# Test Report to EN 300 328 V2.1.1

**Wideband transmission systems;**
**Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques;**
**Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU**

## Report Number: AT72141218-2R1

Manufacturer: Johnson Outdoors, Inc

Model(s): Helix 7x CHIRP MSI GPS G3N

Test Begin Date: August 28, 2018
Test End Date: September 5, 2018

Report Issue Date: December 4, 2018

FOR THE SCOPE OF ACCREDITATION UNDER Certificate Number: 2955.09

This report must not be used by the client to claim product certification, approval, or endorsement by A2LA, NIST, or any agency Federal Government.


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**This report contains 16 pages**

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## 1.0 GENERAL

### 1.1 Purpose
The purpose of this report is to demonstrate compliance with EN300 328.

### 1.2 Manufacturer Information

Manufacturer Information:
Johnson Outdoors, Inc.
678 Humminbird Lane
Eufaula, AL 36027

### 1.3 Product Description

Product Name: HELIX 7X CHIRP MSI GPS G3N

The Humminbird Helix 7X CHIRP MSI GPS G3N (411080-1M) is a fish finder/GPS product with side imaging sonar capability. It is comprised of a keypad, 7" LCD display, two SD card slots, internal GPS, Bluetooth capability, Ethernet capability, transducer and power cable. All G3N CHIRP model variations are built exactly the same. The non G3N variations do not have Bluetooth. They all differ by installed options, SELV circuits, and languages. The only difference in the -1 (12) and -1M (12X) models are languages included in the model.

HELIX 7 CHIRP GPS G3
HELIX 7X CHIRP GPS G3
HELIX 7 CHIRP MDI GPS G3
HELIX 7X CHIRP MDI GPS G3
HELIX 7 CHIRP MSI GPS G3
HELIX 7X CHIRP MSI GPS G3
HELIX 7 CHIRP GPS G3N
HELIX 7X CHIRP GPS G3N
HELIX 7 CHIRP MDI GPS G3N
HELIX 7X CHIRP MDI GPS G3N
HELIX 7 CHIRP MSI GPS G3N
HELIX 7X CHIRP MSI GPS G3N (Tested Variant)
ICE HELIX 7 CHIRP GPS G2N

Serial numbers: 180731223006

Technical Information:

| Detail | Description |
|---|---|
| Transmit Frequency / Alignment Range | 2402 MHz – 2480 MHz |
| Receiver Frequency / Alignment Range | 2402 MHz – 2480 MHz |
| Modulation Format | GFSK, π/4-DQPSK, 8-DPSK |
| Rated RF Output Power | 10dBm (Radiated) |
| Channel Spacing | 2 MHz |
| Operating Voltage | 1.8 VDC |
| Adaptive | Yes |
| Antenna Type / Gain: | Surface Mount Ceramic Chip / 0.9 dBi |
| Type of equipment: | Fixed |
| Software release: | 1.730 |

Test Sample Condition: The test samples were provided in good working order with no visible defects.

### 1.4 Test Methodology and Considerations

No deviation from the test method was applied. The data presented in this report represents the worst case where applicable. All other essential requirements are documented in a separate test report.

For Radiated Emissions, the EUT was programmed to generate a continuously modulated signal. The EUT was evaluated in an orientation typical of normal installation. See test setup photos for more information.

Software Power Setting: +10 dBm

### 1.5 Modifications of EUT

No modification of the EUT where required for compliance.

### 1.6 References

- ETSI EN 300 328 V2.1.1: Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques; Harmonised Standard covering the essential requirements of article 2.3 of Directive 2014/53/EU.

## 2.0 TEST FACILITIES

### 2.1 Location

The radiated and conducted emissions test sites are located at the following addresses:

TÜV SÜD America, Inc.
5945 Cabot Pkwy, Suite 100
Alpharetta, GA 30005
Phone: (678) 341-5900

### 2.2 Laboratory Accreditations/Recognitions/Certifications

TÜV SÜD America, Inc. is accredited to ISO/IEC 17025 by the American Association for Laboratory Accreditation/A2LA accreditation program and has been issued certificate number 2955.09 in recognition of this accreditation.

Unless otherwise specified, all tests methods described within this report are covered under the ISO/IEC 17025 scopes of accreditation.

The Semi-Anechoic Chamber Test Sites, Open Area Test Sites (OATS) and Conducted Emissions Sites have been fully described, submitted to, and accepted by the FCC, ISED Canada and the Japanese Voluntary Control Council for Interference by information technology equipment.

| | |
|---|---|
| FCC Registration Number: | 967699 |
| ISED Canada Lab Code: | 23932 |
| VCCI Member Number: | 1831 |
| • VCCI Registration Number | A-0295 |

## 2.3 Radiated Emissions Test Site Description

### 2.3.1 Semi Anechoic Chamber Test Site

The Semi-Anechoic Chamber Test Site consists of a 20'W x 30'L x 20'H shielded enclosure. The chamber is lined with ETS-Lindgren Ferrite Absorber, model number FT-1500. The ferrite tile 600 mm x 600 mm (2.62 in x 23.62 in) panels and are mounted directly on the inner walls of the chamber shield.

The specular regions of the chamber are lined with additional ETS-Lindgren PS-600 hybrid absorber to extend its frequency range up to 18GHz and beyond.

The turntable is a 2m ETS-Lindgren Model 2170 and installed off the center axis is located 5'6" from the back wall of the chamber. The chamber is grounded via 1 - 8' copper ground rod, installed at the center of the back wall, it is bound to the shield using #8 solid copper wire.

The antenna mast is an EMCO 1060 and is remotely controlled from the control room for both antenna height and polarization.

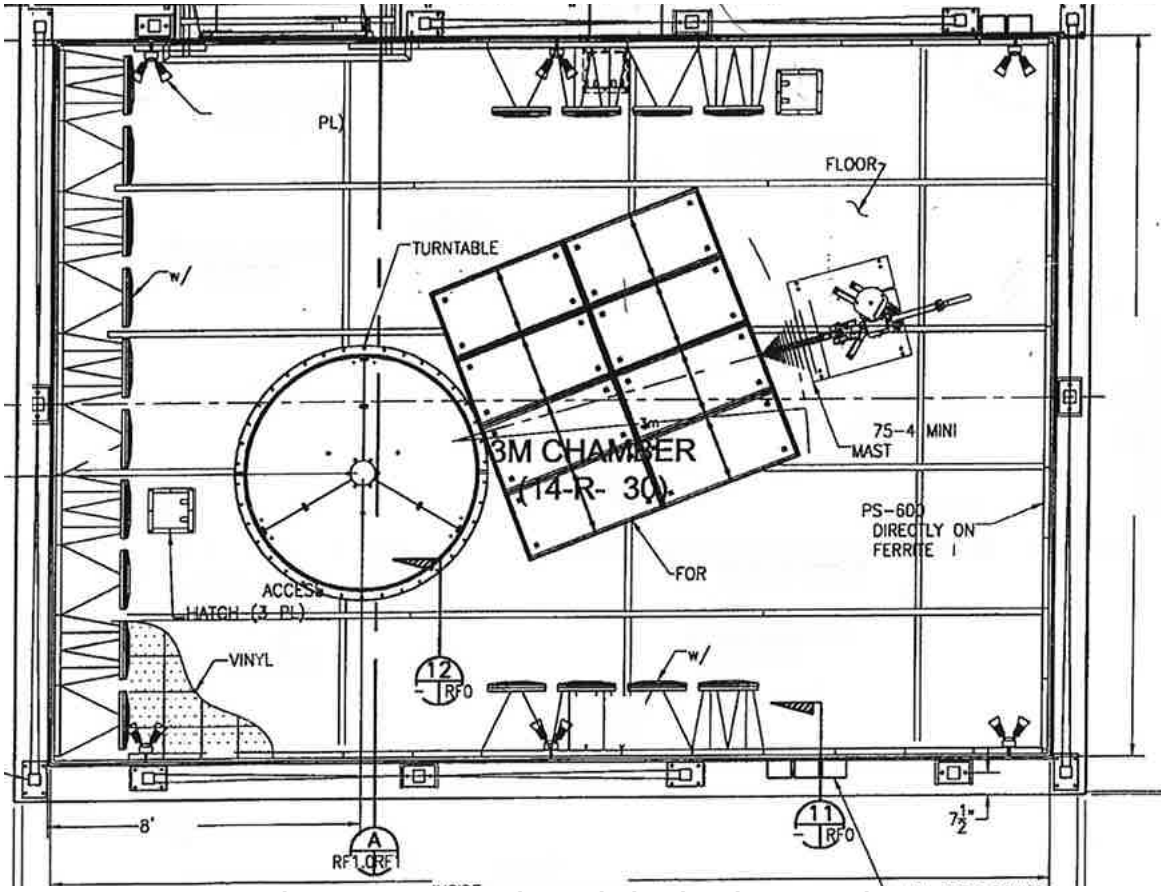


**Figure 2.3.1-1: Semi-Anechoic Chamber Test Site**

## 3.0 EQUIPMENT UNDER TEST SYSTEM BLOCK DIAGRAM

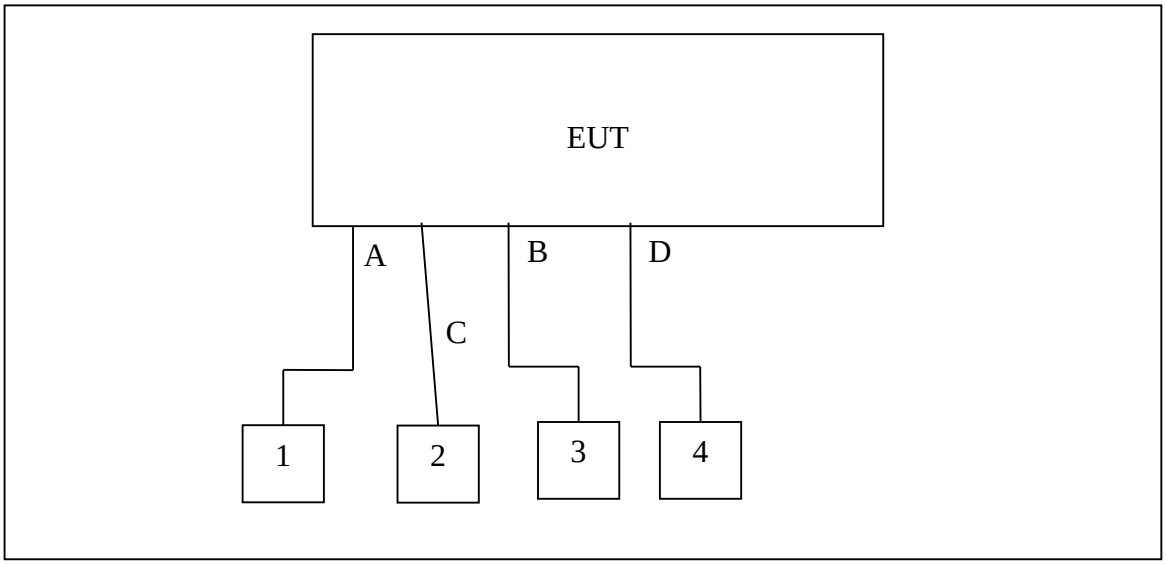


**Figure 3-1: EUT System Block Diagram**

**Table 3-1: Support Equipment**

| Item # | Type Device | Manufacturer | Model/Part # | Serial # |
|---|---|---|---|---|
| 1 | External GPS Receiver | Johnson Outdoors | AS GPS HS | 14121642-0035 |
| 2 | Marine Battery | AUTOCRAFT | 29HM | N/A |
| 3 | Transducer | Johnson Outdoors | N/A | N/A |
| 4 | Remote Unit | Johnson Outdoors | Helix 7 CHIRP SI GPS G2N | 180424220007 |

**Table 3-2: Cable Description**

| Cable # | Cable Type | Length | Shield | Termination |
|---|---|---|---|---|
| A | GPS Cable | 600 cm | No | EUT – External GPS Receiver |
| B | Transducer Cable | 600 cm | No | EUT – Transducer |
| C | DC Power Cable | 190 cm | No | EUT – Marine Battery |
| D | Ethernet Cable | 500 cm | No | EUT – Remote Unit |

## 4.0 TEST SETUP BLOCK DIAGRAM(S)

**RECEIVER SPURIOUS EMISSIONS MEASUREMENTS**

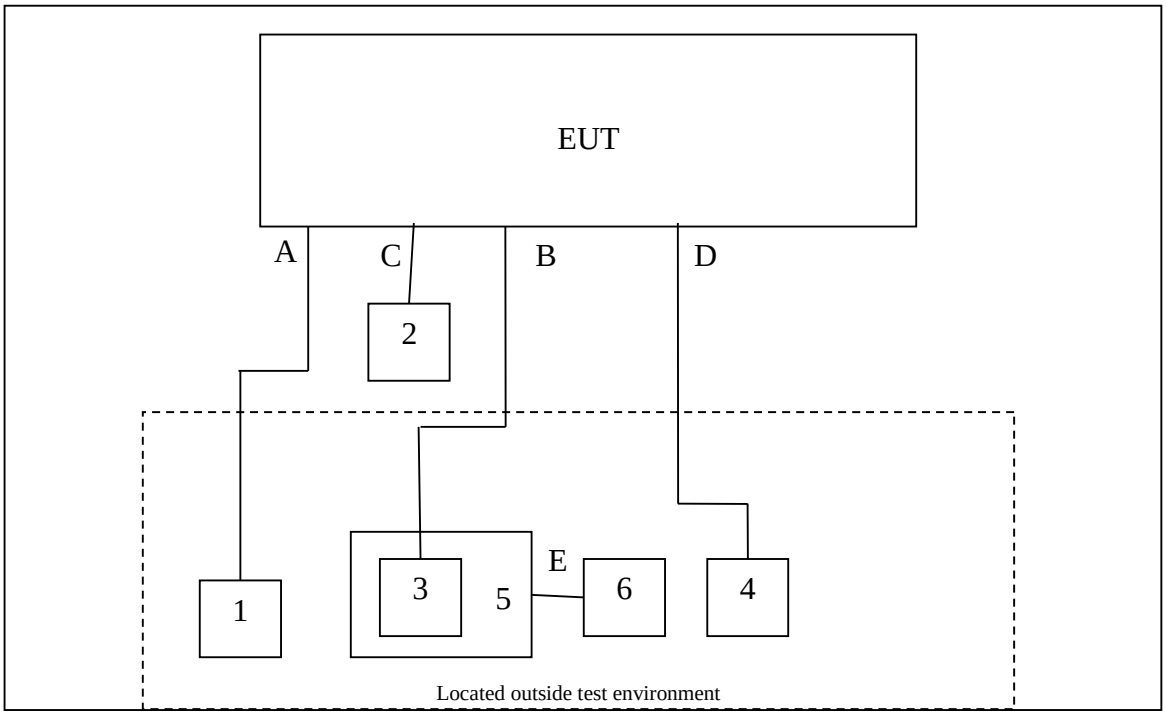


**Figure 4-1: Test Setup Block**

**Table 4-1: Support Equipment Description**

| Item # | Type Device | Manufacturer | Model/Part # | Serial # |
|---|---|---|---|---|
| 1 | External GPS Receiver | Johnson Outdoors | AS GPS HS | 12071842-0039 |
| 2 | Marine Battery | AUTOCRAFT | 29HM | N/A |
| 3 | Transducer | Johnson Outdoors | N/A | N/A |
| 4 | Remote Unit | Johnson Outdoors | Helix 7 CHIRP SI GPS G2N | 160621040008 |
| 5 | Depth Simulator Transducer | Johnson Outdoors | N/A | N/A |
| 6 | Depth Simulator | Johnson Outdoors | N/A | N/A |

**Table 4-2: Support Equipment Cable Description**

| Cable # | Cable Type | Length | Shield | Termination |
|---|---|---|---|---|
| A | GPS Cable | 600 cm | No | EUT – External GPS Receiver |
| B | Transducer Cable | 600 cm | No | EUT – Transducer |
| C | DC Power Cable | 190 cm | No | EUT – Marine Battery |
| D | Ethernet Cable | 500 cm | No | EUT – Remote Unit |
| E | BNC Cable | 85 cm | Yes | Depth Simulator Transducer – Depth Simulator |

## 5.0 CONCLUSIONS, OBSERVATIONS AND COMMENTS

The test report will be filed at TÜV SÜD America, Inc. for a period of 10 years following the issue of this report. It may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval from TÜV SÜD America, Inc.

The results of the tests as stated in this report are exclusively applicable to the EUT as identified in this report. TÜV SÜD America, Inc. cannot be held liable for properties of the EUT that have not been observed during these tests.

TÜV SÜD America, Inc. assumes the sample to comply with the requirements of EN 300 328 for the respective test sector, if the test results turn out positive.

Comments: The provider was responsible for ensuring the test samples provided were representative of final production units.

## 6.0 MEASUREMENT UNCERTAINTY

In accordance with ETSI TR 100 028, measurement uncertainties associated with each test have been estimated and expressed in Table 6-1 below:

**Table 6-1: Measurement Uncertainties**

| Parameter | $U_{std}$ | $U_{lab}$ |
|---|---|---|
| Occupied Channel Bandwidth | ±5 % | ± 0.009 % |
| RF Output Power, Conducted | ±1.5 dB | ± 0.349 dB |
| Power Spectral Density, Conducted | ±3 dB | ± 0.372 dB |
| Unwanted Emissions, Conducted | ±3 dB | ± 1.264 dB |
| All Emissions, Radiated | ±6 dB | ± 5.814 dB |
| Temperature | ±1 °C | ± 0.860 °C |
| Humidity | ±5 % | ± 0.740 % |
| DC and Low Frequency Voltages | ±3 % | ± 0.566 % |
| Time (slower than 10us) | ±5 % | ± 5.000 % |
| Duty Cycle | ±5 % | ± 5.000 % |

The expressed measurement uncertainties shown in the above table have been calculated using a coverage factor of k=2 resulting in a confidence level of 95%.

## 7.0 TEST RESULTS SUMMARY

Table 7-1 summarizes the results for the tested EUT corresponding with the essential requirements defined in EN 300 328. Table 7-2 summarizes the frequencies evaluated for each essential requirement.

**Table 7-1: Test results summary**

| **Harmonized Standard EN 300 328**<br>The following requirements and test specifications are relevant to the presumption of conformity under the article 3.2 of the RE Directive | | | | | |
|---|---|---|---|---|---|
| **Test Parameter** | **Test plan (Yes/No)** | **Test Result** | **Test Specification Reference: Clause No** | **Test Report Page No.** | **Comment** |
| RF output power | N | -- | 5.4.2 | -- | (1) |
| Duty Cycle | N | -- | 5.4.2 | -- | (1) |
| Tx-sequence | N | -- | 5.4.2 | -- | (1) |
| Tx-gap | N | -- | 5.4.2 | -- | (1) |
| Medium Utilisation (MU) factor | N | -- | 5.4.2 | -- | (1) |
| Power Spectral Density | N | -- | 5.4.3 | -- | (1) |
| Accumulated Transmit Time | N | -- | 5.4.4 | -- | (1) |
| Minimum Frequency Occupation | N | -- | 5.4.4 | -- | (1) |
| Hopping Sequence | N | -- | 5.4.4 | -- | (1) |
| Hopping Frequency Separation | N | -- | 5.4.5 | -- | (1) |
| Adaptivity | N | -- | 5.4.6 | -- | (1) |
| Occupied Channel Bandwidth | N | -- | 5.4.7 | -- | (1) |
| Transmitter unwanted emissions in the out-of-band domain | N | -- | 5.4.8 | -- | (1) |
| Transmitter unwanted emissions in the spurious domain | Y | PASS | 5.4.9 | 12 | |
| Receiver spurious emissions | N | -- | 5.4.10 | -- | (1) |
| Receiver Blocking | N | -- | 5.4.11 | -- | (1) |

(1) This test was not under the scope of evaluation. Testing was limited to the radiated spurious emissions on the host device integrating a previously evaluated Bluetooth module.

**Table 7-2: Test Frequencies / Results**

| Test | Frequency (MHz) | Nominal Power (dBm) | Nominal Bandwidth (MHz) | Result |
|---|---|---|---|---|
| Tx Spurious Emission | 2402.000 | 10.0 | 1.000000 | PASS |
| Tx Spurious Emission | 2480.000 | 10.0 | 1.000000 | PASS |

## 8.0 TEST RESULTS

## 8.1 Test Results Details

### 8.1.1 Transmitter unwanted emissions in the spurious domain

| Test Conditions | | Test Specification Reference: Clause No | Test Equip. Used with Equip Number | Method |
|---|---|---|---|---|
| Normal | | 5.4.9 | 30, 90, 213, 338, 432, 731, 819, 836 | Radiated |
| Tnom | +23 °C | | | |

## Helix 7X CHIRP MSI GPS G3N – Bluetooth Low Energy

| DUT Frequency (MHz) | Frequency (MHz) | level (dBm) | Limit (dBm) | Margin (dB) | Antenna Polarity (H/V) | Result |
|---|---|---|---|---|---|---|
| 2402.0000 | 2398.0000 | -78.52 | -30.00 | 48.52 | H | PASS |
| 2402.0000 | 2398.0000 | -68.62 | -30.00 | 38.62 | V | PASS |
| 2402.0000 | 4804.0000 | -46.01 | -30.00 | 16.01 | H | PASS |
| 2402.0000 | 4804.0000 | -56.21 | -30.00 | 26.21 | V | PASS |
| 2480.0000 | 2485.5000 | -70.60 | -30.00 | 40.60 | H | PASS |
| 2480.0000 | 2485.5000 | -67.10 | -30.00 | 37.10 | V | PASS |
| 2480.0000 | 4960.0000 | -46.40 | -30.00 | 16.40 | H | PASS |
| 2480.0000 | 4960.0000 | -54.10 | -30.00 | 24.10 | V | PASS |

*NOTE: Some of the emissions detected are results of emanations from the digital device or peripheral circuitry and components. Those emissions determined to be directly related to the digital device or peripheral circuitry and components are not included.

## Helix 7X CHIRP MSI GPS G3N – Bluetooth GFSK

| DUT Frequency (MHz) | Frequency (MHz) | level (dBm) | Limit (dBm) | Margin (dB) | Antenna Polarity (H/V) | Result |
|---|---|---|---|---|---|---|
| 2402.0000 | 2398.0000 | -64.52 | -30.00 | 34.52 | H | PASS |
| 2402.0000 | 2398.0000 | -59.02 | -30.00 | 29.02 | V | PASS |
| 2402.0000 | 4804.0000 | -46.11 | -30.00 | 16.11 | H | PASS |
| 2402.0000 | 4804.0000 | -56.21 | -30.00 | 26.21 | V | PASS |
| 2480.0000 | 2485.5000 | -69.19 | -30.00 | 39.19 | H | PASS |
| 2480.0000 | 2485.5000 | -74.40 | -30.00 | 44.40 | V | PASS |
| 2480.0000 | 4960.0000 | -46.60 | -30.00 | 16.60 | H | PASS |
| 2480.0000 | 4960.0000 | -52.00 | -30.00 | 22.00 | V | PASS |
| 2480.0000 | 7440.0000 | -51.53 | -30.00 | 21.53 | H | PASS |
| 2480.0000 | 7440.0000 | -56.93 | -30.00 | 26.93 | V | PASS |
| 2480.0000 | 9920.0000 | -52.39 | -30.00 | 22.39 | H | PASS |
| 2480.0000 | 9920.0000 | -59.99 | -30.00 | 29.99 | V | PASS |

*NOTE: Some of the emissions detected are results of emanations from the digital device or peripheral circuitry and components. Those emissions determined to be directly related to the digital device or peripheral circuitry and components are not included.

## Helix 7X CHIRP MSI GPS G3N – Bluetooth 8-DPSK

| DUT Frequency (MHz) | Frequency (MHz) | level (dBm) | Limit (dBm) | Margin (dB) | Antenna Polarity (H/V) | Result |
|---|---|---|---|---|---|---|
| 2402.0000 | 2398.0000 | -64.42 | -30.00 | 34.42 | H | PASS |
| 2402.0000 | 2398.0000 | -59.02 | -30.00 | 29.02 | V | PASS |
| 2402.0000 | 4804.0000 | -46.11 | -30.00 | 16.11 | H | PASS |
| 2402.0000 | 4804.0000 | -56.21 | -30.00 | 26.21 | V | PASS |
| 2480.0000 | 2485.5000 | -66.20 | -30.00 | 36.20 | H | PASS |
| 2480.0000 | 2485.5000 | -59.80 | -30.00 | 29.80 | V | PASS |
| 2480.0000 | 4960.0000 | -49.30 | -30.00 | 19.30 | H | PASS |
| 2480.0000 | 4960.0000 | -53.80 | -30.00 | 23.80 | V | PASS |

*NOTE: Some of the emissions detected are results of emanations from the digital device or peripheral circuitry and components. Those emissions determined to be directly related to the digital device or peripheral circuitry and components are not included.

## 9.0 TEST SETUP PHOTOGRAPHS

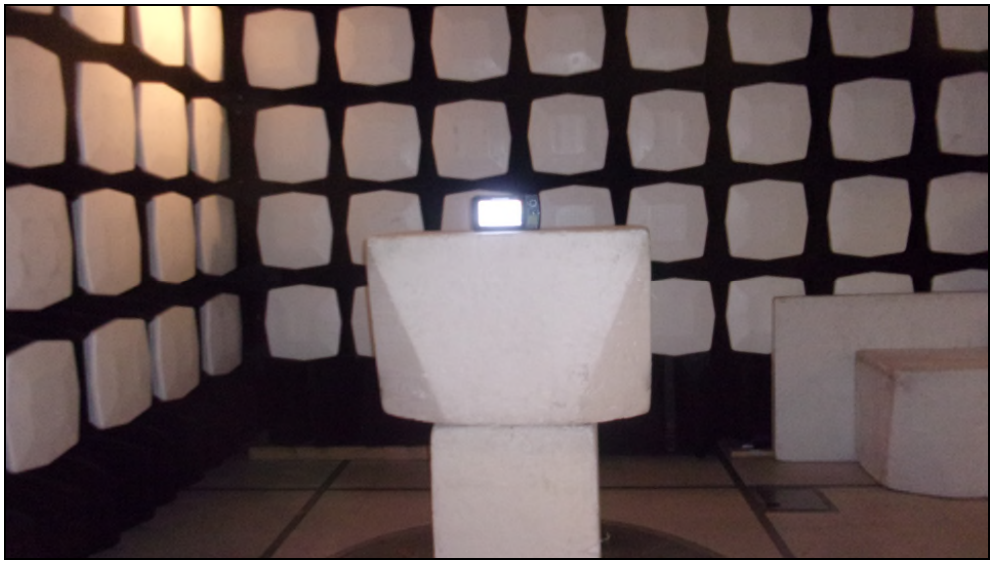

**Figure 9-3: Radiated Emissions Test Setup**

**Figure 9-4: Radiated Emissions Test Setup**

## 10.0 PHOTOGRAPHS OF THE EQUIPMENT (UUT)


**Figure 10-1: Isotropic View – Equipment Under Test**


**Figure 10-2: Isotropic View – Equipment Under Test**

## 11.0 TEST EQUIPMENT

The calibration interval of test equipment is annually or the manufacturer's recommendations. Where the calibration interval deviates from the annual cycle based on the instrument manufacturer's recommendations, it shall be stated below.

**Table 10-1: Test Equipment**

| Asset ID | Manufacturer | Model | Equipment Type | Serial Number | Last Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|---|
| 30 | Spectrum Technologies | DRH-0118 | 1-18GHz Horn Antenna | 970102 | 05/09/2017 | 05/09/2019 |
| 90 | Electro-metrics | LPA25 | LPA Antenna | 1476 | 01/03/2018 | 01/03/2020 |
| 213 | TEC | PA 102 | Amplifier | 44927 | 7/19/2018 | 7/19/2019 |
| 329 | A.H.Systems | SAS-571 | Horn Antenna | 721 | 08/03/2017 | 08/03/2019 |
| 338 | Hewlett Packard | 8449B | High Frequency Pre-Amp | 3008A01111 | 07/11/2017 | 07/11/2019 |
| 432 | Microwave Circuits | H3G020G4 | Highpass Filter | 264066 | 05/16/2018 | 05/16/2019 |
| 701 | United Microwave Products Inc. | AA-190-20.00.0 | Cable | N/A | 07/25/2018 | 7/25/2019 |
| 731 | EMCO | 3104 | Bicon Antenna | 2659 | 11/09/2016 | 11/09/2018 |
| 819 | Rohde & Schwarz | ESR26 | EMI Test Receiver | 101345 | 10/31/2017 | 10/31/2018 |
| 836 | ETS Lindgren | SAC Cable Set | SAC Cable Set includes 620, 837, 838 | N/A | 05/01/2018 | 05/01/2019 |

**NCR = No Calibration Required**
**NOTE: All Equipment only used during active calibration cycles.**

# END REPORT