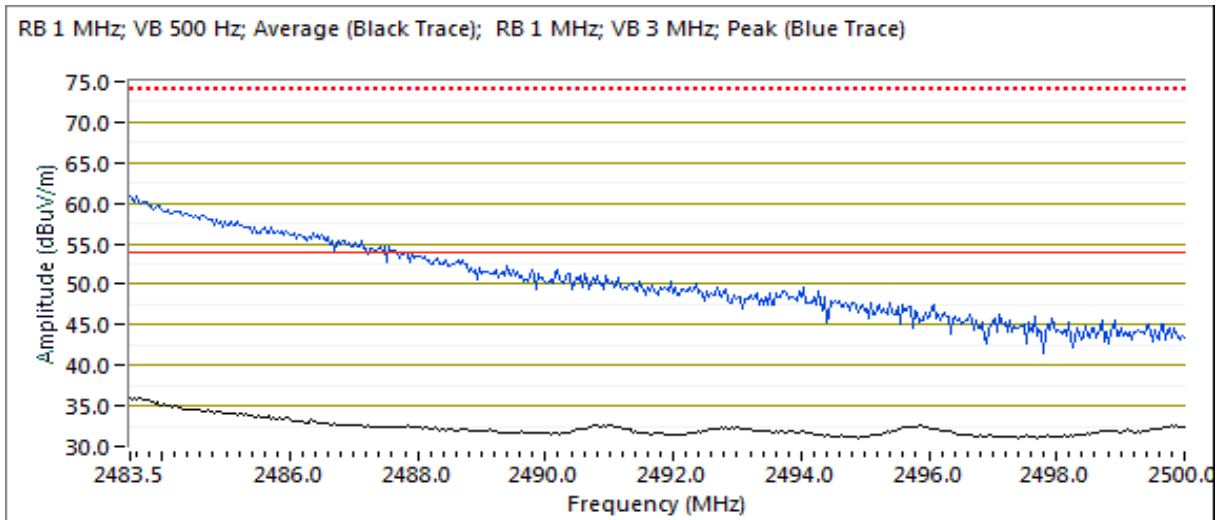
|           |                     |                      |               |
|-----------|---------------------|----------------------|---------------|
| Client:   | Enovate Medical     | Job Number:          | PR095459      |
| Model:    | A0001707            | T-Log Number:        | TL095459-RA   |
| Contact:  | Cameron Boone       | Project Manager:     | Deepa Shetty  |
| Standard: | FCC 15.247, RSS-247 | Project Coordinator: | Deniz Demirci |
|           |                     | Class:               | N/A           |

### Run #3b: High Channel

Channel: 39 Mode: BLE Power Setting: Max  
Tx Chain: Main Data Rate: 1 Mbps

### Band Edge

| Frequency | Level        | Pol | 15.209 / 15.247 |        | Detector  | Azimuth | Height | Comments                     |
|-----------|--------------|-----|-----------------|--------|-----------|---------|--------|------------------------------|
| MHz       | dB $\mu$ V/m | v/h | Limit           | Margin | PK/QP/Avg | degrees | meters |                              |
| 2483.510  | 61.0         | H   | 74.0            | -13.0  | PK        | 188     | 2.0    | RB 1 MHz; VB: 3 MHz          |
| 2483.520  | 59.4         | V   | 74.0            | -14.6  | PK        | 61      | 1.9    | RB 1 MHz; VB: 3 MHz          |
| 2483.600  | 36.0         | H   | 54.0            | -18.0  | AVG       | 188     | 2.0    | Note 6; RB 1 MHz; VB: 500 Hz |
| 2483.550  | 35.2         | V   | 54.0            | -18.8  | AVG       | 61      | 1.9    | Note 6; RB 1 MHz; VB: 500 Hz |





## EMC Test Data

|           |                     |                      |               |
|-----------|---------------------|----------------------|---------------|
| Client:   | Enovate Medical     | Job Number:          | PR095459      |
| Model:    | A0001707            | T-Log Number:        | TL095459-RA   |
| Contact:  | Cameron Boone       | Project Manager:     | Deepa Shetty  |
| Standard: | FCC 15.247, RSS-247 | Project Coordinator: | Deniz Demirci |
|           |                     | Class:               | N/A           |

### RSS-247 and FCC 15.247 (DTS) Antenna Port Measurements Power, PSD, Bandwidth and Spurious Emissions

#### Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 5/28/2019  
Test Engineer: M. Birgani  
Test Location: Lab 4

Config. Used: 2  
Config Change: -  
EUT Voltage: Battery

#### General Test Configuration

The EUT was connected to the spectrum analyzer or power meter via a suitable attenuator. All measurements were made on a single chain.

All measurements have been corrected to allow for the external attenuators used.

#### Ambient Conditions:

Temperature: 22 °C  
Rel. Humidity: 39 %

#### Summary of Results

| Run # | Pwr setting | Avg Pwr | Test Performed               | Limit     | Pass / Fail | Result / Margin |
|-------|-------------|---------|------------------------------|-----------|-------------|-----------------|
| 1     | Max         | -       | Output Power                 | 15.247(b) | Pass        | 4.5 dBm         |
| 2     | Max         | -       | Power spectral Density (PSD) | 15.247(d) | Pass        | 3.4 dBm/30 kHz  |
| 3     | Max         | -       | Minimum 6 dB Bandwidth       | 15.247(a) | Pass        | 0.717 MHz       |
| 3     | Max         | -       | 99% Bandwidth                | RSS GEN   | -           | 1.069 MHz       |
| 4     | Max         | -       | Spurious emissions           | 15.247(b) | Pass        | margin >20 dBc  |

#### Modifications Made During Testing

No modifications were made to the EUT during testing

#### Deviations From The Standard

No deviations were made from the requirements of the standard.



## EMC Test Data

|           |                     |                      |               |
|-----------|---------------------|----------------------|---------------|
| Client:   | Enovate Medical     | Job Number:          | PR095459      |
| Model:    | A0001707            | T-Log Number:        | TL095459-RA   |
| Contact:  | Cameron Boone       | Project Manager:     | Deepa Shetty  |
| Standard: | FCC 15.247, RSS-247 | Project Coordinator: | Deniz Demirci |
|           |                     | Class:               | N/A           |

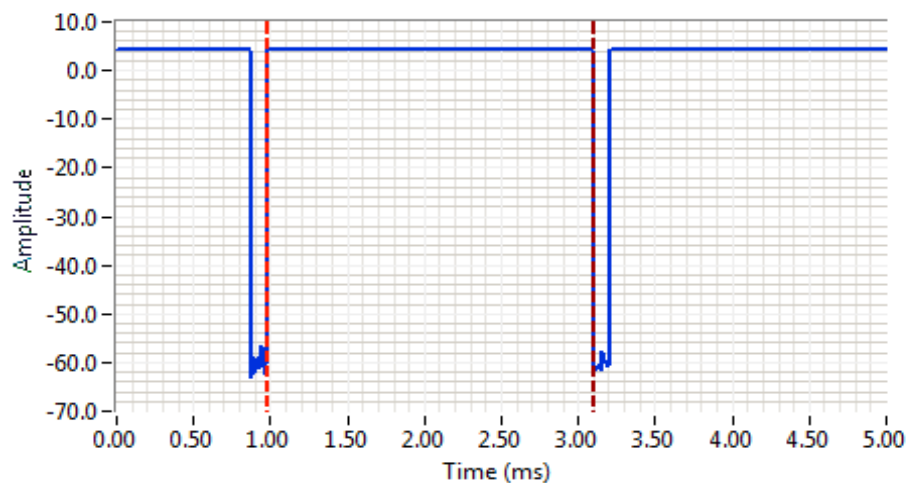
### Sample Notes

Sample S/N: B823730001  
Driver: Minicom  
Antenna: Integral

### Procedure Comments:

Measurements performed in accordance with FCC KDB 558074 and ANSI C63.10

| Mode | Data Rate | Duty Cycle (x) | Constant DC? | T (ms) | Pwr Cor Factor* | Lin Volt Cor Factor** | Min VBW for FS (Hz) |
|------|-----------|----------------|--------------|--------|-----------------|-----------------------|---------------------|
| BLE  | 1 Mb/s    | 95.3%          | Yes          | 2.12   | 0.2             | 0.4                   | 472                 |



#### Analyzer Settings

Agilent Technologies,  
E4446A  
CF: 2402.000 MHz  
SPAN: 0.000 MHz  
RB: 3.000 MHz  
VB: 3.000 MHz  
Detector: POS  
Attn: 20 DB  
RL Offset: 0.0 DB  
Sweep Time: 5.0ms

#### Comments

BLE 1Mbps  
Off time: 0.105 ms  
On time: 2.120 ms  
Duty cycle: 95.3%

|        |          |      |  |
|--------|----------|------|--|
| Cursor | 0.981675 | 20.0 |  |
| Cursor | 3.102094 | 20.0 |  |

Delta Time (ms) 2.120

Delta Amplitude 0.0





## EMC Test Data

|           |                     |                      |               |
|-----------|---------------------|----------------------|---------------|
| Client:   | Enovate Medical     | Job Number:          | PR095459      |
| Model:    | A0001707            | T-Log Number:        | TL095459-RA   |
| Contact:  | Cameron Boone       | Project Manager:     | Deepa Shetty  |
| Standard: | FCC 15.247, RSS-247 | Project Coordinator: | Deniz Demirci |
|           |                     | Class:               | N/A           |

### Run #1: Output Power

Mode: BLE

| Power Setting | Frequency (MHz) | Output Power |     | Antenna Gain (dBi) | Result | EIRP |        | Output Power |    |
|---------------|-----------------|--------------|-----|--------------------|--------|------|--------|--------------|----|
|               |                 | (dBm)        | mW  |                    |        | dBm  | W      | (dBm)        | mW |
| Max           | 2402            | 4.5          | 2.8 | -1.5               | Pass   | 3.0  | 0.0020 |              |    |
| Max           | 2440            | 4.4          | 2.7 | -1.5               | Pass   | 2.9  | 0.0019 |              |    |
| Max           | 2480            | 4.3          | 2.7 | -1.5               | Pass   | 2.8  | 0.0019 |              |    |

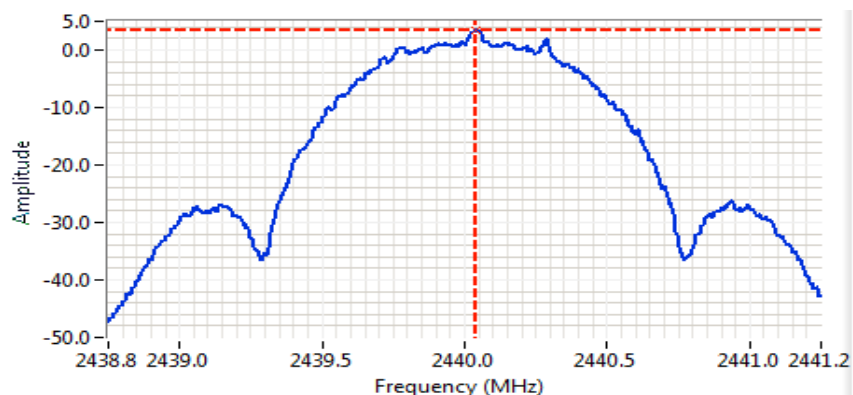
Note 1: Output power measured using a peak power meter, spurious limit is -20 dBc.

### Run #2: Power spectral Density

Mode: BLE

| Power Setting | Frequency (MHz) | PSD                                | Limit<br>dBm/3 kHz | Result |
|---------------|-----------------|------------------------------------|--------------------|--------|
|               |                 | (dBm/30 kHz) <small>Note 1</small> |                    |        |
| Max           | 2402            | 2.4                                | 8.0                | Pass   |
| Max           | 2440            | 3.4                                | 8.0                | Pass   |
| Max           | 2480            | 3.1                                | 8.0                | Pass   |

Note 1: Test performed per method PKSPD, in KDB 558074. Power spectral density measured using:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ ,  $\text{VBW}=3*\text{RBW}$ , peak detector, span =  $1.5*\text{DTS BW}$ , auto sweep time, max hold.



**Analyzer Settings**  
Agilent Technologies,  
E4446A  
CF: 2440.000 MHz  
SPAN: 2.500 MHz  
RB: 30.0 kHz  
VB: 100 kHz  
Detector: POS  
Attn: 20 DB  
RL Offset: 0.2 DB  
Sweep Time: 2.6ms  
Comments  
PSD: 3.4 dBm/30kHz

Cursor 2440.041667 3.4  
0.000000 0.0





## EMC Test Data

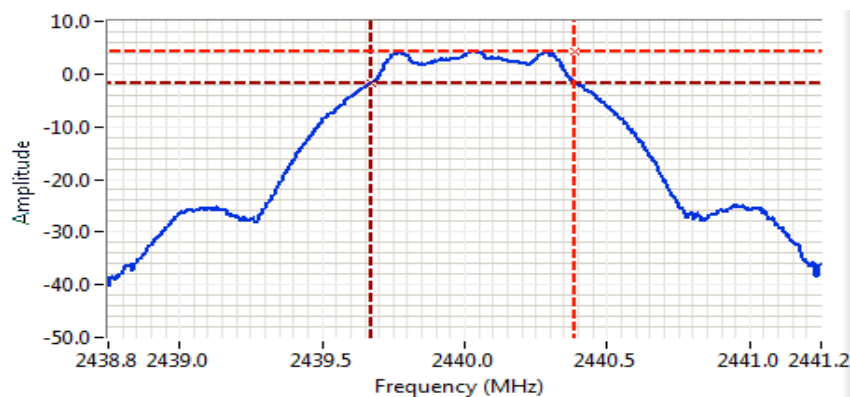
|           |                     |                      |               |
|-----------|---------------------|----------------------|---------------|
| Client:   | Enovate Medical     | Job Number:          | PR095459      |
| Model:    | A0001707            | T-Log Number:        | TL095459-RA   |
| Contact:  | Cameron Boone       | Project Manager:     | Deepa Shetty  |
| Standard: | FCC 15.247, RSS-247 | Project Coordinator: | Deniz Demirci |
|           |                     | Class:               | N/A           |

### Run #3: Signal Bandwidth

Mode: BLE

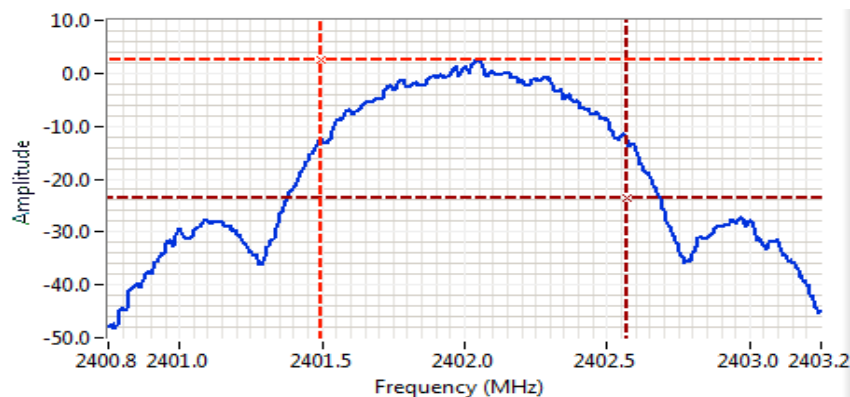
| Power Setting | Frequency (MHz) | Bandwidth (MHz) |       | RBW Setting (MHz) |      |
|---------------|-----------------|-----------------|-------|-------------------|------|
|               |                 | DTS             | 99%   | DTS               | 99%  |
| Max           | 2402            | 0.721           | 1.069 | 0.1               | 0.03 |
| Max           | 2440            | 0.717           | 1.052 | 0.1               | 0.03 |
| Max           | 2480            | 0.717           | 1.057 | 0.1               | 0.03 |

Note 1: DTS BW: RBW=100 kHz, VBW  $\geq 3 \times$  RBW, peak detector, max hold, auto sweep time, Span 2-5 times measured BW.  
99% BW: RBW=1-5% of 99%BW, VBW  $\geq 3 \times$  RBW, peak detector, max hold, auto sweep time. Span 1.5-5 times OBW.



#### Analyzer Settings

Agilent Technologies,  
E4446A  
CF: 2440.000 MHz  
SPAN: 2.500 MHz  
RB: 100 kHz  
VB: 300 kHz  
Detector: POS  
Attn: 20 DB  
RL Offset: 0.0 DB  
Sweep Time: 1.0ms  
Comments  
DTS BW: 717 kHz



#### Analyzer Settings

Agilent Technologies,  
E4446A  
CF: 2402.000 MHz  
SPAN: 2.500 MHz  
RB: 30.0 kHz  
VB: 100 kHz  
Detector: POS  
Attn: 20 DB  
RL Offset: 0.0 DB  
Sweep Time: 2.6ms  
Comments  
99% BW: 1.069 MHz





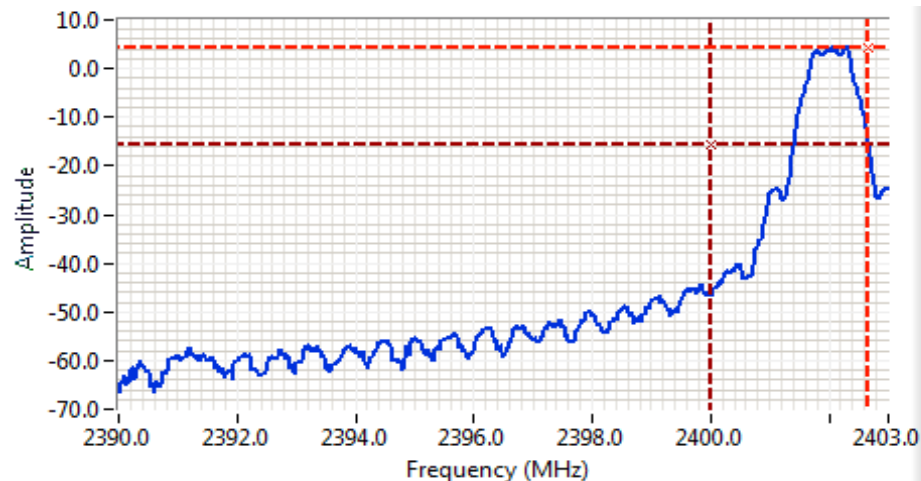
## EMC Test Data

|           |                     |                      |               |
|-----------|---------------------|----------------------|---------------|
| Client:   | Enovate Medical     | Job Number:          | PR095459      |
| Model:    | A0001707            | T-Log Number:        | TL095459-RA   |
| Contact:  | Cameron Boone       | Project Manager:     | Deepa Shetty  |
| Standard: | FCC 15.247, RSS-247 | Project Coordinator: | Deniz Demirci |
|           |                     | Class:               | N/A           |

### Run #4: Out of Band Spurious Emissions

| Frequency (MHz) | Power Setting | Mode | Limit   | Result |
|-----------------|---------------|------|---------|--------|
| 2402            | Max           | BLE  | -20 dBc | Pass   |

Additional plot showing compliance with -20 dBc limit from 2390 MHz to 2400 MHz. Radiated measurements used to show compliance with the limits in the restricted band below 2390 MHz.



#### Analyzer Settings

Agilent Technologies,  
E4446A

CF: 2396.500 MHz

SPAN: 13.000 MHz

RB: 100 kHz

VB: 300 kHz

Detector: POS

Attn: 20 DB

RL Offset: 0.0 DB

Sweep Time: 1.3ms

Comments

20dBc at 2400MHz

|        |             |       |                 |       |
|--------|-------------|-------|-----------------|-------|
| Cursor | 2402.653333 | 4.4   | Delta Freq.     | 2.653 |
| Cursor | 2400.000000 | -15.6 | Delta Amplitude | 20.0  |



***End of Report***

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