

Digital Control, Inc.

DucTrak Model DDS 12 Model DDT 12 (short and long)

Report No. DIGC0145

Report Prepared By



www.nwemc.com
1-888-EMI-CERT

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EMC Test Report



22975 NW Evergreen Parkway
Suite 400
Hillsboro, Oregon 97124

Certificate of Test

Last Date of Test: August 24, 2011

Digital Control, Inc.

Models: DucTrak DDS 12, DDT 12 (short and long)

| Emissions | | | |
|--------------------------------------|-----------------|------------------|-----------|
| Test Description | Specification | Test Method | Pass/Fail |
| Field Strength of Fundamental | FCC 15.209:2011 | ANSI C63.10:2009 | Pass |
| Field Strength of Spurious Emissions | FCC 15.209:2011 | ANSI C63.10:2009 | Pass |

Modifications made to the product

See the Modifications section of this report

Test Facility

The measurement facility used to collect the data is located at:

Northwest EMC, Inc.
22975 NW Evergreen Parkway, Suite 400
Hillsboro, OR 97124
Phone: (503) 844-4066 Fax: 844-3826

This site has been fully described in a report filed with and accepted by the FCC (Federal Communications Commission) and Industry Canada (Site filing #2834D-1).

Approved By:

Tim O'Shea, Operations Manager

NVLAP®

NVLAP Lab Code: 200630-0

This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government of the United States of America.

Product compliance is the responsibility of the client, therefore the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. This Report may only be duplicated in its entirety. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test.

| Revision Number | Description | Date | Page Number |
|-----------------|-------------|------|-------------|
| 00 | None | | |

Barometric Pressure

The recorded barometric pressure has been normalized to sea level.



Accreditations and Authorizations

FCC

Accredited by NVLAP for performance of FCC radio, digital, and ISM device testing. Our Open Area Test Sites, certification chambers, and conducted measurement facilities have been fully described in reports filed with the FCC and accepted by the FCC in letters maintained in our files. Northwest EMC has been accredited by ANSI to ISO / IEC Guide 65 as a product certifier. We have been designated by the FCC as a Telecommunications Certification Body (TCB). This allows Northwest EMC to certify transmitters to FCC specifications in accordance with 47 CFR 2.960 and 2.962.

NVLAP

Northwest EMC, Inc. is accredited under the National Voluntary Laboratory Accreditation Program (NVLAP) for satisfactory compliance with the requirements of ISO/IEC 17025 for Testing Laboratories. NVLAP is administered by the National Institute of Standards and Technology (NIST), an agency of the U.S. Commerce Department. The NVLAP accreditation encompasses Electromagnetic Compatibility Testing in accordance with the European Union EMC Directive 2004/108/EC, and ANSI C63.4. Additionally, Northwest EMC is accredited by NVLAP to perform radio testing in accordance with the European Union R&TTE Directive 1999/5/EEC, the requirements of FCC, and the RSS radio standards for Industry Canada.

Industry Canada

Accredited by NVLAP for performance of Industry Canada RSS and ICES testing. Our Open Area Test Sites and certification chambers comply with RSS-Gen, Issue 2 and have been filed with Industry Canada and accepted. Northwest EMC has been accredited by ANSI to ISO / IEC Guide 65 as a product certifier. We have been designated by NIST and recognized by Industry Canada as a Certification Body (CB) per the APEC Mutual Recognition Arrangement (MRA). This allows Northwest EMC to certify transmitters to Industry Canada technical requirements. (Site Filing Numbers - Hillsboro: 2834D-1, 2834D-2, Sultan: 2834C-1, Irvine: 2834B-1, 2834B-2, Brooklyn Park: 2834E-1)

CAB

Designated by NIST and validated by the European Commission as a Conformity Assessment Body (CAB) to conduct tests and approve products to the EMC directive and transmitters to the R&TTE directive, as described in the U.S. - EU Mutual Recognition Agreement.

Australia/New Zealand

The National Association of Testing Authorities (NATA), Australia has been appointed by the ACA as an accreditation body to accredit test laboratories and competent bodies for EMC standards. Accredited test reports or assessments by competent bodies must carry the NATA logo. Test reports made by an overseas laboratory that has been accredited for the relevant standards by an overseas accreditation body that has a Mutual Recognition Agreement (MRA) with NATA are also accepted as technical grounds for product conformity. The report should be endorsed with the respective logo of the accreditation body (NVLAP).



Accreditations and Authorizations

VCCI

Accepted as an Associate Member to the VCCI, Acceptance No. 564. Conducted and radiated measurement facilities have been registered in accordance with Regulations for Voluntary Control Measures, Article 8. (*Registration Numbers. - Hillsboro: C-1071, R-1025, G-84, C-2687, T-1658, and R-2318, Irvine: R-1943, G-85, C-2766, and T-1659, Sultan: R-871, G-83, C-3265, and T-1511, Brooklyn Park: R-3125, G-86, G-141, C-3464, and T-1634*).

BSMI

Northwest EMC has been designated by NIST and validated by C-Taipei (BSMI) as a CAB to conduct tests as described in the APEC Mutual Recognition Agreement (US0017).

GOST

Northwest EMC, Inc. has been assessed and accredited by the Russian Certification bodies Certinform VNIINMASH, CERTINFO, SAMTES, and Federal CHEC, to perform EMC and Hygienic testing for Information Technology Products. As a result of their laboratory assessment, they will accept test results from Northwest EMC, Inc. for product certification

KCC

Northwest EMC, Inc is a CAB designated by MRA partners and recognized by Korea. (*Assigned Lab Numbers: Hillsboro: US0017, Irvine: US0158, Sultan: US0157, Brooklyn Park: US0175*)

VIETNAM

Vietnam MIC has approved Northwest EMC as an accredited test lab. Per Decision No. 194/QD-QLCL (dated December 15, 2009), Northwest EMC test reports can be used for Vietnam approval submissions.

SCOPE

For details on the Scopes of our Accreditations, please visit:
<http://www.nwemc.com/accreditations/>



Northwest EMC Locations



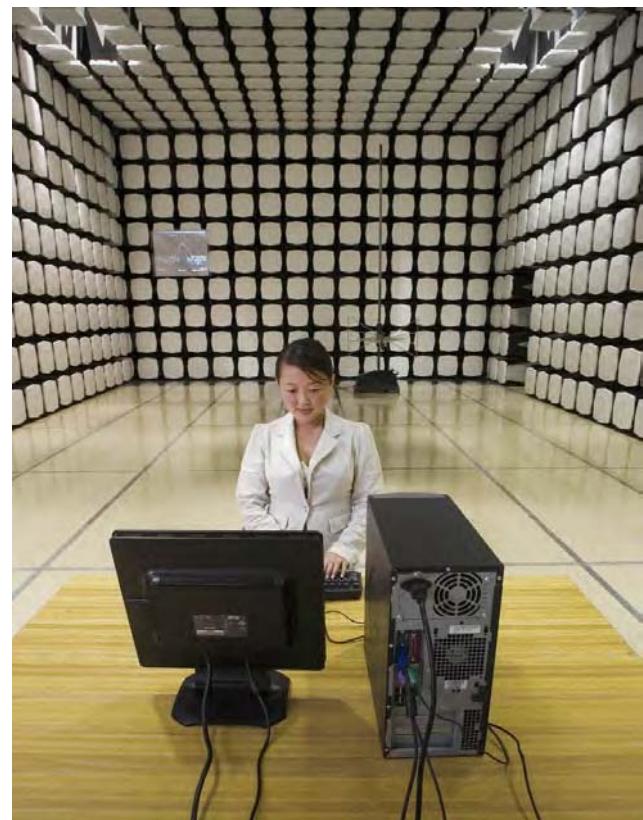
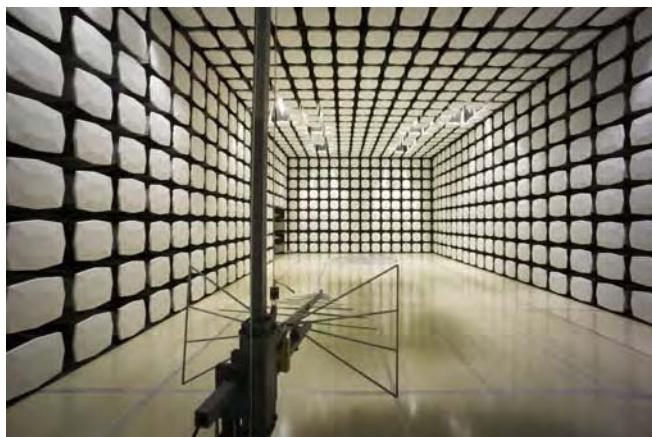
Oregon
Labs EV01-EV12
22975 NW Evergreen Pkwy
Suite 400
Hillsboro, OR 97124
(503) 844-4066

California
Labs OC01-OC13
41 Tesla
Irvine, CA 92618
(949) 861-8918

Minnesota
Labs MN01-MN08
9349 W Broadway Ave.
Brooklyn Park,
MN 55445
(763) 425-2281

Washington
Labs SU01-SU07
14128 339th Ave. SE
Sultan, WA 98294
(360) 793-8675

New York
Labs WA01-WA04
4939 Jordan Rd.
Elbridge, NY 13060
(315) 685-0796



Party Requesting the Test

| | |
|---------------------------------|-------------------------------------|
| Company Name: | Digital Control, Inc. |
| Address: | 19625 62nd Avenue South, Suite B103 |
| City, State, Zip: | Kent, WA 98032 |
| Test Requested By: | Amanda Hamm |
| Model: | DucTrak (short and long) |
| First Date of Test: | 8/23/2011 |
| Last Date of Test: | 8/24/2011 |
| Receipt Date of Samples: | 8/23/2011 |
| Equipment Design Stage: | Production |
| Equipment Condition: | No Damage |

Information Provided by the Party Requesting the Test**Functional Description of the EUT (Equipment Under Test):**

These are 11.976 kHz transmitters located in a battery powered device. The device has a pulling eye on each end so that it can be pulled through existing duct work. It transmits a non-modulated carrier signal for a receiver to detect and assist in determining the depth and field direction of the device. Long has specified range of 80' (24.4m), short: 40' (12.2m)

Testing Objective:

To demonstrate compliance to FCC 15.209 requirements.

CONFIGURATION 1 DIGC0145

| EUT | | | |
|--|-----------------------|--------------------------|----------------------|
| Description | Manufacturer | Model/Part Number | Serial Number |
| 11.976 kHz transmitter - Long Range | Digital Control, Inc. | DDT12 | 1320361 |

CONFIGURATION 2 DIGC0145

| EUT | | | |
|---|-----------------------|--------------------------|----------------------|
| Description | Manufacturer | Model/Part Number | Serial Number |
| 11.976 kHz transmitter - Short Range | Digital Control, Inc. | DDS12 | 1320357 |

| Equipment modifications | | | | | |
|--------------------------------|-----------|--------------------------------------|--------------------------------------|---|---|
| Item | Date | Test | Modification | Note | Disposition of EUT |
| 1 | 8/23/2011 | Field Strength of Fundamental | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | EUT remained at Northwest EMC following the test. |
| 2 | 8/24/2011 | Field Strength of Spurious Emissions | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | Scheduled testing was completed. |

EMC**Field Strength of Fundamental**

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Default Transmit

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

DIGC0145 - 2

FREQUENCY RANGE INVESTIGATED

| | | | |
|-----------------|-------|----------------|---------|
| Start Frequency | 9 kHz | Stop Frequency | 490 kHz |
|-----------------|-------|----------------|---------|

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

| Description | Manufacturer | Model | ID | Last Cal. | Interval |
|-------------------|--------------|-------------------------|-----|-----------|----------|
| Spectrum Analyzer | Agilent | E4443A | AFB | 1/24/2011 | 12 mo |
| Antenna, Loop | EMCO | 6502 | AOA | 6/28/2011 | 24 mo |
| EV11 Cables | N/A | 3m Test Distance Cables | EVM | 3/17/2011 | 12 mo |

MEASUREMENT BANDWIDTHS

| | Frequency Range | Peak Data | Quasi-Peak Data | Average Data |
|--|-----------------|-----------|-----------------|--------------|
| | (MHz) | (kHz) | (kHz) | (kHz) |
| | 0.01 - 0.15 | 1.0 | 0.2 | 0.2 |
| | 0.15 - 30.0 | 10.0 | 9.0 | 9.0 |
| | 30.0 - 1000 | 100.0 | 120.0 | 120.0 |
| | Above 1000 | 1000.0 | N/A | 1000.0 |

Measurements were made using the IF bandwidths and detectors specified. No video filter was used, except in the case of the FCC Average Measurements above 1GHz. In that case, a peak detector with a 10Hz video bandwidth was used.

MEASUREMENT UNCERTAINTY

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

TEST DESCRIPTION

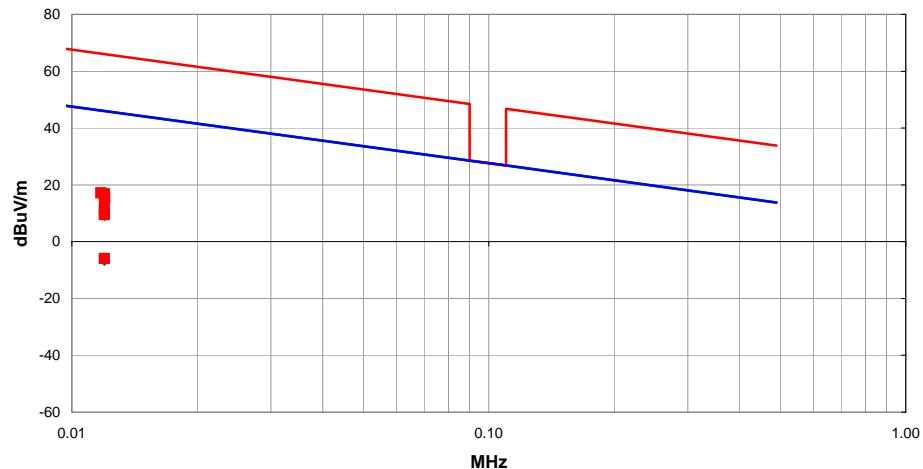
The antennas to be used with the EUT were tested. The EUT was transmitting and receiving while set at the channel available. While scanning, emissions from the EUT were maximized by rotating the EUT, adjusting the measurement antenna height and orientation in 3 orthogonal plane, and manipulating the EUT antenna in 3 orthogonal planes (per ANSI C63.4:2009). An active loop antenna was used for this test in order to provide sufficient measurement sensitivity.

Field Strength of Fundamental

| | | | | |
|-----------------|-----------------------|-------------------|-----------------|--|
| Work Order: | DIGC0145 | Date: | 08/23/11 | |
| Project: | None | Temperature: | 23.8 °C | |
| Job Site: | EV11 | Humidity: | 46.15% RH | |
| Serial Number: | 1320357 | Barometric Pres.: | 1014.7 mbar | |
| EUT: | DucTrak (Short) | Tested by: | Travis Rychener | |
| Configuration: | 2 | | | |
| Customer: | Digital Control, Inc. | | | |
| Attendees: | None | | | |
| EUT Power: | Battery | | | |
| Operating Mode: | Default Transmit | | | |
| Deviations: | None | | | |
| Comments: | None | | | |

| Test Specifications | | Test Method | |
|---------------------|--|------------------|--|
| FCC 15.209:2011 | | ANSI C63.10:2009 | |

| Run # | 14 | Test Distance (m) | 3 | Antenna Height(s) | 1-4m | Results | Pass |
|-------|----|-------------------|---|-------------------|------|---------|------|
|-------|----|-------------------|---|-------------------|------|---------|------|



| Freq (MHz) | Amplitude (dBuV) | Factor (dB) | Antenna Height (meters) | Azimuth (degrees) | Test Distance (meters) | External Attenuation (dB) | Polarity/Transducer Type | Detector | Distance Adjustment (dB) | Adjusted (dBuV/m) | Spec. Limit (dBuV/m) | Compared to Spec. (dB) | Comments |
|------------|------------------|-------------|-------------------------|-------------------|------------------------|---------------------------|--------------------------|----------|--------------------------|-------------------|----------------------|------------------------|---|
| 0.012 | 78.3 | 18.5 | 2.0 | 282.0 | 3.0 | 0.0 | Horz | AV | -80.0 | 16.8 | 46.0 | -29.2 | EUT Hor Antenna perpendicular to ground and parallel to EUT |
| 0.012 | 77.7 | 18.5 | 2.1 | 198.0 | 3.0 | 0.0 | Horz | AV | -80.0 | 16.2 | 46.0 | -29.8 | EUT Hor Antenna perpendicular to ground and perpendicular to EUT |
| 0.012 | 76.0 | 18.5 | 2.0 | 195.0 | 3.0 | 0.0 | Horz | AV | -80.0 | 14.5 | 46.0 | -31.5 | EUT Hor Antenna parallel to ground and perpendicular to EUT |
| 0.012 | 73.2 | 18.5 | 2.0 | 195.0 | 3.0 | 0.0 | Vert | AV | -80.0 | 11.7 | 46.0 | -34.3 | EUT vert Antenna parallel to ground and perpendicular to EUT |
| 0.012 | 70.8 | 18.5 | 2.5 | 209.0 | 3.0 | 0.0 | Horz | AV | -80.0 | 9.3 | 46.0 | -36.7 | EUT Vert Antenna perpendicular to ground and parallel to EUT |
| 0.012 | 78.6 | 18.6 | 2.0 | 195.0 | 3.0 | 0.0 | Horz | PK | -80.0 | 17.2 | 66.2 | -49.0 | EUT Hor Antenna parallel to ground and perpendicular to EUT |
| 0.012 | 78.3 | 18.5 | 2.0 | 282.0 | 3.0 | 0.0 | Horz | PK | -80.0 | 16.8 | 66.0 | -49.2 | EUT Hor Antenna perpendicular to ground and parallel to EUT |
| 0.012 | 77.7 | 18.5 | 2.1 | 198.0 | 3.0 | 0.0 | Horz | PK | -80.0 | 16.2 | 66.0 | -49.8 | EUT Hor Antenna perpendicular to ground and perpendicular to EUT |
| 0.012 | 76.8 | 18.5 | 2.0 | 195.0 | 3.0 | 0.0 | Horz | PK | -80.0 | 15.3 | 66.0 | -50.7 | EUT Hor Antenna parallel to ground and perpendicular to EUT |
| 0.012 | 55.0 | 18.5 | 2.0 | 164.0 | 3.0 | 0.0 | Horz | AV | -80.0 | -6.5 | 46.0 | -52.5 | EUT Vert Antenna perpendicular to ground and perpendicular to EUT |
| 0.012 | 73.3 | 18.5 | 2.0 | 195.0 | 3.0 | 0.0 | Vert | PK | -80.0 | 11.8 | 66.0 | -54.2 | EUT vert Antenna parallel to ground and perpendicular to EUT |
| 0.012 | 71.0 | 18.5 | 2.5 | 209.0 | 3.0 | 0.0 | Horz | PK | -80.0 | 9.5 | 66.0 | -56.5 | EUT Vert Antenna perpendicular to ground and parallel to EUT |
| 0.012 | 55.6 | 18.5 | 2.0 | 164.0 | 3.0 | 0.0 | Horz | PK | -80.0 | -5.9 | 66.0 | -71.9 | EUT Vert Antenna perpendicular to ground and perpendicular to EUT |

EMC**Field Strength of Fundamental**

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Default Transmit

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

DIGC0145 - 1

FREQUENCY RANGE INVESTIGATED

| | | | |
|-----------------|-------|----------------|---------|
| Start Frequency | 9 kHz | Stop Frequency | 490 kHz |
|-----------------|-------|----------------|---------|

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

| Description | Manufacturer | Model | ID | Last Cal. | Interval |
|-------------------|--------------|-------------------------|-----|-----------|----------|
| Spectrum Analyzer | Agilent | E4443A | AFB | 1/24/2011 | 12 mo |
| EV11 Cables | N/A | 3m Test Distance Cables | EVM | 3/17/2011 | 12 mo |
| Antenna, Loop | EMCO | 6502 | AOA | 6/28/2011 | 24 mo |

MEASUREMENT BANDWIDTHS

| | Frequency Range | Peak Data | Quasi-Peak Data | Average Data |
|--|-----------------|-----------|-----------------|--------------|
| | (MHz) | (kHz) | (kHz) | (kHz) |
| | 0.01 - 0.15 | 1.0 | 0.2 | 0.2 |
| | 0.15 - 30.0 | 10.0 | 9.0 | 9.0 |
| | 30.0 - 1000 | 100.0 | 120.0 | 120.0 |
| | Above 1000 | 1000.0 | N/A | 1000.0 |

Measurements were made using the IF bandwidths and detectors specified. No video filter was used, except in the case of the FCC Average Measurements above 1GHz. In that case, a peak detector with a 10Hz video bandwidth was used.

MEASUREMENT UNCERTAINTY

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was transmitting and receiving while set at the channel available. While scanning, emissions from the EUT were maximized by rotating the EUT, adjusting the measurement antenna height and orientation in 3 orthogonal plane, and manipulating the EUT antenna in 3 orthogonal planes (per ANSI C63.4:2009). An active loop antenna was used for this test in order to provide sufficient measurement sensitivity.

| | | | | |
|-----------------|---|-------------------|-------------|--|
| Work Order: | DIGC0145 | Date: | 08/23/11 | |
| Project: | None | Temperature: | 23.8 °C | |
| Job Site: | EV11 | Humidity: | 46.15% RH | |
| Serial Number: | 13200361 | Barometric Pres.: | 1014.8 mbar | |
| EUT: | DucTrak (Long) | | | |
| Configuration: | 1 | | | |
| Customer: | Digital Control, Inc. | | | |
| Attendees: | None | | | |
| EUT Power: | Battery | | | |
| Operating Mode: | Default Transmit | | | |
| Deviations: | None | | | |
| Comments: | Antenna perpendicular to ground and parallel to EUT | | | |

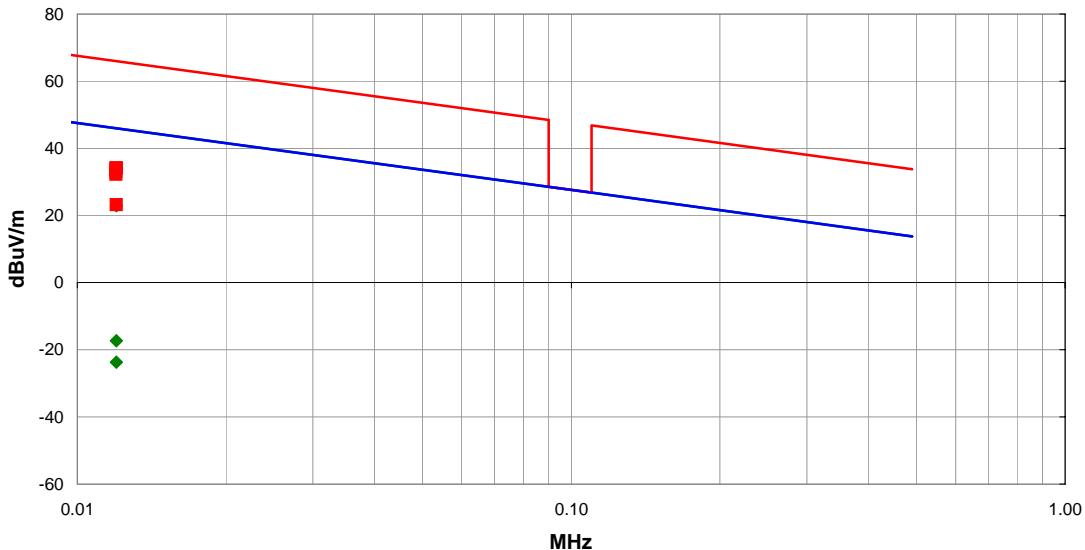
Test Specifications

FCC 15.209:2011

Test Method

ANSI C63.10:2009

| Run # | 8 | Test Distance (m) | 3 | Antenna Height(s) | 1-4m | Results | Pass |
|-------|---|-------------------|---|-------------------|------|---------|------|
| | | | | | | | |



| Freq (MHz) | Amplitude (dBuV) | Factor (dB) | Antenna Height (meters) | Azimuth (degrees) | Test Distance (meters) | External Attenuation (dB) | Polarity/Transducer Type | Detector | Distance Adjustment (dB) | Adjusted (dBuV/m) | Spec. Limit (dBuV/m) | Compared to Spec. (dB) | Comments |
|------------|------------------|-------------|-------------------------|-------------------|------------------------|---------------------------|--------------------------|----------|--------------------------|-------------------|----------------------|------------------------|---------------------------------------|
| 0.012 | 95.6 | 18.5 | 2.0 | 0.0 | 3.0 | 0.0 | Horz | AV | -80.0 | 34.1 | 46.0 | -11.9 | EUT Hor Ant Para to EUT, perp to gnd |
| 0.012 | 94.8 | 18.5 | 1.4 | 197.0 | 3.0 | 0.0 | Vert | AV | -80.0 | 33.3 | 46.0 | -12.7 | EUT Hor Ant Para to EUT, para to gnd |
| 0.012 | 94.6 | 18.5 | 2.0 | 183.0 | 3.0 | 0.0 | Horz | AV | -80.0 | 33.1 | 46.0 | -12.9 | EUT Vert Ant Perp to EUT, perp to gnd |
| 0.012 | 84.4 | 18.5 | 2.0 | 0.0 | 3.0 | 0.0 | Horz | AV | -80.0 | 22.9 | 46.0 | -23.1 | EUT Hor Ant Perp to EUT, perp to gnd |
| 0.012 | 95.7 | 18.5 | 2.0 | 0.0 | 3.0 | 0.0 | Horz | PK | -80.0 | 34.2 | 66.0 | -31.8 | EUT Vert Ant Para to EUT, perp to gnd |
| 0.012 | 95.6 | 18.5 | 1.4 | 197.0 | 3.0 | 0.0 | Vert | PK | -80.0 | 34.1 | 66.0 | -31.9 | EUT Vert Ant Para to EUT, perp to gnd |
| 0.012 | 95.6 | 18.5 | 2.0 | 109.0 | 3.0 | 0.0 | Vert | PK | -80.0 | 34.1 | 66.0 | -31.9 | EUT Hor Ant Para to EUT, para to gnd |
| 0.012 | 94.6 | 18.5 | 2.0 | 183.0 | 3.0 | 0.0 | Horz | PK | -80.0 | 33.1 | 66.0 | -32.9 | EUT Hor Ant Para to EUT, para to gnd |
| 0.012 | 93.8 | 18.5 | 1.4 | 197.0 | 3.0 | 0.0 | Vert | PK | -80.0 | 32.3 | 66.0 | -33.7 | EUT Hor Ant Perp to EUT, perp to gnd |
| 0.012 | 84.7 | 18.5 | 2.0 | 0.0 | 3.0 | 0.0 | Horz | PK | -80.0 | 23.2 | 66.0 | -42.8 | EUT Vert Ant Perp to EUT, perp to gnd |
| 0.012 | 44.2 | 18.5 | 1.4 | 197.0 | 3.0 | 0.0 | Vert | AV | -80.0 | -17.3 | 46.0 | -63.3 | EUT Vert Ant Para to EUT, perp to gnd |
| 0.012 | 38.0 | 18.3 | 2.1 | 121.0 | 3.0 | 0.0 | Horz | AV | -80.0 | -23.7 | 45.6 | -69.4 | EUT Vert Ant Para to EUT, para to gnd |

EMC**Field Strength of Spurious Emissions**

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Default Transmit

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

DIGC0145 - 2

FREQUENCY RANGE INVESTIGATED

Start Frequency 9 kHz Stop Frequency 30 MHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

| Description | Manufacturer | Model | ID | Last Cal. | Interval |
|-------------------|--------------|-------------------------|-----|-----------|----------|
| Spectrum Analyzer | Agilent | E4443A | AFB | 1/24/2011 | 12 mo |
| Antenna, Loop | EMCO | 6502 | AOA | 6/28/2011 | 24 mo |
| EV11 Cables | N/A | 3m Test Distance Cables | EVM | 3/17/2011 | 12 mo |

MEASUREMENT BANDWIDTHS

| | Frequency Range | Peak Data | Quasi-Peak Data | Average Data |
|-------------|-----------------|-----------|-----------------|--------------|
| | (MHz) | (kHz) | (kHz) | (kHz) |
| 0.01 - 0.15 | 1.0 | 0.2 | 0.2 | |
| 0.15 - 30.0 | 10.0 | 9.0 | 9.0 | |
| 30.0 - 1000 | 100.0 | 120.0 | 120.0 | |
| Above 1000 | 1000.0 | N/A | 1000.0 | |

Measurements were made using the IF bandwidths and detectors specified. No video filter was used, except in the case of the FCC Average Measurements above 1GHz. In that case, a peak detector with a 10Hz video bandwidth was used.

MEASUREMENT UNCERTAINTY

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TEST DESCRIPTION

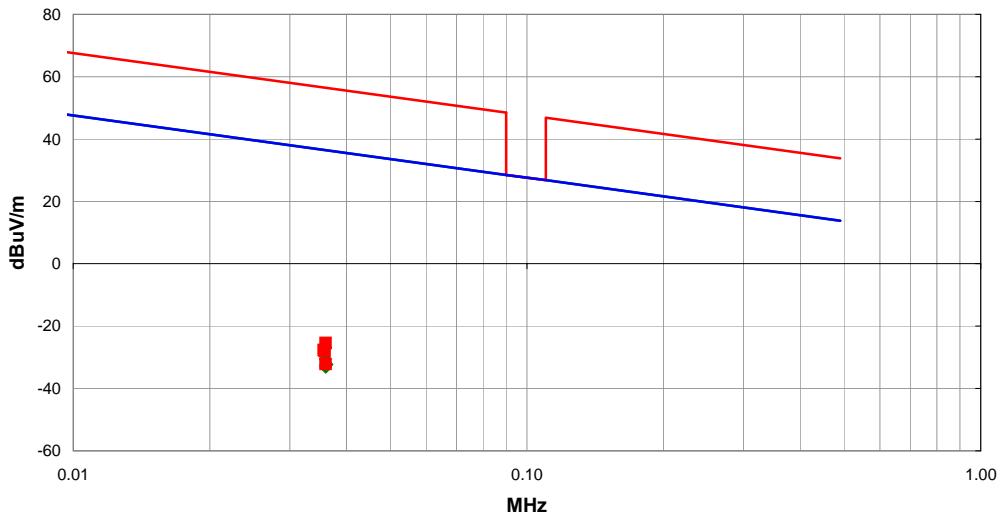
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Field Strength of Spurious Emissions

| | | | | |
|-----------------|-----------------------|-------------------|-----------------|--|
| Work Order: | DIGC0145 | Date: | 08/24/11 | |
| Project: | None | Temperature: | 23.57 °C | |
| Job Site: | EV11 | Humidity: | 49.37% RH | |
| Serial Number: | 1320357 | Barometric Pres.: | 1014.5 mbar | |
| EUT: | DucTrak (Short) | Tested by: | Travis Rychener | |
| Configuration: | 2 | | | |
| Customer: | Digital Control, Inc. | | | |
| Attendees: | None | | | |
| EUT Power: | Battery | | | |
| Operating Mode: | Default Transmit | | | |
| Deviations: | None | | | |
| Comments: | None | | | |

| Test Specifications | | Test Method | |
|---------------------|--|------------------|--|
| FCC 15.209:2011 | | ANSI C63.10:2009 | |

| Run # | 22 | Test Distance (m) | 3 | Antenna Height(s) | 1-4m | Results | Pass |
|-------|----|-------------------|---|-------------------|------|---------|------|
|-------|----|-------------------|---|-------------------|------|---------|------|



| Freq (MHz) | Amplitude (dBuV) | Factor (dB) | Antenna Height (meters) | Azimuth (degrees) | Test Distance (meters) | External Attenuation (dB) | Polarity/Transducer Type | Detector | Distance Adjustment (dB) | Adjusted (dBuV/m) | Spec. Limit (dBuV/m) | Compared to Spec. (dB) | Comments |
|------------|------------------|-------------|-------------------------|-------------------|------------------------|---------------------------|--------------------------|----------|--------------------------|-------------------|----------------------|------------------------|---|
| 0.036 | 40.3 | 12.8 | 2.0 | 0.0 | 3.0 | 0.0 | Vert | AV | -80.0 | -26.9 | 36.5 | -63.3 | EUT Hor, Antenna parallel to EUT, perp to ground |
| 0.036 | 40.0 | 12.9 | 2.0 | 271.0 | 3.0 | 0.0 | Horz | AV | -80.0 | -27.1 | 36.5 | -63.6 | EUT Hor, Antenna parallel to EUT, perp to ground |
| 0.036 | 36.6 | 12.8 | 2.2 | 172.0 | 3.0 | 0.0 | Horz | AV | -80.0 | -30.6 | 36.5 | -67.0 | EUT Hor, Antenna perp to EUT, perp to ground |
| 0.036 | 34.9 | 12.8 | 2.0 | 363.0 | 3.0 | 0.0 | Horz | AV | -80.0 | -32.3 | 36.4 | -68.7 | EUT Vert, Antenna perp to ground, perp to EUT |
| 0.036 | 34.8 | 12.8 | 2.0 | 248.0 | 3.0 | 0.0 | Vert | AV | -80.0 | -32.4 | 36.4 | -68.8 | EUT Vert, Antenna parallel to ground, perp to EUT |
| 0.036 | 34.6 | 12.8 | 2.0 | 0.0 | 3.0 | 0.0 | Vert | AV | -80.0 | -32.6 | 36.5 | -69.0 | EUT Hor, Antenna parallel to ground perp to EUT |
| 0.036 | 34.5 | 12.8 | 2.9 | 248.0 | 3.0 | 0.0 | Horz | AV | -80.0 | -32.7 | 36.5 | -69.1 | EUT Vert, Antenna parallel to EUT, perp to ground |
| 0.036 | 34.0 | 12.8 | 2.0 | 0.0 | 3.0 | 0.0 | Vert | AV | -80.0 | -33.2 | 36.5 | -69.6 | EUT Hor, Antenna parallel to ground perp to EUT |
| 0.036 | 41.8 | 12.8 | 2.0 | 248.0 | 3.0 | 0.0 | Vert | PK | -80.0 | -25.4 | 56.5 | -81.8 | EUT Vert, Antenna parallel to ground, perp to EUT |
| 0.036 | 39.5 | 12.9 | 2.9 | 248.0 | 3.0 | 0.0 | Horz | PK | -80.0 | -27.6 | 56.5 | -84.2 | EUT Vert, Antenna parallel to EUT, perp to ground |
| 0.036 | 39.1 | 12.9 | 2.0 | 363.0 | 3.0 | 0.0 | Horz | PK | -80.0 | -28.0 | 56.5 | -84.5 | EUT Vert, Antenna perp to ground, perp to EUT |
| 0.036 | 35.0 | 12.8 | 2.0 | 248.0 | 3.0 | 0.0 | Vert | PK | -80.0 | -32.2 | 56.5 | -88.6 | EUT Hor, Antenna perp to EUT, perp to ground |

EMC**Field Strength of Spurious Emissions**

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Default Transmit

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

DIGC0145 - 1

FREQUENCY RANGE INVESTIGATED

| | | | |
|-----------------|-------|----------------|--------|
| Start Frequency | 9 kHz | Stop Frequency | 30 MHz |
|-----------------|-------|----------------|--------|

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

| Description | Manufacturer | Model | ID | Last Cal. | Interval |
|-------------------|--------------|-------------------------|-----|-----------|----------|
| Spectrum Analyzer | Agilent | E4443A | AFB | 1/24/2011 | 12 mo |
| Antenna, Loop | EMCO | 6502 | AOA | 6/28/2011 | 24 mo |
| EV11 Cables | N/A | 3m Test Distance Cables | EVM | 3/17/2011 | 12 mo |

MEASUREMENT BANDWIDTHS

| | Frequency Range | Peak Data | Quasi-Peak Data | Average Data |
|--|-----------------|-----------|-----------------|--------------|
| | (MHz) | (kHz) | (kHz) | (kHz) |
| | 0.01 - 0.15 | 1.0 | 0.2 | 0.2 |
| | 0.15 - 30.0 | 10.0 | 9.0 | 9.0 |
| | 30.0 - 1000 | 100.0 | 120.0 | 120.0 |
| | Above 1000 | 1000.0 | N/A | 1000.0 |

Measurements were made using the IF bandwidths and detectors specified. No video filter was used, except in the case of the FCC Average Measurements above 1GHz. In that case, a peak detector with a 10Hz video bandwidth was used.

MEASUREMENT UNCERTAINTY

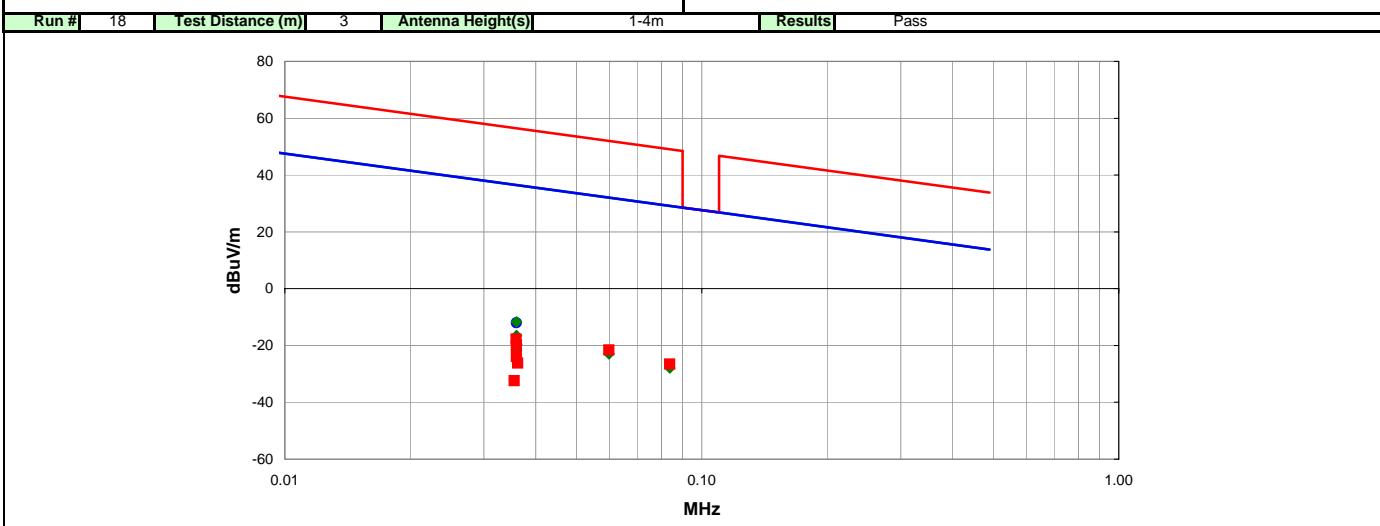
A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was transmitting and receiving while set at the channel available. While scanning, emissions from the EUT were maximized by rotating the EUT, adjusting the measurement antenna height and orientation in 3 orthogonal plane, and manipulating the EUT antenna in 3 orthogonal planes (per ANSI C63.4:2009). An active loop antenna was used for this test in order to provide sufficient measurement sensitivity.

| | | | | |
|-----------------|-----------------------|-------------------|-----------------|--|
| Work Order: | DIGC0145 | Date: | 08/24/11 | |
| Project: | None | Temperature: | 23.57 °C | |
| Job Site: | EV11 | Humidity: | 49.37% RH | |
| Serial Number: | 13200361 | Barometric Pres.: | 1014.5 mbar | |
| EUT: | DucTrak (Long) | Tested by: | Travis Rychener | |
| Configuration: | 1 | | | |
| Customer: | Digital Control, Inc. | | | |
| Attendees: | None | | | |
| EUT Power: | Battery | | | |
| Operating Mode: | Default Transmit | | | |
| Deviations: | None | | | |
| Comments: | None | | | |

| Test Specifications | | Test Method | |
|---------------------|--|------------------|--|
| FCC 15.209:2011 | | ANSI C63.10:2009 | |



| Freq (MHz) | Amplitude (dBuV) | Factor (dB) | Antenna Height (meters) | Azimuth (degrees) | Test Distance (meters) | External Attenuation (dB) | Polarity/Transducer Type | Detector | Distance Adjustment (dB) | Adjusted (dBuV/m) | Spec. Limit (dBuV/m) | Compared to Spec. (dB) | Comments |
|------------|------------------|-------------|-------------------------|-------------------|------------------------|---------------------------|--------------------------|----------|--------------------------|-------------------|----------------------|------------------------|--|
| 0.036 | 55.1 | 12.9 | 2.0 | 283.0 | 3.0 | 0.0 | Horz | AV | -80.0 | -12.0 | 36.5 | -48.5 | EUT Hor, Antenna perpendicular to ground and parallel to EUT |
| 0.036 | 48.8 | 12.9 | 2.0 | 202.0 | 3.0 | 0.0 | Horz | AV | -80.0 | -18.3 | 36.5 | -54.8 | EUT Hor, Antenna perpendicular to ground and parallel to EUT |
| 0.060 | 45.8 | 11.3 | 2.0 | 91.0 | 3.0 | 0.0 | Horz | AV | -80.0 | -22.9 | 32.0 | -54.9 | EUT Hor, Antenna perpendicular to ground and perpendicular to EUT |
| 0.036 | 47.6 | 12.8 | 2.0 | 233.0 | 3.0 | 0.0 | Horz | AV | -80.0 | -19.6 | 36.5 | -56.0 | EUT Hor, Antenna perpendicular to ground and parallel to EUT |
| 0.084 | 41.3 | 10.8 | 2.0 | 286.0 | 3.0 | 0.0 | Horz | AV | -80.0 | -27.9 | 29.1 | -57.1 | EUT Hor, Antenna parallel to ground and perpendicular to EUT |
| 0.036 | 45.5 | 12.9 | 2.0 | 80.0 | 3.0 | 0.0 | Vert | AV | -80.0 | -21.6 | 36.5 | -58.1 | EUT Hor, Antenna perpendicular to ground and parallel to EUT |
| 0.036 | 41.7 | 12.9 | 2.9 | 294.0 | 3.0 | 0.0 | Horz | AV | -80.0 | -25.4 | 36.5 | -61.9 | EUT Vert, Antenna parallel to ground and perpendicular to EUT |
| 0.036 | 55.5 | 12.9 | 2.0 | 283.0 | 3.0 | 0.0 | Horz | PK | -80.0 | -11.6 | 56.5 | -68.1 | EUT Vert, Antenna perpendicular to ground and parallel to EUT |
| 0.036 | 34.7 | 12.9 | 2.0 | 22.0 | 3.0 | 0.0 | Horz | AV | -80.0 | -32.4 | 36.6 | -69.0 | EUT Hor, Antenna perpendicular to ground and parallel to EUT |
| 0.036 | 50.6 | 12.9 | 2.0 | 233.0 | 3.0 | 0.0 | Horz | PK | -80.0 | -16.5 | 56.5 | -73.0 | EUT Vert, Antenna perpendicular to ground and perpendicular to EUT |
| 0.060 | 47.1 | 11.3 | 2.0 | 91.0 | 3.0 | 0.0 | Horz | PK | -80.0 | -21.6 | 52.0 | -73.6 | EUT Hor, Antenna parallel to ground and perpendicular to EUT |
| 0.036 | 49.4 | 12.9 | 2.0 | 202.0 | 3.0 | 0.0 | Horz | PK | -80.0 | -17.7 | 56.5 | -74.2 | EUT Hor, Antenna perpendicular to ground and parallel to EUT |
| 0.084 | 42.7 | 10.8 | 2.0 | 286.0 | 3.0 | 0.0 | Horz | PK | -80.0 | -26.5 | 49.1 | -75.7 | EUT Hor, Antenna perpendicular to ground and perpendicular to EUT |
| 0.036 | 47.3 | 12.9 | 2.0 | 80.0 | 3.0 | 0.0 | Vert | PK | -80.0 | -19.8 | 56.5 | -76.3 | EUT Hor, Antenna perpendicular to ground and parallel to EUT |
| 0.036 | 43.3 | 12.8 | 2.9 | 294.0 | 3.0 | 0.0 | Horz | PK | -80.0 | -23.9 | 56.5 | -80.3 | EUT Vert, Antenna parallel to ground and perpendicular to EUT |
| 0.036 | 41.0 | 12.8 | 2.0 | 22.0 | 3.0 | 0.0 | Horz | PK | -80.0 | -26.2 | 56.4 | -82.6 | EUT Vert, Antenna perpendicular to ground and parallel to EUT |