NORTHWEST EMC

Medivators

Advantage Plus Pass-Thru

FCC 15.247:2016

902 - 928 MHz Transceiver

Report # MDVS0001

NVLAP TESTING

NVLAP Lab Code: 200881-0

CERTIFICATE OF TEST

NORTHWEST EMC
2014-12-10

Last Date of Test: October 18, 2016
Medivators
Model: Advantage Plus Pass-Thru

Radio Equipment Testing

Standards

Specification	Method
FCC 15.247:2016	ANSI C63.10:2013

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	No	N/A	Not required for a C2PC with change of antennas, and hardware change to unintentional part of the system.
6.5, 6.6	Spurious Radiated Emissions	Yes	Pass	
7.5	Duty Cycle	No	N/A	Not required for a C2PC with change of antennas, and hardware change to unintentional part of the system.
7.8.2	Carrier Frequency Separation	No	N/A	Not required for a C2PC with change of antennas, and hardware change to unintentional part of the system.
7.8.3	Number of Hopping Frequencies	No	N/A	Not required for a C2PC with change of antennas, and hardware change to unintentional part of the system.
7.8.4	Dwell Time	No	N/A	Not required for a C2PC with change of antennas, and hardware change to unintentional part of the system.
7.8.5	Output Power	No	N/A	Not required for a C2PC with change of antennas, and hardware change to unintentional part of the system.
7.8.6	Band Edge Compliance	No	N/A	Not required for a C2PC with change of antennas, and hardware change to unintentional part of the system.
7.8.6	Band Edge Compliance - Hopping Mode	No	N/A	Not required for a C2PC with change of antennas, and hardware change to unintentional part of the system.
7.8.7	Occupied Bandwidth	No	N/A	Not required for a C2PC with change of antennas, and hardware change to unintentional part of the system.
7.8.8	Spurious Conducted Emissions	No	N/A	Not required for a C2PC with change of antennas, and hardware change to unintentional part of the system.
11.10.2	Power Spectral Density	No	N/A	Not required for FHSS devices.

Deviations From Test Standards

None

Approved By:

Tim O'Shea, 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 2016.7.25

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

ISED - Recognized by Innovation, Science and Economic Development Canada as a Certification Body (CB). Certification chambers and Open Area Test Sites are filed with ISED.

European Union

European Commission – Validated by the European Commission 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.

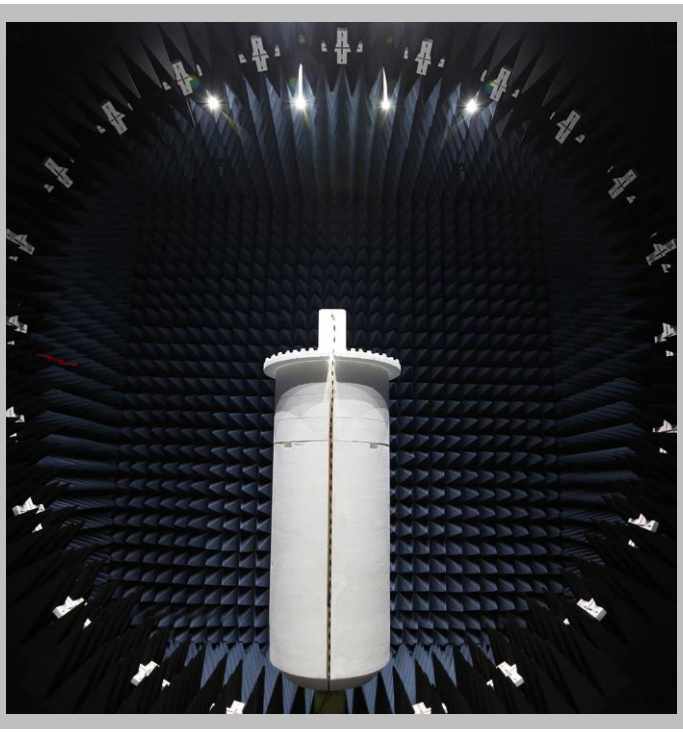
SCOPE

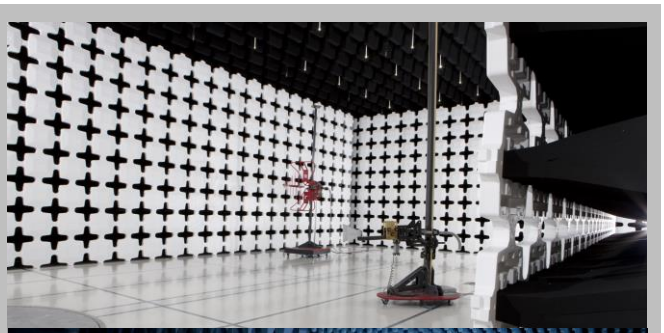
For details on the Scopes of our Accreditations, please visit:
http://www.nwemc.com/accreditations/
http://gsi.nist.gov/global/docs/cabs/designations.html

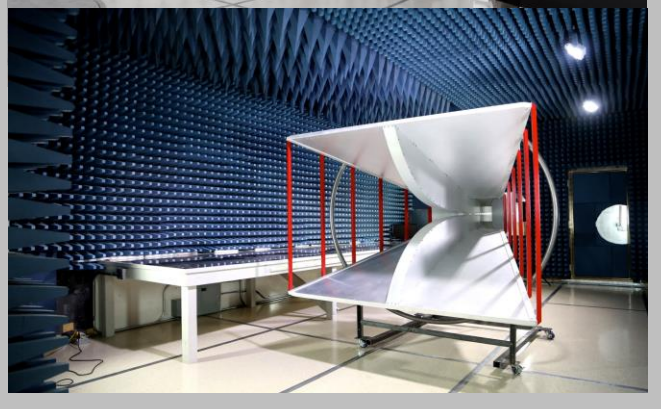
FACILITIES

NORTHWEST EMC
REV 2016.7.25

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 98011 (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
Innovation, Science and Economic Development 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







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 QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable test description page. 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.

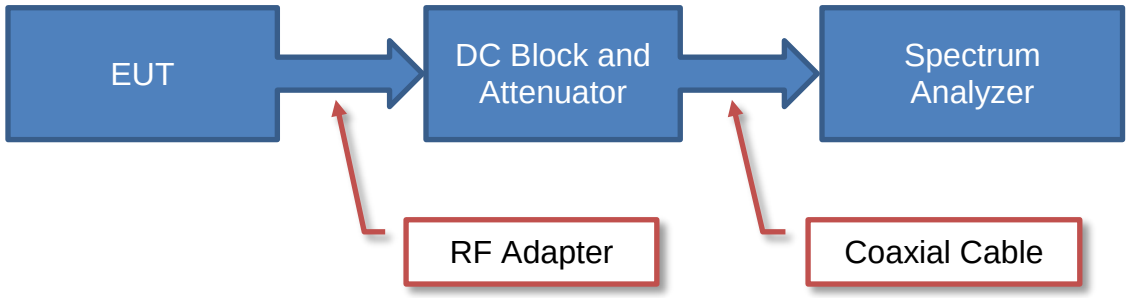
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

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

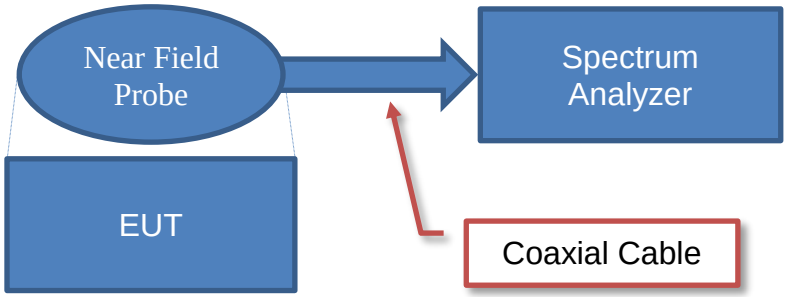
Test Setup Block Diagrams

NORTHWEST EMC
REV 2016.10.04

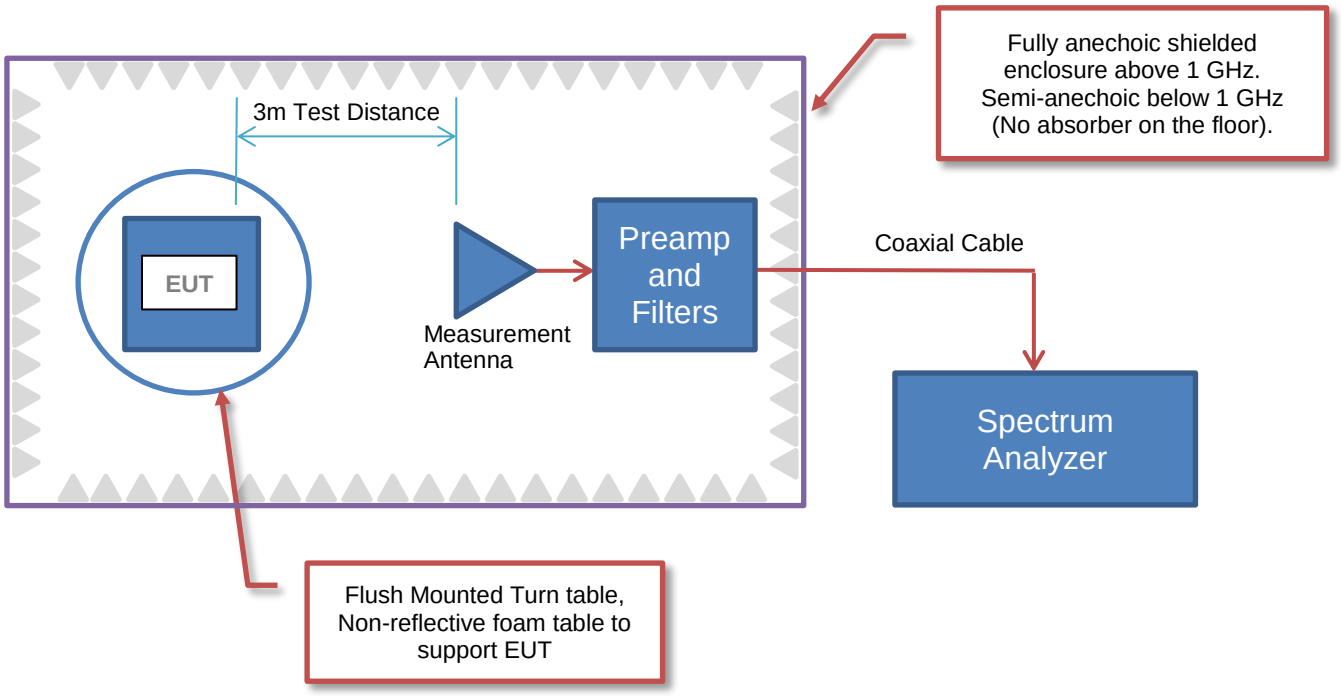
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



PRODUCT DESCRIPTION

NORTHWEST EMC
2014-12-10

Client and Equipment Under Test (EUT) Information

Company Name:	Medivators
Address:	14605 28th Ave, North
City, State, Zip:	Plymouth, MN 55447
Test Requested By:	Ryan Kelly
Model:	Advantage Plus Pass-Thru
First Date of Test:	October 18, 2016
Last Date of Test:	October 18, 2016
Receipt Date of Samples:	October 18, 2016
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
The Advantage Plus Pass-Thru is a washer disinfector for endoscopes which is designed to be mounted within a wall to separate the clean rooms and dirty rooms. An RFID reader is will be used to identify operators of the system.

Testing Objective:
Seeking to demonstrate compliance under FCC 15.247:2016 for operation in the 902 - 928 MHz Band.

CONFIGURATIONS

NORTHWEST EMC
2014-12-10

Configuration MDVS0001- 1

Software/Firmware Running during test	
Description	**Version**
Internal Software	Unknown

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Endoscope Reprocessing System	Medivators	Advantage Plus Pass-Thru	76961304

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
AC Mains Cable	No	>3.0m	No	Medical Disinfector	AC Mains

MODIFICATIONS

NORTHWEST EMC
2014-12-10

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	10/18/2016	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

SPURIOUS RADIATED EMISSIONS

NORTHWEST EMC

PSA-ESCI 2016.07.22

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

Transmitting continuously (100% duty cycle) at low channel (902.75 MHz), mid channel (915.25 MHz), high channel (927.25 MHz)

POWER SETTINGS INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

MDVS0001 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	10 GHz

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
Filter - Band Pass/Notch	K&L Microwave	3TNF-500/1000-N/N	HGS	8/29/2016	12 mo
Filter - High Pass	Micro-Tronics	HPM50108	LFM	9/22/2016	12 mo
Attenuator	Fairview Microwave	SA18E-20	TWZ	9/23/2016	12 mo
Filter - Low Pass	Micro-Tronics	LPM50003	LFJ	9/22/2016	12 mo
Attenuator	Fairview Microwave	SA18E-10	TYA	9/23/2016	12 mo
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AVO	12/10/2015	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVT	3/1/2016	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVV	3/1/2016	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-07	AXP	NCR	0 mo
Antenna - Double Ridge	ETS Lindgren	3115	AJA	6/23/2016	24 mo
Cable	ESM Cable Corp.	Standard Gain Horn Cables	MNJ	7/29/2016	12 mo
Cable	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	12/7/2015	12 mo
Cable	ESM Cable Corp.	Bilog Cables	MNH	12/7/2015	12 mo
Antenna - Biconilog	Teseq	CBL 6141B	AYD	1/6/2016	24 mo
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFI	1/27/2016	12 mo

MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (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

TEST DESCRIPTION

The highest gain antenna of each type to be used with the EUT was tested. The EUT was configured for the required transmit frequencies and the modes as showed in the data sheets.

For each configuration, the spectrum was scanned throughout the specified range as part of the exploratory investigation of the emissions. These “pre-scans” are not included in the report. Final measurements on individual emissions were then made and included in this test report.

The individual emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis if required, and adjusting the measurement antenna height and polarization (per ANSI C63.10). A preamp and high pass filter (and notch filter) were used for this test in order to provide sufficient measurement sensitivity.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

Measurements were made to satisfy the specific requirements of the test specification for out of band emissions as well as the restricted band requirements.

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

Measurements at the edges of the allowable band may be presented in an alternative method as provided for in the ANSI C63.10 Marker-Delta method. This method involves performing an in-band fundamental measurement followed by a screen capture of the fundamental and out-of-band emission using reduced measurement instrumentation bandwidths. The amplitude delta measured on this screen capture is applied to the fundamental emission value to show the out-of-band emission level as applied to the limit.

A duty cycle correction factor based on the typically operating mode on time in a 100ms period was applied to the average measurements.

SPURIOUS RADIATED EMISSIONS

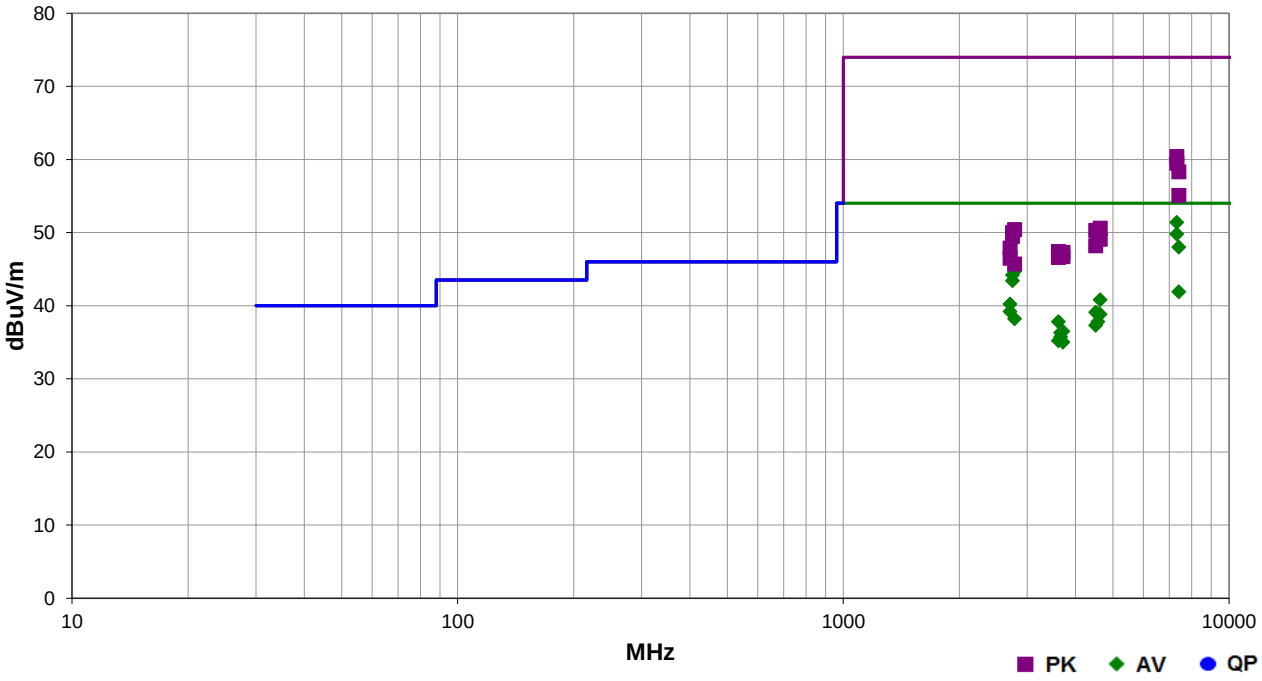
NORTHWEST EMC

PSA-ESCI 2016.07.22
EmiR5 2016.08.26

Work Order:	MDVS0001	**Date:**	10/18/16		
Project:	None	**Temperature:**	23.7 °C		
Job Site:	MN05	**Humidity:**	49.7% RH		
Serial Number:	76961304	**Barometric Pres.:**	1010 mbar	**Tested by:**	Dustin Sparks
EUT:	Advantage Plus Pass-Thru				
Configuration:	1				
Customer:	Medivators				
Attendees:	Ryan Kelly				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting continuously (100% duty cycle) at low channel (902.75 MHz), mid channel (915.25 MHz), high channel (927.25 MHz)				
Deviations:	None				
Comments:	EUT in single upright position. DCCF added to average values based on 80% duty cycle hopping mode. DCCF: 20*LOG10(71.4/100) = -2.9dB				

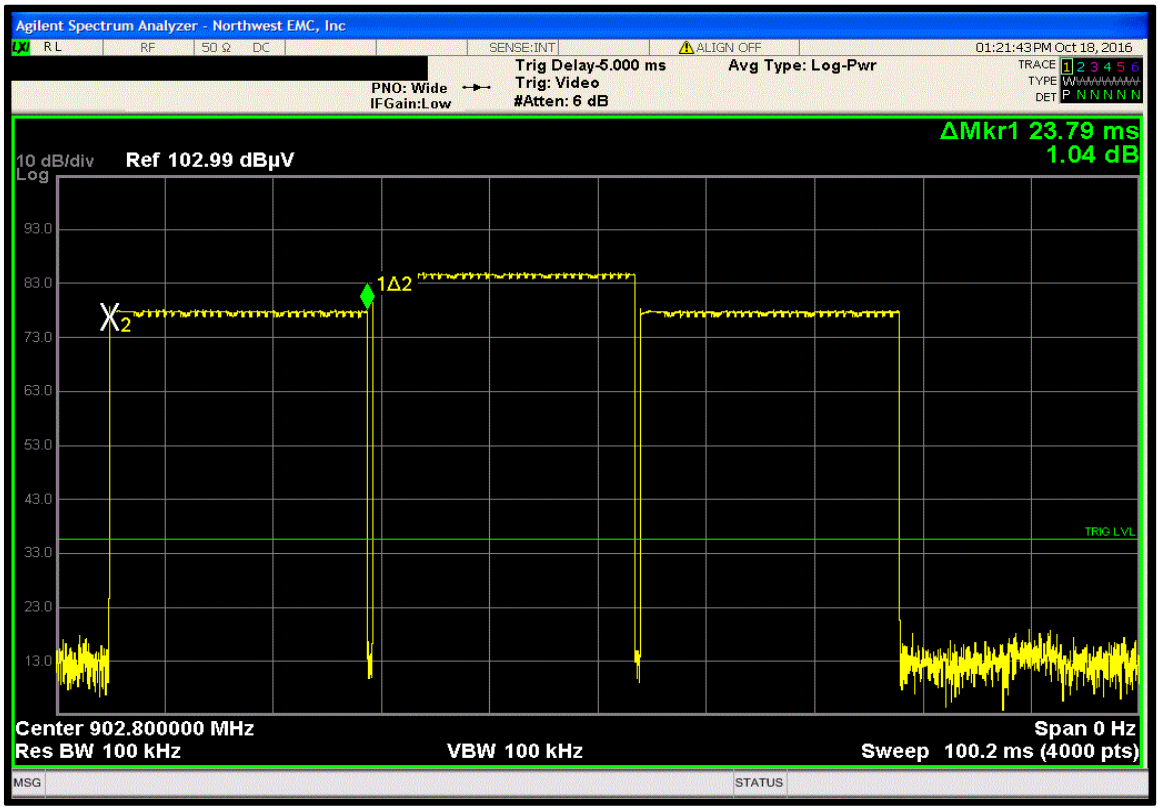
Test Specifications	**Test Method**
FCC 15.247:2016	ANSI C63.10:2013

Run #	12	**Test Distance (m)**	3	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
7321.983	41.0	13.3	1.0	220.1	-2.9	0.0	Vert	AV	0.0	51.4	54.0	-2.6	Mid channel
7322.025	39.4	13.3	1.0	188.1	-2.9	0.0	Horz	AV	0.0	49.8	54.0	-4.2	Mid channel
7418.017	37.5	13.4	1.1	183.0	-2.9	0.0	Horz	AV	0.0	48.0	54.0	-6.0	High channel
2781.758	49.8	-2.2	1.0	194.0	-2.9	0.0	Horz	AV	0.0	44.7	54.0	-9.3	High channel
2745.750	49.6	-2.5	1.0	183.0	-2.9	0.0	Horz	AV	0.0	44.2	54.0	-9.8	Mid channel
2745.808	48.8	-2.5	3.3	206.1	-2.9	0.0	Vert	AV	0.0	43.4	54.0	-10.6	Mid channel
7418.183	31.4	13.4	1.8	22.1	-2.9	0.0	Vert	AV	0.0	41.9	54.0	-12.1	High channel
4636.267	38.8	4.9	2.0	236.9	-2.9	0.0	Horz	AV	0.0	40.8	54.0	-13.2	High channel
7322.008	47.1	13.3	1.0	188.1	0.0	0.0	Horz	PK	0.0	60.4	74.0	-13.6	Mid channel
2708.242	46.0	-2.9	1.0	168.0	-2.9	0.0	Horz	AV	0.0	40.2	54.0	-13.8	Low channel
7322.150	46.2	13.3	1.0	220.1	0.0	0.0	Vert	PK	0.0	59.5	74.0	-14.5	Mid channel
2708.292	45.0	-2.9	1.0	142.1	-2.9	0.0	Vert	AV	0.0	39.2	54.0	-14.8	Low channel
4513.725	37.5	4.5	1.3	329.9	-2.9	0.0	Horz	AV	0.0	39.1	54.0	-14.9	Low channel

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
4576.292	37.1	4.7	2.2	189.0	-2.9	0.0	Horz	AV	0.0	38.9	54.0	-15.1	Mid channel
4636.350	36.8	4.9	1.1	184.1	-2.9	0.0	Vert	AV	0.0	38.8	54.0	-15.2	High channel
7417.700	44.9	13.4	1.1	183.0	0.0	0.0	Horz	PK	0.0	58.3	74.0	-15.7	High channel
2781.825	43.3	-2.2	1.0	229.9	-2.9	0.0	Vert	AV	0.0	38.2	54.0	-15.8	High channel
4576.317	36.0	4.7	2.1	229.0	-2.9	0.0	Vert	AV	0.0	37.8	54.0	-16.2	Mid channel
3611.058	39.9	0.8	1.0	131.1	-2.9	0.0	Vert	AV	0.0	37.8	54.0	-16.2	Low channel
4513.800	35.7	4.5	1.3	336.0	-2.9	0.0	Vert	AV	0.0	37.3	54.0	-16.7	Low channel
3709.100	37.9	1.5	1.6	253.9	-2.9	0.0	Vert	AV	0.0	36.5	54.0	-17.5	High channel
3661.008	38.0	1.2	1.7	256.0	-2.9	0.0	Vert	AV	0.0	36.3	54.0	-17.7	Mid channel
3661.033	37.4	1.2	1.0	203.1	-2.9	0.0	Horz	AV	0.0	35.7	54.0	-18.3	Mid channel
3610.933	37.3	0.8	1.5	201.0	-2.9	0.0	Horz	AV	0.0	35.2	54.0	-18.8	Low channel
7415.700	41.7	13.4	1.8	22.1	0.0	0.0	Vert	PK	0.0	55.1	74.0	-18.9	High channel
3709.042	36.4	1.5	1.0	191.1	-2.9	0.0	Horz	AV	0.0	35.0	54.0	-19.0	High channel
4636.383	45.7	4.9	2.0	236.9	0.0	0.0	Horz	PK	0.0	50.6	74.0	-23.4	High channel
2781.675	52.6	-2.2	1.0	194.0	0.0	0.0	Horz	PK	0.0	50.4	74.0	-23.6	High channel
4576.108	45.6	4.7	2.2	189.0	0.0	0.0	Horz	PK	0.0	50.3	74.0	-23.7	Mid channel
4513.758	45.8	4.5	1.3	329.9	0.0	0.0	Horz	PK	0.0	50.3	74.0	-23.7	Low channel
2745.858	52.5	-2.5	1.0	183.0	0.0	0.0	Horz	PK	0.0	50.0	74.0	-24.0	Mid channel
2745.742	52.0	-2.5	3.3	206.1	0.0	0.0	Vert	PK	0.0	49.5	74.0	-24.5	Mid channel
4575.825	44.5	4.7	2.1	229.0	0.0	0.0	Vert	PK	0.0	49.2	74.0	-24.8	Mid channel
4636.242	44.2	4.9	1.1	184.1	0.0	0.0	Vert	PK	0.0	49.1	74.0	-24.9	High channel
4514.100	43.7	4.5	1.3	336.0	0.0	0.0	Vert	PK	0.0	48.2	74.0	-25.8	Low channel
2708.483	50.8	-2.9	1.0	168.0	0.0	0.0	Horz	PK	0.0	47.9	74.0	-26.1	Low channel
3611.017	46.6	0.8	1.0	131.1	0.0	0.0	Vert	PK	0.0	47.4	74.0	-26.6	Low channel
3709.033	45.8	1.5	1.6	253.9	0.0	0.0	Vert	PK	0.0	47.3	74.0	-26.7	High channel
3660.867	45.6	1.2	1.0	203.1	0.0	0.0	Horz	PK	0.0	46.8	74.0	-27.2	Mid channel
3661.317	45.6	1.2	1.7	256.0	0.0	0.0	Vert	PK	0.0	46.8	74.0	-27.2	Mid channel
3709.083	45.2	1.5	1.0	191.1	0.0	0.0	Horz	PK	0.0	46.7	74.0	-27.3	High channel
3611.325	45.8	0.8	1.5	201.0	0.0	0.0	Horz	PK	0.0	46.6	74.0	-27.4	Low channel
2708.108	49.4	-2.9	1.0	142.1	0.0	0.0	Vert	PK	0.0	46.5	74.0	-27.5	Low channel
2781.792	47.9	-2.2	1.0	229.9	0.0	0.0	Vert	PK	0.0	45.7	74.0	-28.3	High channel



80% hopping mode pulse train.