NORTHWEST EMC

White's Electronics, Inc.

MX Sport

FCC 15.209:2015

Inductive Radio

Report # WHIT0053.1

NVLAP Lab Code: 200630-0

CERTIFICATE OF TEST

NORTHWEST EMC
2014-12-10

Last Date of Test: August 27, 2015
White's Electronics, Inc.
Model: MX Sport

Radio Equipment Testing

Standards

Specification	Method
FCC 15.209:2015	ANSI C63.10:2013

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	No	N/A	Not required for a battery powered EUT.
6.4	Field Strength of Fundamental	Yes	Pass	
6.4, 6.5	Spurious Radiated Emissions	Yes	Pass	

Deviations From Test Standards

None

Approved By:

Kyle Holgate, Operations Manager

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. 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. This report reflects only those tests from the referenced standards shown in the certificate of test. It does not include inspection or verification of labels, identification, marking or user information.

REVISION HISTORY

NORTHWEST EMC
REV 2014.10.14

Revision Number	Description	Date	Page Number
00	None		

ACCREDITATIONS AND AUTHORIZATIONS

REV 2015.2.19

United States

FCC - Designated by the FCC as a Telecommunications Certification Body (TCB). Certification chambers, Open Area Test Sites, and conducted measurement facilities are listed with the FCC.

A2LA - Accredited by A2LA to ISO / IEC 17065 as a product certifier. This allows Northwest EMC to certify transmitters to FCC and IC specifications.

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

IC - Recognized by Industry Canada as a Certification Body (CB). Certification chambers and Open Area Test Sites are filed with IC.

European Union

European Commission – Validated by the European Commission as a Conformity Assessment Body (CAB) under the EMC directive and as a Notified Body under the R&TTE Directive.

Australia/New Zealand

ACMA - Recognized by ACMA as a CAB for the acceptance of test data.

Korea

MSIP / RRA - Recognized by KCC's RRA as a CAB for the acceptance of test data.

Japan

VCCI - Associate Member of the VCCI. Conducted and radiated measurement facilities are registered.

Taiwan

BSMI – Recognized by BSMI as a CAB for the acceptance of test data.

NCC - Recognized by NCC as a CAB for the acceptance of test data.

Singapore

IDA – Recognized by IDA as a CAB for the acceptance of test data.

Israel

MOC – Recognized by MOC as a CAB for the acceptance of test data.

Hong Kong

OFCA – Recognized by OFCA as a CAB for the acceptance of test data.

Vietnam

MIC – Recognized by MIC as a CAB for the acceptance of test data.

SCOPE

For details on the Scopes of our Accreditations, please visit:
http://www.nwemc.com/accreditations/
http://gsi.nist.gov/global/docs/cabs/designations.html

MEASUREMENT UNCERTAINTY

TMU.2015.07.10

Measurement Uncertainty

When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. Measurement uncertainty is a statistical expression of measurement error qualified by a probability distribution.

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 (K=2) for each test is on each data sheet. Our measurement data meets or exceeds the measurement uncertainty requirements of the applicable specification; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for estimating measurement uncertainty are based upon ETSI TR 100 028 (or CISPR 16-4-2 as applicable), and are available upon request.

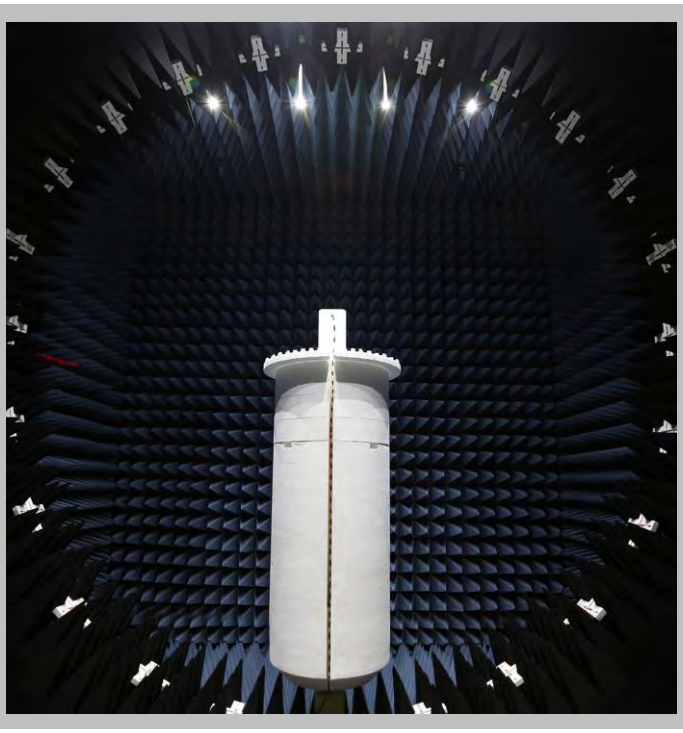
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

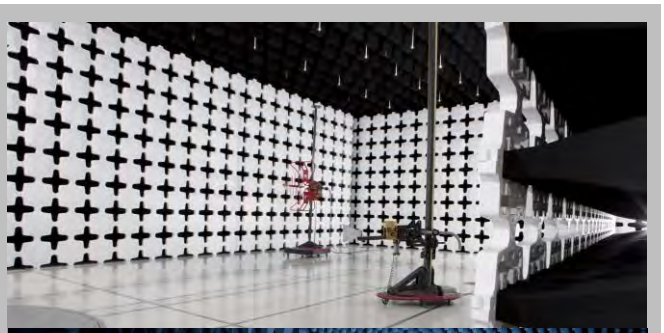
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	5.2 dB	-5.2 dB
AC Powerline Conducted Emissions (dB)	2.4 dB	-2.4 dB

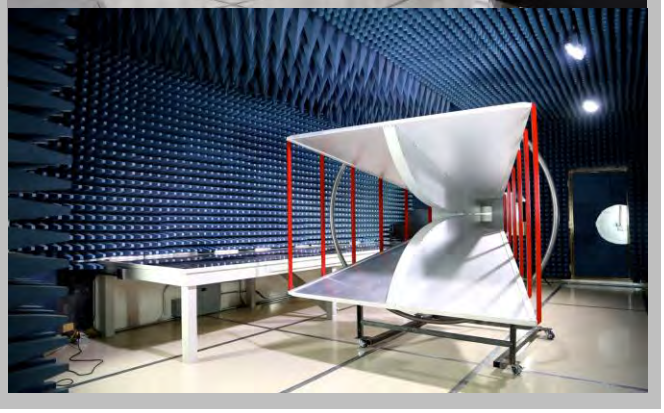
FACILITIES

NORTHWEST EMC
REV 2015.2.19

California	Minnesota	New York	Oregon	Texas	Washington
Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-08, MN10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	Labs EV01-12 22975 NW Evergreen Pkwy Hillsboro, OR 97124 (503) 844-4066	Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Labs NC01-05 19201 120th Ave NE Bothell, WA 9801 (425)984-6600
NVLAP					
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200761-0	NVLAP Lab Code: 200630-0	NVLAP Lab Code:201049-0	NVLAP Lab Code: 200629-0
Industry Canada					
2834B-1, 2834B-3	2834E-1	N/A	2834D-1, 2834D-*2*	2834G-1	2834F-1
BSMI					
SL2-IN-E-1154R	SL2-IN-E-1152R	N/A	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI					
A-0029	A-0109	N/A	A-0108	A-0201	A-0110
Recognized Phase I CAB for ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA					
US0158	US0175	N/A	US0017	US0191	US0157







PRODUCT DESCRIPTION

2014-12-10

Client and Equipment Under Test (EUT) Information

Company Name:	White's Electronics, Inc.
Address:	1011 Pleasant Valley Drive
City, State, Zip:	Sweet Home, OR 97386
Test Requested By:	Tyler Sims
Model:	MX Sport
First Date of Test:	August 26, 2015
Last Date of Test:	August 27, 2015
Receipt Date of Samples:	August 26, 2015
Equipment Design Stage:	Production
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
Metal detector – Inductive Radio with 1 antenna

Testing Objective:
To demonstrate compliance of the inductive portion of the device to FCC Part 15.209 specifications.

CONFIGURATIONS

NORTHWEST EMC
2014-12-10

Configuration WHIT0053- 1

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Metal Detector Control Device	White's Electronics, Inc.	MX Sport	1673
Antenna 9.5 inch Concentric	White's Electronics, Inc.	None	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
Antenna Cable	Unknown	1.5m	No	Antenna Concentric	Metal Detector Control Device
Audio Cable Extension	Unknown	0.8m	No	Metal Detector Control Device	Unterminated

MODIFICATIONS

NORTHWEST EMC
2014-12-10

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	8/26/2015	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	8/27/2015	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

FIELD STENGTH 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

On, continuous poling 13.9 kHz

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

WHIT0053 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency	9 kHz	Stop Frequency	20 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
Analyzer - Spectrum Analyzer	Agilent	E4443A	AFB	3/17/2015	12 mo
Cable	None	10m Test Distance Cable	EVL	5/11/2015	12 mo
Antenna, Loop	EMCO	6502	AOA	6/24/2014	24 mo

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was continuously transmitting while set to the channel specified.

Per ANSI C63.10 sections 6.4.4.1 and 6.4.4.2, the emissions from the EUT were maximized by rotating the EUT on the turntable. Also, the EUT and/or associated antenna was positioned in 3 orthogonal planes. A calibrated active loop antenna was used for this test in order to provide sufficient measurement sensitivity per section 4.5.1. The center of the loop antenna was maintained at 1m above the ground plane during the testing.

As outlined in 15.209(e) and 15.31(f)(2), measurements may be performed at a distance closer than what is specified with the limit. The limit at the specified distance is shown on the data sheet. Measurements are made at a closer distance and the data is adjusted using a distance correction factor of 40dB/decade for comparison to the limit.

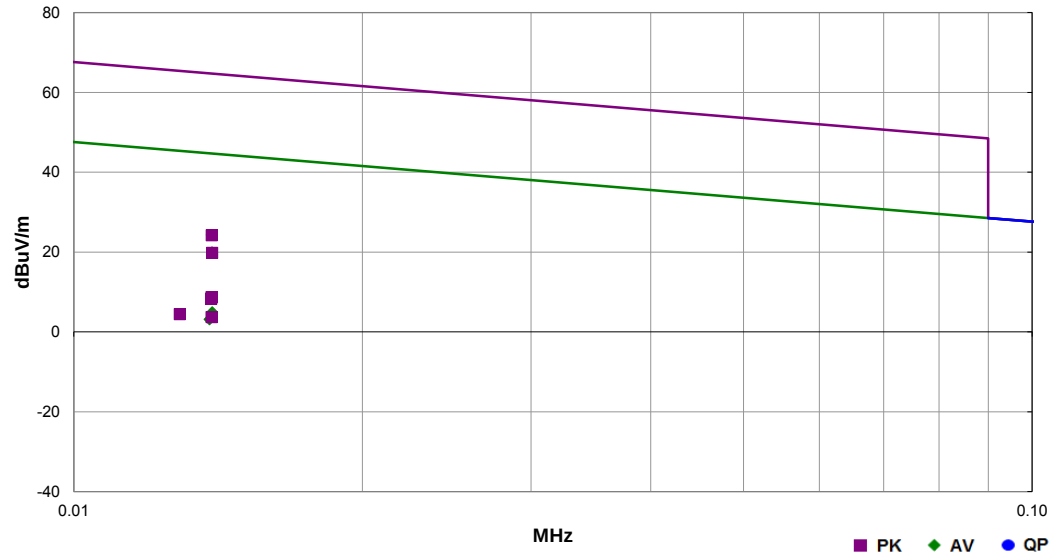
If there are no detectable emissions above the noise floor, the data included will show noise floor measurements for reference only.

FIELD STENGTH OF FUNDAMENTAL

Work Order:	WHIT0053	**Date:**	08/26/15		
Project:	None	**Temperature:**	24.6 °C		
Job Site:	EV11	**Humidity:**	39% RH		
Serial Number:	1673	**Barometric Pres.:**	1015.4 mbar	**Tested by:**	Brandon Hobbs
EUT:	MX Sport				
Configuration:	1				
Customer:	White's Electronics, Inc				
Attendees:	Joshua Maina				
EUT Power:	Battery				
Operating Mode:	On, continuous poling 13.9 kHz				
Deviations:	None				
Comments:	Please see data commets for EUT orientation and Antenna position. The DD inductive antenna was being used. The Antenna had only two axis of measurement				

Test Specifications	**Test Method**
FCC 15.209:2015	ANSI C63.10:2013

Run #	1	**Test Distance (m)**	10	**Antenna Height(s)**	1 to 4(m)	**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
0.014	66.6	16.8	1.0	7.0	10.0	0.0	See Comments	AV	-59.1	24.3	44.7	-20.4	Ant perp to GND/Ant perp to EUT, EUT Vertical
0.014	62.2	16.8	1.0	287.0	10.0	0.0	See Comments	AV	-59.1	19.9	44.7	-24.8	Ant perp to GND/Ant para to EUT, EUT Vertical
0.014	51.0	16.8	1.0	52.0	10.0	0.0	See Comments	AV	-59.1	8.7	44.7	-36.0	Ant para to GND/Ant perp to EUT, EUT Vertical
0.014	50.7	16.8	1.0	92.0	10.0	0.0	See Comments	AV	-59.1	8.4	44.7	-36.3	Ant perp to GND/Ant para to EUT, EUT Horizontal
0.014	47.2	16.8	1.0	140.0	10.0	0.0	See Comments	AV	-59.1	4.9	44.7	-39.8	Ant para to GND/Ant perp to EUT, EUT Horizontal
0.014	66.5	16.8	1.0	7.0	10.0	0.0	See Comments	PK	-59.1	24.2	64.7	-40.5	Ant perp to GND/Ant perp to EUT, EUT Vertical
0.014	45.4	16.8	1.0	180.0	10.0	0.0	See Comments	AV	-59.1	3.1	44.7	-41.6	Ant perp to GND/Ant perp to EUT, EUT Horizontal
0.014	62.1	16.8	1.0	287.0	10.0	0.0	See Comments	PK	-59.1	19.8	64.7	-44.9	Ant perp to GND/Ant para to EUT, EUT Vertical
0.014	51.0	16.8	1.0	92.0	10.0	0.0	See Comments	PK	-59.1	8.7	64.7	-56.0	Ant perp to GND/Ant para to EUT, EUT Horizontal
0.014	50.6	16.8	1.0	52.0	10.0	0.0	See Comments	PK	-59.1	8.3	64.7	-56.4	Ant para to GND/Ant perp to EUT, EUT Vertical
0.013	46.3	17.3	1.0	180.0	10.0	0.0	See Comments	PK	-59.1	4.5	65.4	-60.9	Ant perp to GND/Ant perp to EUT, EUT Horizontal
0.014	46.0	16.8	1.0	140.0	10.0	0.0	See Comments	PK	-59.1	3.7	64.7	-61.0	Ant para to GND/Ant perp to EUT, EUT Horizontal

SPURIOUS RADIATED 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

On, continuous poling 13.9 kHz

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

WHIT0053 - 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
Cable	None	3m Test Distance Cable	EVM	5/11/2015	12 mo
Analyzer - Spectrum Analyzer	Agilent	E4443A	AFB	3/17/2015	12 mo
Antenna, Loop	EMCO	6502	AOA	6/24/2014	24 mo

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was continuously transmitting while set to the channel specified.

Per ANSI C63.10 sections 6.4.4.1 and 6.4.4.2, the emissions from the EUT were maximized by rotating the EUT on the turntable. Also, the EUT and/or associated antenna was positioned in 3 orthogonal planes. A calibrated active loop antenna was used for this test in order to provide sufficient measurement sensitivity per section 4.5.1. The center of the loop antenna was maintained at 1m above the ground plane during the testing.

For measurements below 30 MHz, as outlined in 15.209(e) and 15.31(f)(2), measurements may be performed at a distance closer than what is specified with the limit. The limit at the specified distance is shown on the data sheet. Measurements are made at a closer distance and the data is adjusted using a distance correction factor of 40dB/decade for comparison to the limit. Per FCC 15.33(a)(4), measurements were taken up to the highest frequency range of either the 10th harmonic of the fundamental or the applicable digital frequency test range.

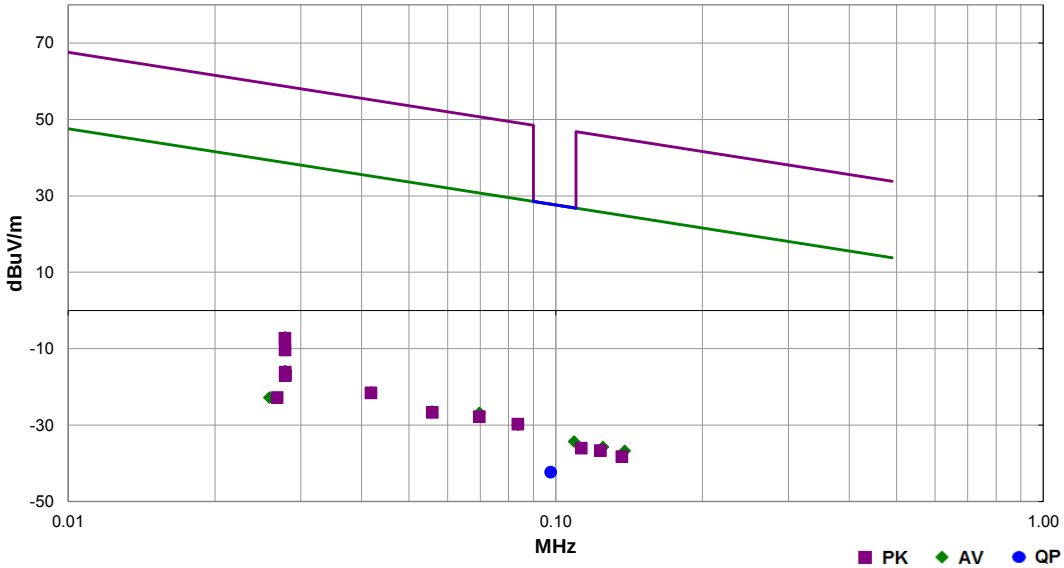
If there are no detectable emissions above the noise floor, the data included will show noise floor measurements for reference only.

SPURIOUS RADIATED EMISSIONS

Work Order:	WHIT0053	**Date:**	08/27/15		
Project:	None	**Temperature:**	23.4 °C		
Job Site:	EV11	**Humidity:**	39.5% RH		
Serial Number:	1673	**Barometric Pres.:**	1018.6 mbar	**Tested by:**	Brandon Hobbs
EUT:	MX Sport				
Configuration:	1				
Customer:	White's Electronics, Inc.				
Attendees:	Joshua Maina				
EUT Power:	Battery				
Operating Mode:	On, continuous poling 13.9 kHz				
Deviations:	None				
Comments:	Please reference data comments for EUT orientation and antenna position. The antenna used for testing was the DD 950 antenna.				

Test Specifications	**Test Method**
FCC 15.209:2015	ANSI C63.10:2013

Run #	4	**Test Distance (m)**	3	**Antenna Height(s)**	1 to 4(m)	**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
0.028	59.5	13.4	1.0	100.0	3.0	0.0	Horz	AV	-80.0	-7.1	38.7	-45.7	Ant perp to GND/Ant para to EUT, EUT Vert
0.028	56.5	13.4	1.0	364.0	3.0	0.0	Horz	AV	-80.0	-10.1	38.7	-48.7	Ant perp to GND/Ant perp to EUT, EUT Vert
0.028	50.7	13.4	1.0	21.0	3.0	0.0	Vert	AV	-80.0	-15.9	38.7	-54.5	Ant perp to GND/Ant perp to EUT, EUT Horz
0.028	50.4	13.4	1.0	36.0	3.0	0.0	Horz	AV	-80.0	-16.2	38.7	-54.8	Ant perp to GND/Ant para to EUT, EUT Horz
0.028	49.6	13.5	1.0	333.0	3.0	0.0	Vert	AV	-80.0	-16.9	38.7	-55.6	Ant para to GND/Ant perp to EUT, EUT Vert
0.042	46.6	11.9	1.0	119.0	3.0	0.0	Horz	AV	-80.0	-21.5	35.2	-56.6	Ant perp to GND/Ant para to EUT, EUT Vert
0.070	42.5	10.7	1.0	282.0	3.0	0.0	Horz	AV	-80.0	-26.8	30.7	-57.5	Ant perp to GND/Ant para to EUT, EUT Vert
0.084	39.4	10.6	1.0	283.0	3.0	0.0	Horz	AV	-80.0	-30.0	29.1	-59.1	Ant perp to GND/Ant para to EUT, EUT Vert
0.056	42.5	11.0	1.0	99.0	3.0	0.0	Horz	AV	-80.0	-26.5	32.7	-59.1	Ant perp to GND/Ant para to EUT, EUT Vert
0.109	35.4	10.3	1.0	264.0	3.0	0.0	Horz	AV	-80.0	-34.3	26.9	-61.2	Ant perp to GND/Ant para to EUT, EUT Vert
0.125	34.0	10.3	1.0	299.0	3.0	0.0	Horz	AV	-80.0	-35.8	25.7	-61.4	Ant perp to GND/Ant para to EUT, EUT Vert
0.139	33.0	10.2	1.0	33.0	3.0	0.0	Horz	AV	-80.0	-36.8	24.8	-61.6	Ant perp to GND/Ant para to EUT, EUT Vert
0.026	43.6	13.6	1.0	299.0	3.0	0.0	Horz	AV	-80.0	-22.8	39.3	-62.1	Ant perp to GND/Ant perp to EUT, EUT Horz
0.028	59.3	13.5	1.0	100.0	3.0	0.0	Horz	PK	-80.0	-7.2	58.7	-65.9	Ant perp to GND/Ant para to EUT, EUT Vert
0.028	56.2	13.4	1.0	364.0	3.0	0.0	Horz	PK	-80.0	-10.4	58.7	-69.0	Ant perp to GND/Ant perp to EUT, EUT Vert
0.098	27.3	10.4	1.0	90.0	3.0	0.0	Horz	QP	-80.0	-42.3	27.8	-70.1	Ant perp to GND/Ant para to EUT, EUT Vert
0.028	50.4	13.4	1.0	21.0	3.0	0.0	Vert	PK	-80.0	-16.2	58.7	-74.8	Ant para to GND/Ant perp to EUT, EUT Horz
0.028	49.6	13.4	1.0	36.0	3.0	0.0	Horz	PK	-80.0	-17.0	58.7	-75.6	Ant perp to GND/Ant para to EUT, EUT Horz
0.028	49.5	13.4	1.0	333.0	3.0	0.0	Vert	PK	-80.0	-17.1	58.7	-75.7	Ant para to GND/Ant perp to EUT, EUT Vert
0.042	46.5	11.9	1.0	119.0	3.0	0.0	Horz	PK	-80.0	-21.6	55.2	-76.7	Ant perp to GND/Ant para to EUT, EUT Vert
0.070	41.5	10.7	1.0	282.0	3.0	0.0	Horz	PK	-80.0	-27.8	50.7	-78.5	Ant perp to GND/Ant para to EUT, EUT Vert
0.084	39.6	10.6	1.0	283.0	3.0	0.0	Horz	PK	-80.0	-29.8	49.1	-78.9	Ant perp to GND/Ant para to EUT, EUT Vert
0.056	42.3	11.0	1.0	99.0	3.0	0.0	Horz	PK	-80.0	-26.7	52.7	-79.3	Ant perp to GND/Ant para to EUT, EUT Vert
0.027	43.7	13.5	1.0	299.0	3.0	0.0	Horz	PK	-80.0	-22.8	59.0	-81.8	Ant perp to GND/Ant perp to EUT, EUT Horz
0.124	33.1	10.3	1.0	299.0	3.0	0.0	Horz	PK	-80.0	-36.6	45.8	-82.4	Ant perp to GND/Ant para to EUT, EUT Vert
0.113	33.7	10.3	1.0	264.0	3.0	0.0	Horz	PK	-80.0	-36.0	46.6	-82.6	Ant perp to GND/Ant para to EUT, EUT Vert
0.137	31.5	10.2	1.0	33.0	3.0	0.0	Horz	PK	-80.0	-38.3	44.9	-83.2	Ant perp to GND/Ant para to EUT, EUT Vert