



# Electromagnetic Compatibility Test Report

Tests Performed on an AJ1E Superior Solutions, LLC

Salt Sensor Transmitter, Model SS1RF

Radiometrics Document RP-9485A



*Product Detail:*

FCC ID: 2AUWRSS-0001  
IC: 25652-SS0001  
Equipment type: 433.9 MHz Momentarily Operated Transmitter

*Test Standards:*

US CFR Title 47, Chapter I, FCC Part 15 Subpart C  
FCC Part 15 CFR Title 47: 2021  
Canada ISSED; RSS-210, Issue 10: 2019 as required for Category I Equipment  
IC RSS-GEN Issue 5: 2018

This report concerns: Original Grant for Certification  
FCC Part 15.231(e); RSS-210 Annex A

*Tests Performed For:*

**AJ1E Superior Solutions, LLC**  
4284 Carneros Way  
Jackson, WI 53037

*Test Facility:*

**Radiometrics Midwest Corporation**  
12 Devonwood Avenue  
Romeoville, IL 60446-1349  
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*Test Date(s):*

September 1 to October 5, 2021

Document RP-9485A Revisions:

| Rev. | Issue Date      | Revised By |
|------|-----------------|------------|
| 0    | October 6, 2021 |            |
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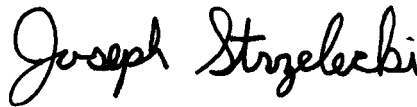
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## 1.0 ADMINISTRATIVE DATA

|                                                                                                                                                                                                                                                                                     |                                                                                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| <i>Equipment Under Test:</i><br>A AJ1E Superior Solutions, LLC, Salt Sensor Transmitter<br>Model: SS1RF Serial Number: SMP05<br>This will be referred to as the EUT in this Report                                                                                                  |                                                                                                              |
| <i>Date EUT Received at Radiometrics:</i><br>August 4, 2021                                                                                                                                                                                                                         | <i>Test Date(s):</i><br>September 1 to October 5, 2021                                                       |
| <i>Test Report Written and Authorized By:</i><br>Joseph Strzelecki<br>Senior EMC Engineer                                                                                                                                                                                           | <i>Test Witnessed By:</i><br>The tests were not witnessed by personnel from<br>AJ1E Superior Solutions, LLC. |
| <i>Radiometrics' Personnel Responsible for Test:</i><br><br><br>10/06/2021<br>Date<br><br>Joseph Strzelecki<br>Senior EMC Engineer<br>NARTE EMC-000877-NE<br><br>Chris D'Alessio<br>EMC Technician | <i>EUT Checked By:</i><br><br>Joseph Strzelecki<br>Chris D'Alessio<br>Radiometrics                           |

## 2.0 TEST SUMMARY AND RESULTS

The EUT (Equipment Under Test) is a Salt Sensor Transmitter, Model SS1RF, manufactured by AJ1E Superior Solutions, LLC. The detailed test results are presented in a separate section. The following is a summary of the test results.

### Emissions Tests Results

| Environmental Phenomena | Frequency Range   | Basic Standard           | Test Result |
|-------------------------|-------------------|--------------------------|-------------|
| RF Radiated Emissions   | 30-5000 MHz       | RSS-210 &<br>FCC Part 15 | Pass        |
| Occupied Bandwidth Test | Fundamental Freq. | RSS-210 &<br>FCC Part 15 | Pass        |

#### IEC 17025 Decision Rule:

The declaration of pass or fail is based on the specifications listed above. The declaration of pass or fail did not consider measurement uncertainty.

## 2.1 RF Exposure Compliance Requirements

Since the power output is less than 10 mW, the EUT meets the FCC requirement for RF exposure and it is exempt from RSS-102 SAR and RF exposure evaluations. There are no power level adjustments available to the end user. The antenna is permanently attached. The detailed calculations for RF Exposure are presented in a separate document.



### 3.0 EQUIPMENT UNDER TEST (EUT) DETAILS

#### 3.1 EUT Description

The EUT is a Salt Sensor Transmitter, Model SS1RF, manufactured by AJ1E Superior Solutions, LLC. The EUT was in good working condition during the tests, with no known defects.

##### 3.1.1 FCC Section 15.203 & RSS-GEN Antenna Requirements

The antenna is permanently attached to the printed circuit board. The antenna is internal to the EUT and it is not readily available to be modified by the end user. Therefore, it meets the 15.203 Requirements.

### 4.0 TESTED SYSTEM DETAILS

#### 4.1 Tested System Configuration

The system was configured for testing in a typical fashion. The EUT was placed on an 80-cm or 150 cm high, nonconductive test stand. The testing was performed in conditions as close as possible to installed conditions. The EUT has no external cabling.

Since the EUT is wall mounted, it was placed in an upright configuration during the tests. The EUT was tested as a stand-alone device. Power was supplied with new batteries.

**Tested System Configuration List**

| Item | Description             | Type* | Manufacturer                 | Model Number | Serial Number |
|------|-------------------------|-------|------------------------------|--------------|---------------|
| 1    | Salt Sensor Transmitter | E     | AJ1E Superior Solutions, LLC | SS1RF        | SMP05         |

\* Type: E = EUT, P = Peripheral, S = Support Equipment; H = Host Computer

| Specification                                                     | Specific Product information                                                                       |
|-------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| Type of modulation including the bit rate and symbol rate         | On/Off Keying (OOK)<br>Bit rate is 370bps (800uS/1600uS bit widths)<br>Total of 73 bits per packet |
| Name and version of the test software used to exercise the device | None; It was set to transmit continuously.                                                         |
| Power settings used for the purpose of exercising the device      | Standard setting; Not programable                                                                  |
| Firmware number of the transmitter                                | SS-0063V2_0.3                                                                                      |

#### 4.2 EUT Operating Modes

The transmit mode was continuous. The EUT was in its normal modulation during the tests. It was tested as a stand-alone battery powered device, since that is the configuration in the final installation.

#### 4.3 Special Accessories

No special accessories were used during the tests in order to achieve compliance.



## 4.4 Equipment Modifications

No modifications were made to the EUT at Radiometrics' test facility in order to comply with the standards listed in this report.

## 5.0 TEST SPECIFICATIONS

| Document               | Date | Title                                                                                                                 |
|------------------------|------|-----------------------------------------------------------------------------------------------------------------------|
| FCC<br>CFR Title 47    | 2021 | Code of Federal Regulations Title 47, Chapter 1, Federal Communications Commission, Part 15 - Radio Frequency Devices |
| IC RSS-210<br>Issue 10 | 2019 | Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands) Category I Equipment                        |
| IC RSS-Gen<br>Issue 5  | 2019 | General Requirements and Information for the Certification of Radiocommunication Equipment (RSS-Gen)                  |

## 6.0 TEST PROCEDURE DOCUMENTS

The tests were performed using the procedures from the following specifications:

| Document            | Date | Title                                                                                                                                |
|---------------------|------|--------------------------------------------------------------------------------------------------------------------------------------|
| ANSI<br>C63.4-2014  | 2014 | Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz |
| ANSI<br>C63.10-2013 | 2013 | American National Standard for Testing Unlicensed Wireless Devices                                                                   |

## 7.0 RADIOMETRICS' TEST FACILITIES

The results of these tests were obtained at Radiometrics Midwest Corp. in Romeoville, Illinois, USA. Radiometrics is accredited by A2LA (American Association for Laboratory Accreditation) to conform to ISO/IEC 17025: 2017 "General Requirements for the Competence of Calibration and Testing Laboratories". Radiometrics' Lab Code is 121191 and Certification Number is 1495.01. Radiometrics' scope of accreditation includes all of the test methods listed herein. A copy of the accreditation can be accessed on our web site ([www.radiomet.com](http://www.radiomet.com)). Radiometrics accreditation status can be verified at A2LA's web site ([www.a2la2.org](http://www.a2la2.org)).

The following is a list of shielded enclosures located in Romeoville, Illinois used during the tests:

Chamber E: Is a custom-made anechoic chamber that measures 52' L X 30' W X 18' H. The walls and ceiling are fully lined with RF absorber. Pro-shield of Collinsville, Oklahoma manufactured the chamber. The floor has a 9' x 9' section of microwave absorber for testing above 1 GHz.

A separate ten-foot long, brass plated, steel ground rod attached via a 6-inch copper braid grounds each of the above chambers. Each enclosure is also equipped with low-pass power line filters.

The FCC has accepted these sites as test site number US1065. The FCC test site Registration Number is 732175. Details of the site characteristics are on file with the Industry Canada as site number IC 3124A with a CAB ID of US0224.

A complete list of the test equipment is provided herein. The calibration due dates are indicated on the equipment list. The equipment is calibrated in accordance to ANSI/NCSL Z540-1 with traceability to the National Institute of Standards and Technology (NIST).



## 8.0 DEVIATIONS AND EXCLUSIONS FROM THE TEST SPECIFICATIONS

There were no deviations or exclusions from the test specifications.

## 9.0 CERTIFICATION

Radiometrics Midwest Corporation certifies that the data contained herein was taken under conditions that meet or exceed the requirements of the test specification and the data contained herein was taken with calibrated test equipment. The results relate only to the EUT listed herein.

## 10.0 TEST EQUIPMENT TABLE

| RMC ID   | Manufacturer  | Description       | Model No. | Serial No. | Frequency Range | Cal Period | Cal Date |
|----------|---------------|-------------------|-----------|------------|-----------------|------------|----------|
| AMP-05   | RMC/Celeritek | Pre-amplifier     | MW110G    | 1001       | 1.0-12GHz       | 12 Mo.     | 01/04/21 |
| ANT-66   | ETS-Lindgren  | Horn Antenna      | 3115      | 62580      | 1.0-18GHz       | 24 Mo.     | 03/11/21 |
| ANT-68   | EMCO          | Log-Periodic Ant. | 93146     | 9604-4456  | 200-1000MHz     | 24 Mo.     | 01/02/20 |
| ANT-80   | AH Systems    | Bicon Antenna     | SAS-540   | 294        | 20-330MHz       | 24 Mo.     | 01/05/21 |
| CAB-106A | Teledyne      | Coaxial Cable     | N/A       | 106A       | DC-2 GHz        | 24 Mo.     | 01/29/20 |
| CAB-1221 | Storm         | Coaxial Cable     | N/A       | 1221       | DC-18 GHz       | 24 Mo.     | 02/06/20 |
| CAB-160B | Teledyne      | Coaxial Cable     | N/A       | 160B       | DC-18 GHz       | 24 Mo.     | 02/05/20 |
| REC-21   | Agilent       | Spectrum Analyzer | E7405A    | MY45118341 | 9Hz-26.5 GHz    | 24 Mo.     | 01/14/20 |
| THM-03   | Fluke         | Temp/Humid Meter  | 971       | 95850465   | N/A             | 12 Mo.     | 05/25/21 |

Note: All calibrated equipment is subject to periodic checks.

The RMC ID is referenced in the Setup Diagrams.

| Software Company | Test Software Name | Version  | Applicable Tests                               |
|------------------|--------------------|----------|------------------------------------------------|
| Radiometrics     | RREC11D            | 07.16.19 | RF Radiated Emissions (FCC Part 15 & EN 55032) |
| Agilent          | PSA/ESA-E/L/EMC    | 2.4.0.42 | Bandwidth and screen shots                     |

## 11.0 SPECIFICATION LIMITS

Field strength limits for momentarily operated devices FCC 15.231(e) & Table A2 of RSS-210

| Fundamental frequency (MHz) | Field strength of fundamental (microvolts/meter) | Field strength of spurious emission (microvolts/meter) |
|-----------------------------|--------------------------------------------------|--------------------------------------------------------|
| 40.66-40.70                 | 1,000                                            | 100                                                    |
| 70-130                      | 500                                              | 50                                                     |
| 130-174                     | 500 to 1,500*                                    | 50 to 150*                                             |
| 174-260                     | 1,500                                            | 150                                                    |
| 260-470                     | 1,500 to 5,000*                                  | 150 to 500*                                            |
| Above 470                   | 5,000                                            | 500                                                    |

\* Linear interpolations.

The emission limits shown in the above table are based on measurements using an average.

**General Radiated Emissions Field Strength Limits**

| Frequency Range (MHz) | Test Distance (meters) | Class B Limits |          |
|-----------------------|------------------------|----------------|----------|
|                       |                        | uV/m           | dB(uV/m) |
| 30 - 88               | 3                      | 100            | 40.0     |
| 88 - 216              | 3                      | 150            | 43.5     |
| 216 - 960             | 3                      | 200            | 46.0     |
| Above 960             | 3                      | 500            | 54.0     |

The emission limits shown in the above table are based on measurements using a CISPR quasi-peak detector except above 1000 MHz. Radiated emission limits above 1 GHz are based on measurements employing an average detector.

For all emissions using an average detector, the peak limits are 20 dB above the average limits.

## 12.0 TEST SECTIONS

### 12.1 Radiated RF Emissions

Radiated emission measurements were performed with linearly polarized broadband antennas. The results obtained with these antennas can be correlated with results obtained with a tuned dipole antenna. The radiated emission measurements were performed with a spectrum analyzer. The bandwidth used from 150 kHz to 30 MHz is 9 kHz and the bandwidth from 30 MHz to 1000 MHz is 120 kHz. Above 1 GHz, a 1 MHz bandwidth is used. A 10 dB linearity check is performed prior to start of testing in order to determine if an overload condition exists. Figure 4 herein lists the details of the test equipment used during radiated emissions tests.

Final radiated emissions measurements were performed inside of an anechoic chamber at a test distance of 3 meters. The anechoic chamber is designated as Chamber E. This Chamber meets the Site Attenuation requirements of ANSI C63.4 and CISPR 16-1. Chamber E is located at 12 East Devonwood Ave. Romeoville, Illinois EMI test lab.

The entire frequency range from 30 to 5000 MHz was slowly scanned. Measurements were performed using two antenna polarizations, (vertical and horizontal). The worst case emissions were recorded. All measurements may be performed using either the peak, average or quasi-peak detector functions. If the peak detector data exceeds or is marginally close to the limits, the measurements are repeated using a quasi-peak detector or average function as required by the specification for final determination of compliance. The QP and average detectors have a linear response.

The detected emission levels were maximized by rotating the EUT, and by scanning the measurement antenna from 1 to 4 meters above the ground.

#### 12.1.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and by subtracting the Amplifier Gain from the measured reading. The basic equation is as follows:

$$FS = RA + AF + CF - AG$$

Where: FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Attenuation Factor

AG = Amplifier Gain

**12.1.2 Radiated Emissions Test Results**

|               |                                                                            |
|---------------|----------------------------------------------------------------------------|
| Test Date     | 9/01/2021 to 09/03/2021                                                    |
| Test Distance | 3 Meters                                                                   |
| Specification | FCC Part 15 Subpart C & RSS-210 Section A                                  |
| Abbreviations | Pol = Antenna Polarization; V = Vertical; H = Horizontal; P = peak; Q = QP |
| Antennas      | ANT-80 from 30-250 MHz; ANT-68 from 250-1000 MHz; ANT-66 Above 1 GHz       |
| Configuration | The EUT is in the transmit mode                                            |

This table includes all emissions **except** Fundamental and Harmonics emissions.

| Freq.<br>MHz | Meter<br>Reading<br>dBuV | Dect. | Ant.<br>Pol. | Ant<br>Factor<br>dB/m | Cbl/amp<br>Factors | Dist<br>Fact<br>dB | EUT<br>dBuV/m | Limit<br>dBuV/m | Margin<br>Under<br>Limit dB | Note |
|--------------|--------------------------|-------|--------------|-----------------------|--------------------|--------------------|---------------|-----------------|-----------------------------|------|
| 33.9         | 11.0                     | P     | H            | 12.7                  | 0.6                | 0.0                | 24.3          | 40.0            | 15.7                        |      |
| 57.1         | 8.2                      | P     | H            | 9.3                   | 0.8                | 0.0                | 18.3          | 40.0            | 21.7                        |      |
| 86.4         | 8.1                      | P     | H            | 9.6                   | 1.0                | 0.0                | 18.7          | 40.0            | 21.3                        |      |
| 86.4         | 8.4                      | P     | H            | 9.6                   | 1.0                | 0.0                | 19.0          | 40.0            | 21.0                        |      |
| 111.8        | 8.6                      | P     | H            | 11.1                  | 1.1                | 0.0                | 20.8          | 43.5            | 22.7                        |      |
| 131.7        | 8.7                      | P     | H            | 12.2                  | 1.2                | 0.0                | 22.1          | 43.5            | 21.4                        |      |
| 153.2        | 9.3                      | P     | H            | 12.8                  | 1.3                | 0.0                | 23.4          | 43.5            | 20.1                        |      |
| 175.3        | 8.9                      | P     | H            | 13.4                  | 1.4                | 0.0                | 23.7          | 43.5            | 19.8                        |      |
| 195.2        | 9.4                      | P     | H            | 14.2                  | 1.5                | 0.0                | 25.1          | 43.5            | 18.4                        |      |
| 228.3        | 9.2                      | P     | H            | 15.0                  | 1.6                | 0.0                | 25.8          | 46.0            | 20.2                        |      |
| 282.3        | 9.1                      | P     | H            | 13.1                  | 1.8                | 0.0                | 24.0          | 46.0            | 22.0                        |      |
| 322.6        | 8.7                      | P     | H            | 14.0                  | 2.0                | 0.0                | 24.7          | 46.0            | 21.3                        |      |
| 357.9        | 9.1                      | P     | H            | 14.3                  | 2.1                | 0.0                | 25.5          | 46.0            | 20.5                        |      |
| 388.7        | 9.5                      | P     | H            | 15.1                  | 2.2                | 0.0                | 26.8          | 46.0            | 19.2                        |      |
| 412.0        | 9.8                      | P     | H            | 15.5                  | 2.2                | 0.0                | 27.5          | 46.0            | 18.5                        |      |
| 457.4        | 10.5                     | P     | H            | 16.7                  | 2.4                | 0.0                | 29.6          | 46.0            | 16.4                        |      |
| 491.4        | 11.5                     | P     | H            | 17.4                  | 2.5                | 0.0                | 31.4          | 46.0            | 14.6                        |      |
| 541.3        | 8.5                      | P     | H            | 17.9                  | 2.6                | 0.0                | 29.0          | 46.0            | 17.0                        |      |
| 618.8        | 9.5                      | P     | H            | 18.9                  | 2.8                | 0.0                | 31.2          | 46.0            | 14.8                        |      |
| 695.0        | 9.2                      | P     | H            | 20.8                  | 2.9                | 0.0                | 32.9          | 46.0            | 13.1                        |      |
| 761.3        | 9.0                      | P     | H            | 21.1                  | 3.0                | 0.0                | 33.1          | 46.0            | 12.9                        |      |
| 838.8        | 8.9                      | P     | H            | 22.0                  | 3.2                | 0.0                | 34.1          | 46.0            | 11.9                        |      |
| 943.8        | 8.8                      | P     | H            | 23.2                  | 3.4                | 0.0                | 35.4          | 46.0            | 10.6                        |      |
| 48.8         | 7.7                      | P     | V            | 9.8                   | 0.7                | 0.0                | 18.2          | 40.0            | 21.8                        |      |
| 67.6         | 7.8                      | P     | V            | 9.2                   | 0.9                | 0.0                | 17.9          | 40.0            | 22.1                        |      |
| 83.0         | 7.2                      | P     | V            | 9.5                   | 1.0                | 0.0                | 17.7          | 40.0            | 22.3                        |      |
| 107.3        | 7.6                      | P     | V            | 10.8                  | 1.1                | 0.0                | 19.5          | 43.5            | 24.0                        |      |
| 131.7        | 8.1                      | P     | V            | 12.2                  | 1.2                | 0.0                | 21.5          | 43.5            | 22.0                        |      |
| 157.1        | 8.5                      | P     | V            | 12.9                  | 1.4                | 0.0                | 22.8          | 43.5            | 20.7                        |      |
| 177.0        | 8.9                      | P     | V            | 13.5                  | 1.4                | 0.0                | 23.8          | 43.5            | 19.7                        |      |
| 196.9        | 8.6                      | P     | V            | 14.3                  | 1.5                | 0.0                | 24.4          | 43.5            | 19.1                        |      |
| 219.5        | 8.9                      | P     | V            | 14.9                  | 1.6                | 0.0                | 25.4          | 46.0            | 20.6                        |      |
| 240.5        | 9.2                      | P     | V            | 15.2                  | 1.7                | 0.0                | 26.1          | 46.0            | 19.9                        |      |
| 279.1        | 8.6                      | P     | V            | 13.0                  | 1.8                | 0.0                | 23.4          | 46.0            | 22.6                        |      |
| 310.0        | 9.0                      | P     | V            | 15.1                  | 1.9                | 0.0                | 26.0          | 46.0            | 20.0                        |      |
| 341.5        | 9.3                      | P     | V            | 14.3                  | 2.0                | 0.0                | 25.6          | 46.0            | 20.4                        |      |
| 376.8        | 10.1                     | P     | V            | 14.6                  | 2.1                | 0.0                | 26.8          | 46.0            | 19.2                        |      |
| 400.1        | 10.5                     | P     | V            | 15.4                  | 2.2                | 0.0                | 28.1          | 46.0            | 17.9                        |      |
| 456.8        | 11.8                     | P     | V            | 16.7                  | 2.3                | 0.0                | 30.8          | 46.0            | 15.2                        |      |
| 483.2        | 11.4                     | P     | V            | 17.2                  | 2.4                | 0.0                | 31.0          | 46.0            | 15.0                        |      |
| 524.1        | 8.1                      | P     | V            | 17.9                  | 2.5                | 0.0                | 28.5          | 46.0            | 17.5                        |      |
| 560.6        | 8.2                      | P     | V            | 18.3                  | 2.6                | 0.0                | 29.1          | 46.0            | 16.9                        |      |

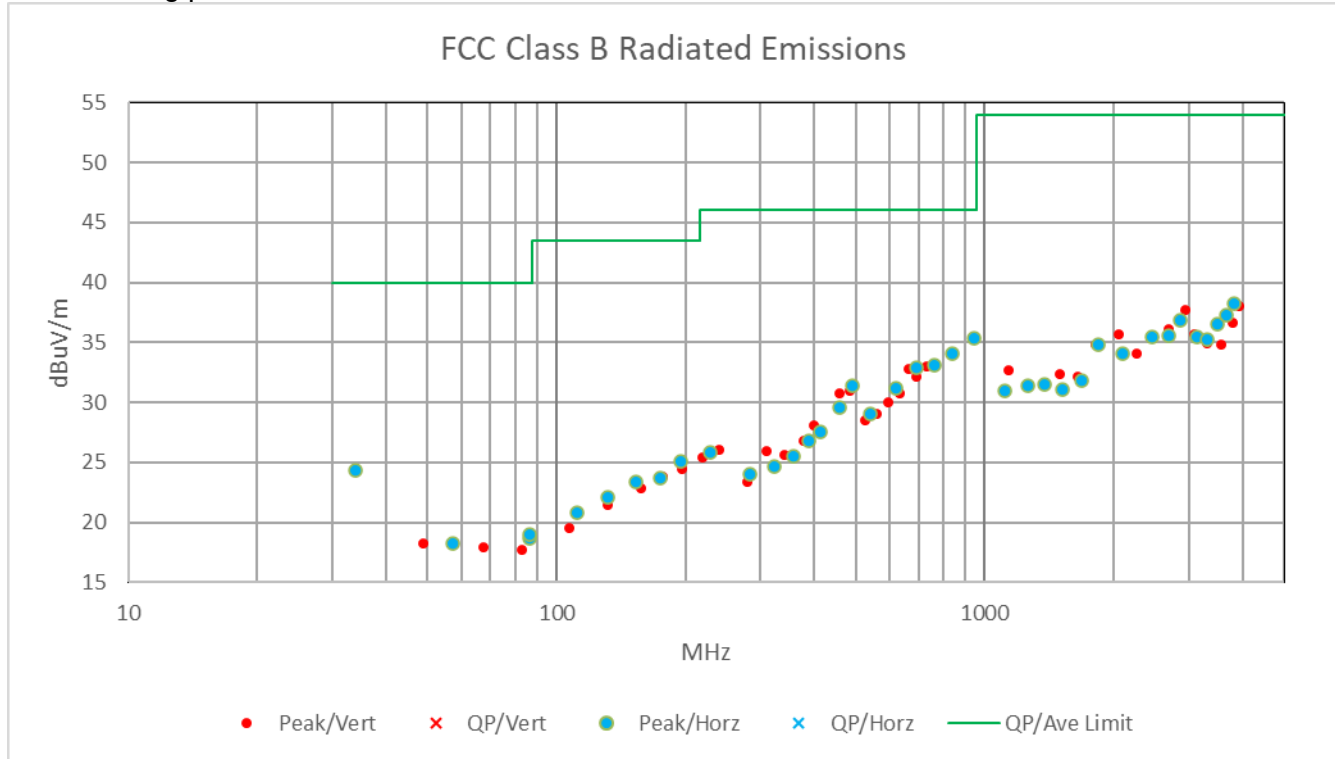


| Freq.<br>MHz | Meter<br>Reading<br>dBuV | Dect. | Ant.<br>Pol. | Ant<br>Factor<br>dB/m | Cbl/amp<br>Factors | Dist<br>Fact<br>dB | EUT<br>dBuV/m | Limit<br>dBuV/m | Margin<br>Under<br>Limit dB | Note |
|--------------|--------------------------|-------|--------------|-----------------------|--------------------|--------------------|---------------|-----------------|-----------------------------|------|
| 593.4        | 8.6                      | P     | V            | 18.7                  | 2.7                | 0.0                | 30.0          | 46.0            | 16.0                        |      |
| 631.8        | 8.7                      | P     | V            | 19.3                  | 2.8                | 0.0                | 30.8          | 46.0            | 15.2                        |      |
| 664.6        | 9.4                      | P     | V            | 20.5                  | 2.9                | 0.0                | 32.8          | 46.0            | 13.2                        |      |
| 694.2        | 8.5                      | P     | V            | 20.8                  | 2.9                | 0.0                | 32.2          | 46.0            | 13.8                        |      |
| 731.3        | 9.1                      | P     | V            | 20.9                  | 3.0                | 0.0                | 33.0          | 46.0            | 13.0                        |      |
| 1115.0       | 40.4                     | P     | H            | 24.6                  | -34.0              | 0.0                | 31.0          | 74.0            | 43.0                        | 1    |
| 1257.5       | 40.3                     | P     | H            | 25.2                  | -34.1              | 0.0                | 31.4          | 74.0            | 42.6                        | 1    |
| 1380.0       | 40.2                     | P     | H            | 25.4                  | -34.1              | 0.0                | 31.5          | 74.0            | 42.5                        | 1    |
| 1517.5       | 40.2                     | P     | H            | 25.0                  | -34.1              | 0.0                | 31.1          | 74.0            | 42.9                        | 1    |
| 1687.5       | 40.2                     | P     | H            | 25.7                  | -34.1              | 0.0                | 31.8          | 74.0            | 42.2                        | 1    |
| 1842.5       | 41.6                     | P     | H            | 27.1                  | -33.9              | 0.0                | 34.8          | 74.0            | 39.2                        | 1    |
| 2097.5       | 40.3                     | P     | H            | 27.6                  | -33.8              | 0.0                | 34.1          | 74.0            | 39.9                        | 1    |
| 2457.5       | 40.7                     | P     | H            | 28.3                  | -33.5              | 0.0                | 35.5          | 74.0            | 38.5                        | 1    |
| 2685.0       | 40.2                     | P     | H            | 28.8                  | -33.4              | 0.0                | 35.6          | 74.0            | 38.4                        | 1    |
| 2867.5       | 40.6                     | P     | H            | 29.1                  | -32.9              | 0.0                | 36.8          | 74.0            | 37.2                        | 1    |
| 3125.0       | 37.4                     | P     | H            | 30.8                  | -32.7              | 0.0                | 35.5          | 74.0            | 38.5                        | 1    |
| 3297.5       | 36.6                     | P     | H            | 31.1                  | -32.4              | 0.0                | 35.3          | 74.0            | 38.7                        | 1    |
| 3492.5       | 37.7                     | P     | H            | 31.1                  | -32.3              | 0.0                | 36.5          | 74.0            | 37.5                        | 1    |
| 3670.0       | 37.7                     | P     | H            | 31.9                  | -32.3              | 0.0                | 37.3          | 74.0            | 36.7                        | 1    |
| 3810.0       | 37.6                     | P     | H            | 32.8                  | -32.2              | 0.0                | 38.2          | 74.0            | 35.8                        | 1    |
| 1140.0       | 42.2                     | P     | V            | 24.6                  | -34.1              | 0.0                | 32.7          | 74.0            | 41.3                        | 1    |
| 1497.5       | 41.6                     | P     | V            | 24.9                  | -34.1              | 0.0                | 32.4          | 74.0            | 41.6                        | 1    |
| 1645.0       | 41.1                     | P     | V            | 25.3                  | -34.2              | 0.0                | 32.2          | 74.0            | 41.8                        | 1    |
| 1812.5       | 41.9                     | P     | V            | 26.8                  | -33.9              | 0.0                | 34.8          | 74.0            | 39.2                        | 1    |
| 2060.0       | 42.0                     | P     | V            | 27.6                  | -33.9              | 0.0                | 35.7          | 74.0            | 38.3                        | 1    |
| 2267.5       | 40.3                     | P     | V            | 27.5                  | -33.7              | 0.0                | 34.1          | 74.0            | 39.9                        | 1    |
| 2457.5       | 40.6                     | P     | V            | 28.3                  | -33.5              | 0.0                | 35.4          | 74.0            | 38.6                        | 1    |
| 2690.0       | 40.7                     | P     | V            | 28.8                  | -33.4              | 0.0                | 36.1          | 74.0            | 37.9                        | 1    |
| 2932.5       | 41.0                     | P     | V            | 29.6                  | -32.9              | 0.0                | 37.7          | 74.0            | 36.3                        | 1    |
| 3095.0       | 37.8                     | P     | V            | 30.7                  | -32.8              | 0.0                | 35.7          | 74.0            | 38.3                        | 1    |
| 3307.5       | 36.2                     | P     | V            | 31.1                  | -32.4              | 0.0                | 34.9          | 74.0            | 39.1                        | 1    |
| 3572.5       | 35.9                     | P     | V            | 31.3                  | -32.4              | 0.0                | 34.8          | 74.0            | 39.2                        | 1    |
| 3782.5       | 36.1                     | P     | V            | 32.7                  | -32.2              | 0.0                | 36.6          | 74.0            | 37.4                        | 1    |
| 3932.5       | 36.9                     | P     | V            | 32.9                  | -31.8              | 0.0                | 38.0          | 74.0            | 36.0                        | 1    |

Judgment: Passed by 10.6 dB



The following plot is the same data as the table above





## Fundamental, and harmonics emissions

|                                             |       |                            |      |                   |      | EUT   |          |         |      |        |      |              |
|---------------------------------------------|-------|----------------------------|------|-------------------|------|-------|----------|---------|------|--------|------|--------------|
| harm                                        | Tx    | Spectrum Analyzer Readings |      |                   |      | Corr. | Emission | Tot. FS |      | Limit  |      | Margin Under |
| #                                           | Freq  | Vertical Pol               |      | Horz Polarization |      | Fact. | Freq MHz | dBuV/m  |      | dBuV/m |      | Limit        |
|                                             |       | Peak                       | Ave  | Peak              | Ave  | dB    | MHz      | Peak    | Ave  | Peak   | Ave  | dB           |
| 1                                           | 433.9 | 52.9                       | 46.2 | 43.1              | 37.1 | 18.3  | 433.9    | 71.2    | 64.5 | 92.9   | 72.9 | 8.4          |
| 2                                           | 433.9 | 22.8                       | 13.3 | 20.9              | 11.4 | 25.9  | 867.8    | 48.7    | 39.2 | 72.9   | 52.9 | 13.7         |
| 3                                           | 433.9 | 52.6                       | 44.6 | 47.0              | 39.0 | -9.0  | 1301.8   | 43.6    | 35.6 | 74.0   | 54.0 | 18.4         |
| 4                                           | 433.9 | 45.1                       | 39.1 | 42.0              | 36.0 | -7.3  | 1735.7   | 37.8    | 31.8 | 74.0   | 54.0 | 22.2         |
| 5                                           | 433.9 | 62.8                       | 57.5 | 56.1              | 50.8 | -6.1  | 2169.6   | 56.7    | 51.4 | 74.0   | 54.0 | 2.6          |
| 6                                           | 433.9 | 48.4                       | 42.4 | 45.7              | 39.7 | -4.5  | 2603.5   | 43.9    | 37.9 | 74.0   | 54.0 | 16.1         |
| 7                                           | 433.9 | 46.9                       | 40.9 | 44.1              | 38.1 | -1.6  | 3037.4   | 45.3    | 39.3 | 74.0   | 54.0 | 14.7         |
| 8                                           | 433.9 | 39.0                       | 33.0 | 41.8              | 35.8 | -1.2  | 3471.4   | 40.6    | 34.6 | 74.0   | 54.0 | 19.4         |
| 9                                           | 433.9 | 53.0                       | 47.5 | 49.0              | 43.5 | 1.0   | 3905.3   | 54.0    | 48.5 | 74.0   | 54.0 | 5.5          |
| 10                                          | 433.9 | 38.9                       | 32.9 | 38.0              | 32.0 | 2.5   | 4339.2   | 41.4    | 35.4 | 74.0   | 54.0 | 18.6         |
| Column numbers (see below for explanations) |       |                            |      |                   |      |       |          |         |      |        |      |              |
| 1                                           | 2     | 3                          | 4    | 5                 | 6    | 7     | 8        | 9       | 10   | 11     | 12   | 13           |

Column #1. harm = Harmonic

Column #2. Frequency of Transmitter.

Column #3. Uncorrected readings from the spectrum analyzer with First Axis Rotation.

Column #4. Average Reading based on peak reading reduced by the Duty cycle correction

Column #5. Uncorrected readings from the spectrum analyzer with First Axis Rotation.

Column #6. Average Reading based on peak reading reduced by the Duty cycle correction

Column #7. Corr. Factors = Cable Loss – Preamp Gain + Antenna Factor

Column #8. Frequency of Tested Emission

Column #9. Highest peak field strength at listed frequency.

Column #10. Highest Average field strength at listed frequency.

Column #11. Peak Limit.

Column #12. Average Limit.

Column #13. The margin (last column) is the worst case margin under the peak or average limits for that row.

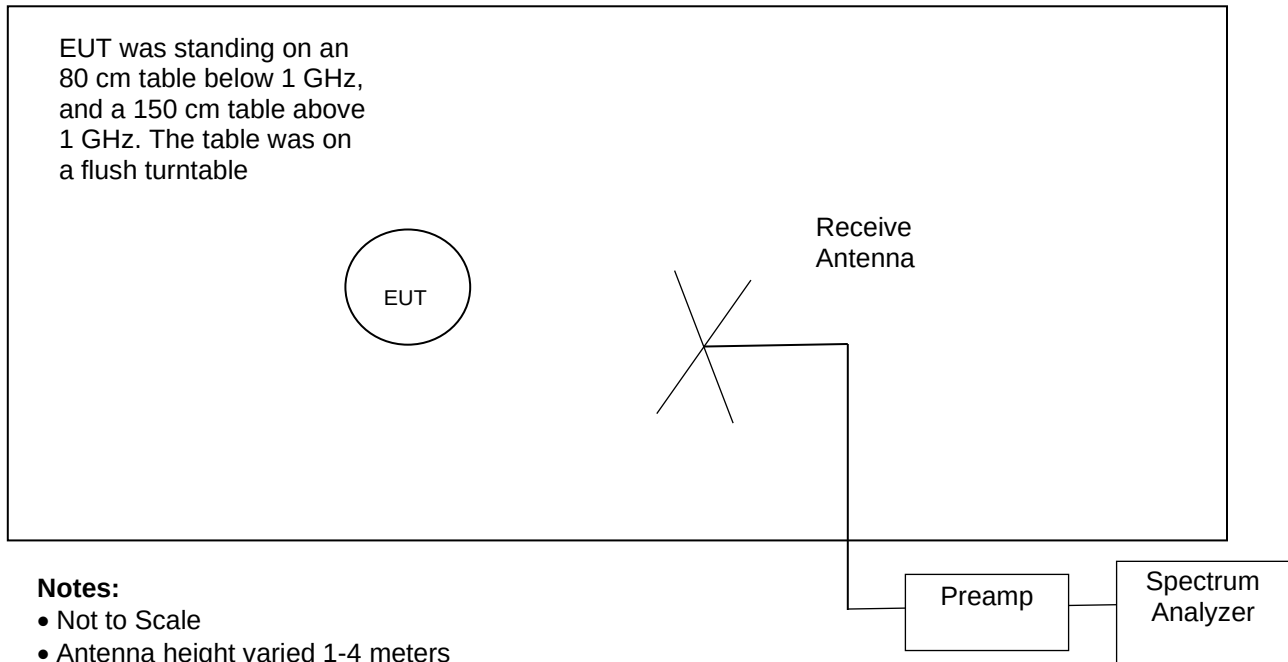
Judgment: Passed by 2.6 dB

No other Emissions were detected from 30 to 5,000 MHz within 10 dB of the limits.



Figure 1. Drawings of Radiated Emissions Setup

Chamber E, anechoic

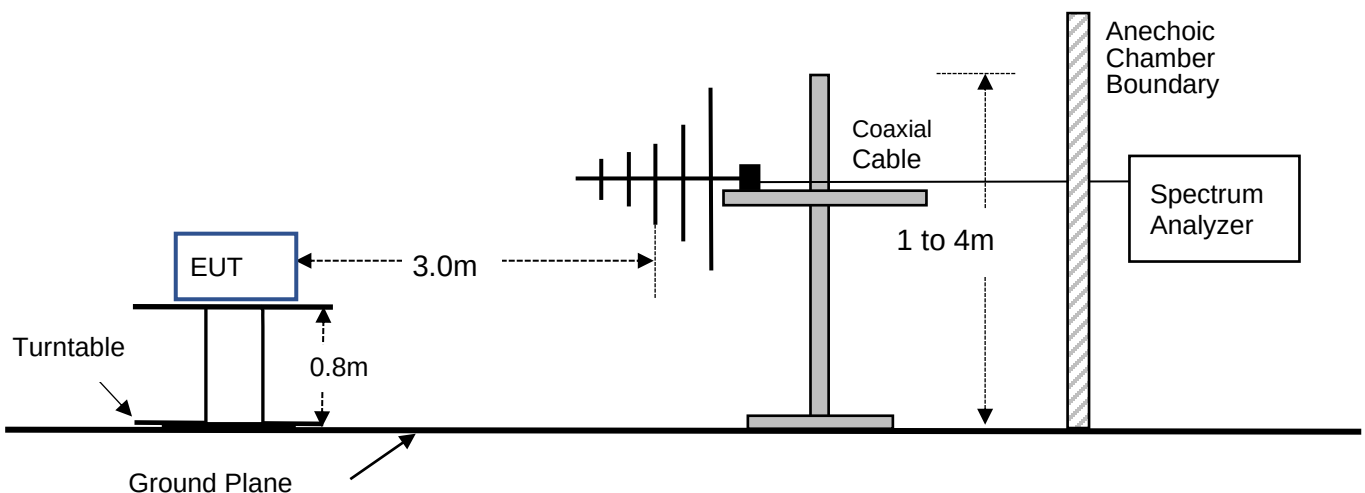


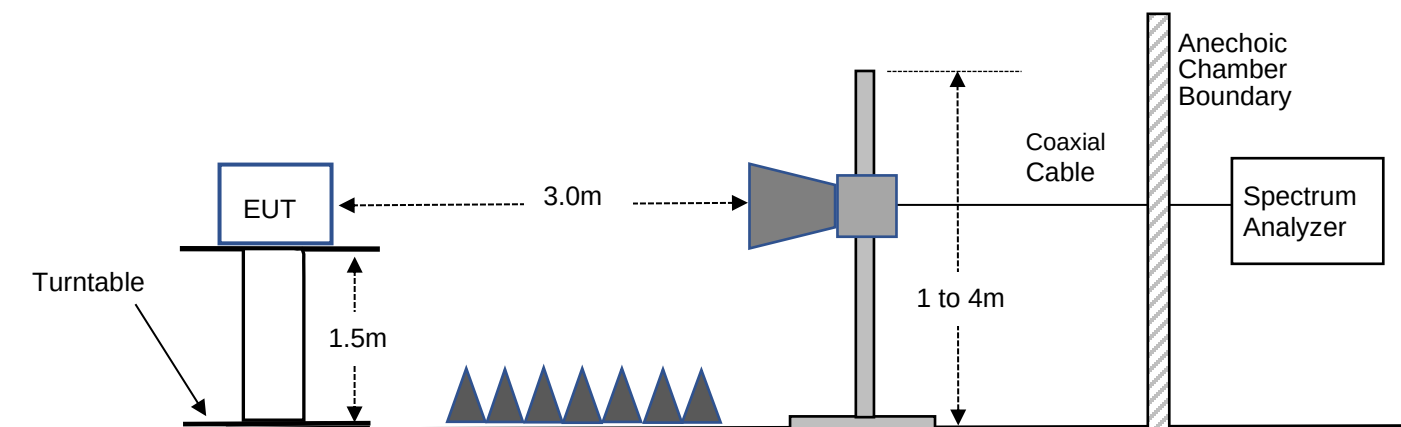
**Notes:**

- Not to Scale
- Antenna height varied 1-4 meters
- Distance from antenna to tested system is 3 meters
- AC cords not shown. They are connected to AC outlet with low-pass filter on turntable

| Frequency Range | Receive Antenna | Pre-Amplifier | Spectrum Analyzer |
|-----------------|-----------------|---------------|-------------------|
| 30 to 200 MHz   | ANT-80          | Internal      | REC-21            |
| 200 to 1000 MHz | ANT-68          | Internal      | REC-21            |
| 1 to 5 GHz      | ANT-66          | AMP-05        | REC-21            |

Radiated Emissions Test Setup for Frequencies from 30MHz to 1000MHz (Side View)



**Radiated Emissions Test Setup for Frequencies over 1000MHz (Side View)****12.2 Occupied Bandwidth Data**

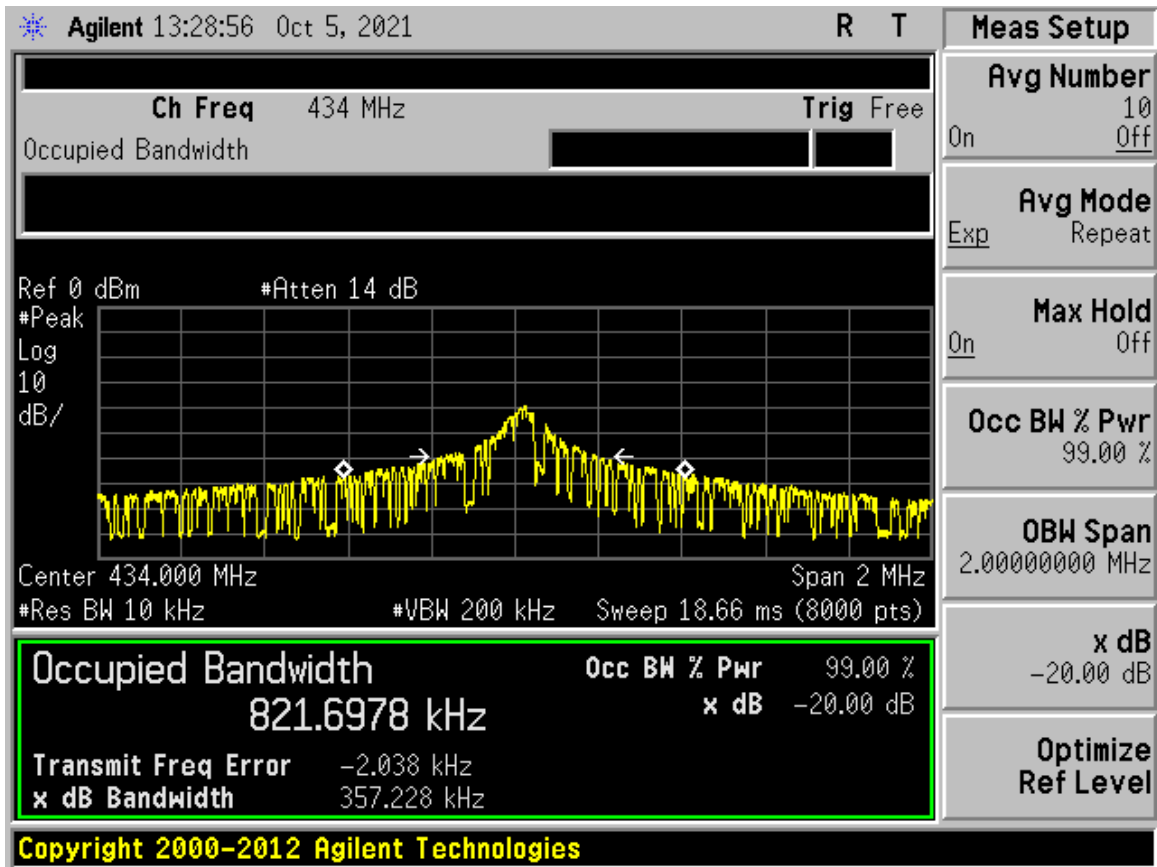
The occupied bandwidth of the RF output was measured using a spectrum analyzer. The bandwidth was measured using the peak detector function. The spectrum analyzer was set to a MAX HOLD mode to record the worst case of the modulation. The marker-to-peak function was set to the peak of the emission. Then the marker-delta function was used to measure 20 dB down one side of the emission. The marker-delta function was reset and then moved to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the bandwidth of the emission. The Analyzer also measured 99% occupied bandwidth.

The OBW must be less than 0.25% of the fundamental Frequency.

| 20 dB OBW<br>kHz | 99% EBW<br>kHz | Max allowed<br>kHz |
|------------------|----------------|--------------------|
| 357.2            | 821.7          | 1084.8             |



Figure 2. Occupied Bandwidth Plot





### 12.2.1 Measurement Instrumentation Uncertainty

| Measurement                                            | Uncertainty |
|--------------------------------------------------------|-------------|
| Radiated Emissions, E-field, 3 meters, 30 to 200 MHz   | 4.7 dB      |
| Radiated Emissions, E-field, 3 meters, 200 to 1000 MHz | 6.2 dB      |
| Radiated Emissions, E-field, 3 meters, 1 to 6 GHz      | 5.0 dB      |
| Bandwidth using marker delta method at a span of 2 MHz | 5 kHz       |
| Temperature THM-02                                     | 0.6 Deg C   |

The uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k=2 in accordance with CISPR 16-4-2.

### 13.0 REVISION HISTORY

| Document RP-9485A Revisions: |                   |             |           |
|------------------------------|-------------------|-------------|-----------|
| Rev.                         | Affected Sections | Description | Rationale |
|                              |                   |             |           |
|                              |                   |             |           |
|                              |                   |             |           |
|                              |                   |             |           |