

NORTHWEST EMC

Williams Sound, LLC

T45, T45NET and T45NET-D

FCC 15.207:2016

FCC 15.237:2016

72-76 MHz Transmitter

Report # WILM0013.2



NVLAP Lab Code: 200881-0

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.

CERTIFICATE OF TEST

Last Date of Test: June 02, 2016
Williams Sound, LLC
Model: T45NET-D

Radio Equipment Testing

Standards

Specification	Method
FCC 15.207:2016	ANSI C63.10:2013
FCC 15.237:2016	

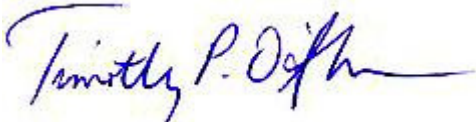
Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Occupied Bandwidth	Yes	Pass	
6.2	AC - Powerline Conducted Emissions	Yes	Pass	
6.5, 6.6	Field Strength of Harmonics and Spurious Radiated Emissions	Yes	Pass	
6.6	Field Strength of Fundamental	Yes	Pass	

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

Revision Number		Description	Date	Page Number
00		None		

ACCREDITATIONS AND AUTHORIZATIONS

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 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

Measurement Uncertainty

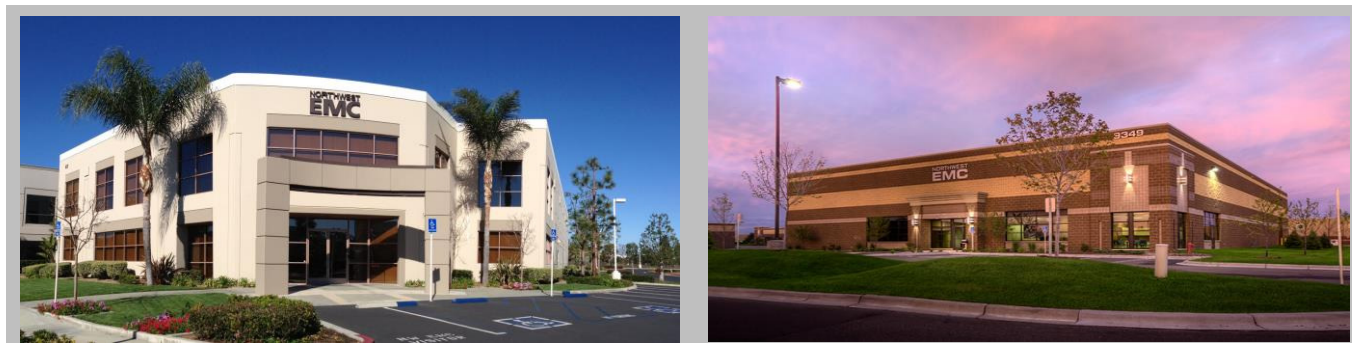
When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. Measurement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

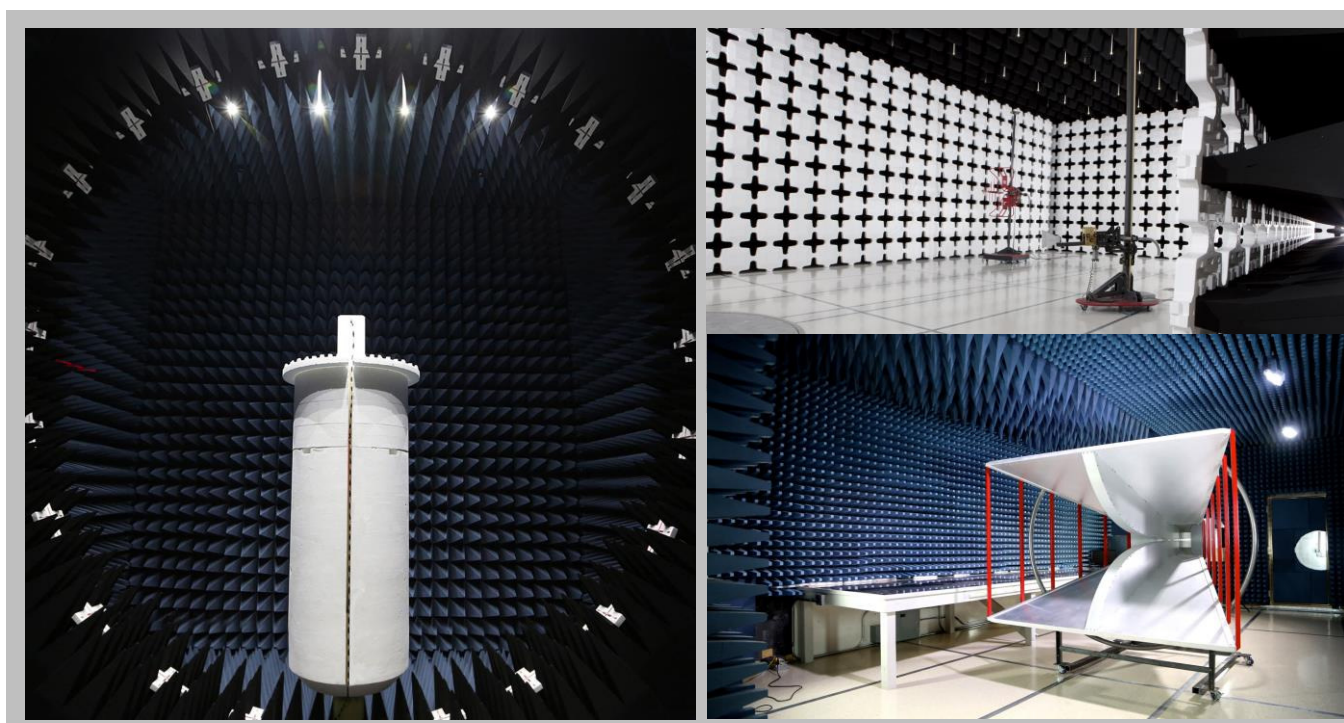
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

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



California Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	Minnesota Labs MN01-08, MN10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	New York Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	Oregon Labs EV01-12 22975 NW Evergreen Pkwy Hillsboro, OR 97124 (503) 844-4066	Texas Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Washington Labs NC01-05 19201 120 th 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
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/RRR, MIC, MOC, NCC, OFCA					
US0158	US0175	N/A	US0017	US0191	US0157



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Williams Sound, LLC
Address:	10300 Valley View Road
City, State, Zip:	Eden Prairie, MN 55344
Test Requested By:	Lawrence Herrington
Model:	T45NET-D
First Date of Test:	May 31, 2016
Last Date of Test:	June 02, 2016
Receipt Date of Samples:	May 31, 2016
Equipment Design Stage:	Preproduction
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT:

The T45 is an FM transmitter operating in the 72 - 76 MHz bands. It is used for hearing assistance and associated uses like language translation support. The T45 is capable of rack mounting. It permits a variety (4) of antennas which permit both local and remote antenna configurations. For local antennas (2) there is a hole in the top of the unit to permit attachment of the desired antenna. For remote antennas (2) there is an "F" connector mounted on the rear of the device. 4 different audio inputs are allowed. 1. Analog audio. 2. AES3 and 3. SPDIF audio, and 4. Dante audio. Depending on the selected antenna and audio source, the user may comfortably sit anywhere in the range of the device, listening on a receiver, and hear at an audio level he/she selects for their own comfort and intelligibility.

Client Justification:

The T45NET-D was tested because it is the maximum configuration, and includes the T45NET and T45 models.

1. T45 is the base unit.
2. T45NET is a T45 with an added circuit card to provide ethernet control capability.
3. T45NET-D is a T45 with an added circuit card that provides both ethernet control (T45NET) and DANTE digital audio input capability.

Testing Objective:

Demonstrate compliance to FCC 15.237:2016 for operation in the 72.0-73.0, 74.6-74.8, 75.2-76.0 MHz bands.

CONFIGURATIONS

Configuration WILM0013- 5

EUT					
Description		Manufacturer		Model/Part Number	Serial Number
Auditory Assistance Transmitter		Williams Sound, LLC		T45	3
Antenna 1		Williams Sound, LLC		ANT025	None
Peripherals in test setup boundary					
Description		Manufacturer		Model/Part Number	Serial Number
AC/DC Adaptor		SL Power Electronics		TE20A2403F02	None
Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Mains Cable	No	1.8m	No	AC Mains	AC/DC Adaptor
DC Cable	No	1.8m	No	AC/DC Adaptor	Auditory Assistance Transmitter
Headphone Cable	Yes	1.4m	No	Auditory Assistance Transmitter	Terminated
XLR Balanced Audio Cable (x2)	Yes	1.4m	No	Auditory Assistance Transmitter	Terminated
50 Ohm Line Out Cable	Yes	1.3m	No	Auditory Assistance Transmitter	Terminated
SPDIF Cable	Yes	2.9m	No	Auditory Assistance Transmitter	Terminated

Configuration WILM0013- 6

EUT					
Description		Manufacturer		Model/Part Number	Serial Number
Auditory Assistance Transmitter		Williams Sound, LLC		T45	3
Antenna 2		Williams Sound, LLC		ANT005	None
Peripherals in test setup boundary					
Description		Manufacturer		Model/Part Number	Serial Number
AC/DC Adaptor		SL Power Electronics		TE20A2403F02	None
Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Mains Cable	No	1.8m	No	AC Mains	AC/DC Adaptor
DC Cable	No	1.8m	No	AC/DC Adaptor	Auditory Assistance Transmitter
Headphone Cable	Yes	1.4m	No	Auditory Assistance Transmitter	Terminated
XLR Balanced Audio Cable (x2)	Yes	1.4m	No	Auditory Assistance Transmitter	Terminated
50 Ohm Line Out Cable	Yes	1.3m	No	Auditory Assistance Transmitter	Terminated
SPDIF Cable	Yes	2.9m	No	Auditory Assistance Transmitter	Terminated

CONFIGURATIONS

Configuration WILM0013- 7

EUT					
Description		Manufacturer		Model/Part Number	Serial Number
Auditory Assistance Transmitter		Williams Sound, LLC		T45	3
Antenna 3		Williams Sound, LLC		ANT024	None
Peripherals in test setup boundary					
Description		Manufacturer		Model/Part Number	Serial Number
AC/DC Adaptor		SL Power Electronics		TE20A2403F02	None
Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Mains Cable	No	1.8m	No	AC Mains	AC/DC Adaptor
DC Cable	No	1.8m	No	AC/DC Adaptor	Auditory Assistance Transmitter
Headphone Cable	Yes	1.4m	No	Auditory Assistance Transmitter	Terminated
XLR Balanced Audio Cable (x2)	Yes	1.4m	No	Auditory Assistance Transmitter	Terminated
50 Ohm Line Out Cable	Yes	1.3m	No	Auditory Assistance Transmitter	Terminated
SPDIF Cable	Yes	2.9m	No	Auditory Assistance Transmitter	Terminated

Configuration WILM0013- 8

EUT					
Description		Manufacturer		Model/Part Number	Serial Number
Auditory Assistance Transmitter		Williams Sound, LLC		T45	3
Antenna 4		Williams Sound, LLC		ANT021	None
Peripherals in test setup boundary					
Description		Manufacturer		Model/Part Number	Serial Number
AC/DC Adaptor		SL Power Electronics		TE20A2403F02	None
Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Mains Cable	No	1.8m	No	AC Mains	AC/DC Adaptor
DC Cable	No	1.8m	No	AC/DC Adaptor	Auditory Assistance Transmitter
Headphone Cable	Yes	1.4m	No	Auditory Assistance Transmitter	Terminated
XLR Balanced Audio Cable (x2)	Yes	1.4m	No	Auditory Assistance Transmitter	Terminated
50 Ohm Line Out Cable	Yes	1.3m	No	Auditory Assistance Transmitter	Terminated
SPDIF Cable	Yes	2.9m	No	Auditory Assistance Transmitter	Terminated

CONFIGURATIONS

Configuration WILM0013- 9

EUT					
Description		Manufacturer		Model/Part Number	Serial Number
Auditory Assistance Transmitter		Williams Sound, LLC		T45	3
Antenna 1		Williams Sound, LLC		ANT025	None
Audio Generator		GW		GAG-810	EF911826
Surge Protector		Tripp-Lite		Isobar Ultra	IB7590 2145AS0
Peripherals in test setup boundary					
Description		Manufacturer		Model/Part Number	Serial Number
AC/DC Adaptor		SL Power Electronics		TE20A2403F02	None
Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Mains Cable	No	1.8m	No	AC Mains	AC/DC Adaptor
DC Cable	No	1.8m	No	AC/DC Adaptor	Auditory Assistance Transmitter
Headphone Cable	Yes	1.4m	No	Auditory Assistance Transmitter	Terminated
50 Ohm Line Out Cable	Yes	1.3m	No	Auditory Assistance Transmitter	Terminated
SPDIF Cable	Yes	2.9m	No	Auditory Assistance Transmitter	Terminated
XLR Balanced Audio Cable	Yes	1.4m	No	Auditory Assistance Transmitter	Terminated
XLR Balanced Audio Cable	Yes	>3.0m	No	Auditory Assistance Transmitter	Transformer Box
AC Mains Cable (Audio Generator)	No	1.8m	No	Surge Protector	Audio Generator
AC Mains Cable (Surge Protector)	No	1.8m	No	Surge Protector	AC Mains
BNC Cable	Yes	1.5m	No	Transformer Box	Audio Generator

CONFIGURATIONS

Configuration WILM0013- 10

EUT					
Description		Manufacturer		Model/Part Number	Serial Number
Auditory Assistance Transmitter		Williams Sound, LLC		T45	3
Antenna 4		Williams Sound, LLC		ANT021	None
Audio Generator		GW		GAG-810	EF911826
Surge Protector		Tripp-Lite		Isobar Ultra	IB7590 2145AS0
Peripherals in test setup boundary					
Description		Manufacturer		Model/Part Number	Serial Number
AC/DC Adaptor		SL Power Electronics		TE20A2403F02	None
Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Mains Cable	No	1.8m	No	AC Mains	AC/DC Adaptor
DC Cable	No	1.8m	No	AC/DC Adaptor	Auditory Assistance Transmitter
Headphone Cable	Yes	1.4m	No	Auditory Assistance Transmitter	Terminated
50 Ohm Line Out Cable	Yes	1.3m	No	Auditory Assistance Transmitter	Terminated
SPDIF Cable	Yes	2.9m	No	Auditory Assistance Transmitter	Terminated
XLR Balanced Audio Cable	Yes	1.4m	No	Auditory Assistance Transmitter	Terminated
XLR Balanced Audio Cable	Yes	>3.0m	No	Auditory Assistance Transmitter	Transformer Box
AC Mains Cable (Audio Generator)	No	1.8m	No	Surge Protector	Audio Generator
AC Mains Cable (Surge Protector)	No	1.8m	No	Surge Protector	AC Mains
BNC Cable	Yes	1.5m	No	Transformer Box	Audio Generator

CONFIGURATIONS

Configuration WILM0013- 11

EUT					
Description		Manufacturer		Model/Part Number	Serial Number
Auditory Assistance Transmitter		Williams Sound, LLC		T45	3
Antenna 3		Williams Sound, LLC		ANT024	None
Audio Generator		GW		GAG-810	EF911826
Surge Protector		Tripp-Lite		Isobar Ultra	IB7590 2145AS0
Peripherals in test setup boundary					
Description		Manufacturer		Model/Part Number	Serial Number
AC/DC Adaptor		SL Power Electronics		TE20A2403F02	None
Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Mains Cable	No	1.8m	No	AC Mains	AC/DC Adaptor
DC Cable	No	1.8m	No	AC/DC Adaptor	Auditory Assistance Transmitter
Headphone Cable	Yes	1.4m	No	Auditory Assistance Transmitter	Terminated
50 Ohm Line Out Cable	Yes	1.3m	No	Auditory Assistance Transmitter	Terminated
SPDIF Cable	Yes	2.9m	No	Auditory Assistance Transmitter	Terminated
XLR Balanced Audio Cable	Yes	1.4m	No	Auditory Assistance Transmitter	Terminated
XLR Balanced Audio Cable	Yes	>3.0m	No	Auditory Assistance Transmitter	Transformer Box
AC Mains Cable (Audio Generator)	No	1.8m	No	Surge Protector	Audio Generator
AC Mains Cable (Surge Protector)	No	1.8m	No	Surge Protector	AC Mains
BNC Cable	Yes	1.5m	No	Transformer Box	Audio Generator

CONFIGURATIONS

Configuration WILM0013- 12

EUT					
Description		Manufacturer		Model/Part Number	Serial Number
Auditory Assistance Transmitter		Williams Sound, LLC		T45	3
Antenna 4		Williams Sound, LLC		ANT021	None
Audio Generator		GW		GAG-810	EF911826
Surge Protector		Tripp-Lite		Isobar Ultra	IB7590 2145AS0
Peripherals in test setup boundary					
Description		Manufacturer		Model/Part Number	Serial Number
AC/DC Adaptor		SL Power Electronics		TE20A2403F02	None
Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Mains Cable	No	1.8m	No	AC Mains	AC/DC Adaptor
DC Cable	No	1.8m	No	AC/DC Adaptor	Auditory Assistance Transmitter
Headphone Cable	Yes	1.4m	No	Auditory Assistance Transmitter	Terminated
50 Ohm Line Out Cable	Yes	1.3m	No	Auditory Assistance Transmitter	Terminated
SPDIF Cable	Yes	2.9m	No	Auditory Assistance Transmitter	Terminated
XLR Balanced Audio Cable	Yes	1.4m	No	Auditory Assistance Transmitter	Terminated
XLR Balanced Audio Cable	Yes	>3.0m	No	Auditory Assistance Transmitter	Transformer Box
AC Mains Cable (Audio Generator)	No	1.8m	No	Surge Protector	Audio Generator
AC Mains Cable (Surge Protector)	No	1.8m	No	Surge Protector	AC Mains
BNC Cable	Yes	1.5m	No	Transformer Box	Audio Generator

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	5/31/2016	Field Strength of Fundamental	Modified from delivered configuration.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
2	6/2/2016	Occupied Bandwidth	Modified from delivered configuration.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
3	6/2/2016	Field Strength of Harmonics and Spurious Radiated Emissions	Modified from delivered configuration.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
4	6/2/2016	AC – Powerline Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

OCCUPIED BANDWIDTH

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.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mo)
Attenuator	Fairview Microwave	SA18E-20	TWZ	10/21/2015	12
Cable	ESM Cable Corp.	Bilog Cables	MNH	12/7/2015	12
Antenna - Biconilog	Teseq	CBL 6141B	AYD	1/6/2016	24
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFI	1/27/2016	12

TEST DESCRIPTION

The 20dB occupied bandwidth was measured using a Peak detector. The resolution bandwidth was set to 1-3% of the measured emissions bandwidth.

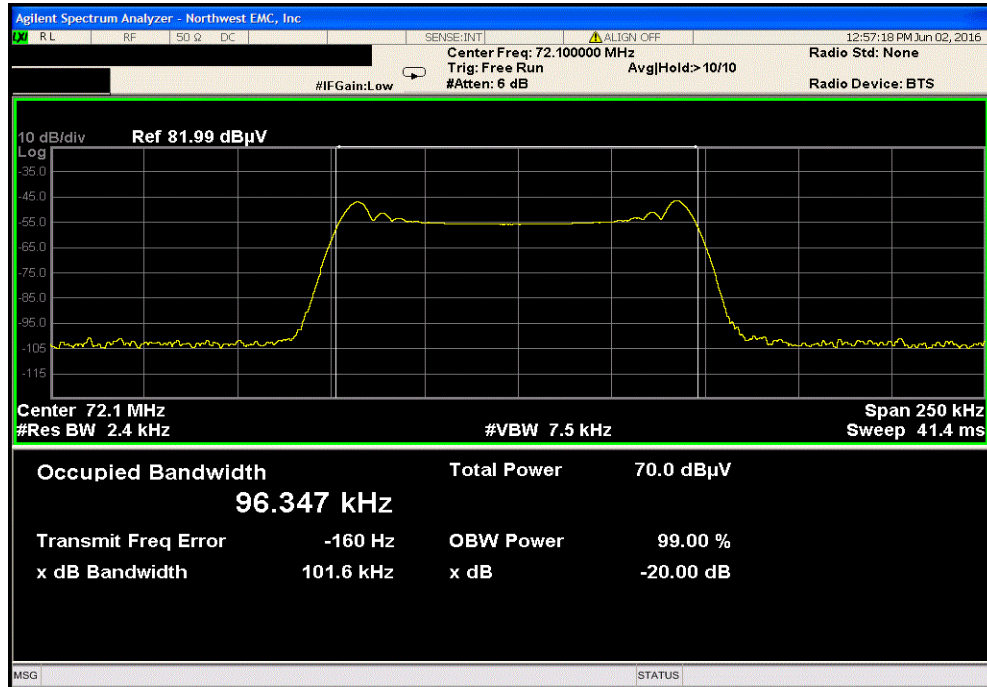
The EUT was set to low, medium and high transmit frequencies. The measurement was made in a radiated configuration in a semi-anechoic chamber with the fundamental of the carrier full maximized for its highest radiated power. The EUT was transmitting at the data rate(s) listed in the datasheet.

OCCUPIED BANDWIDTH

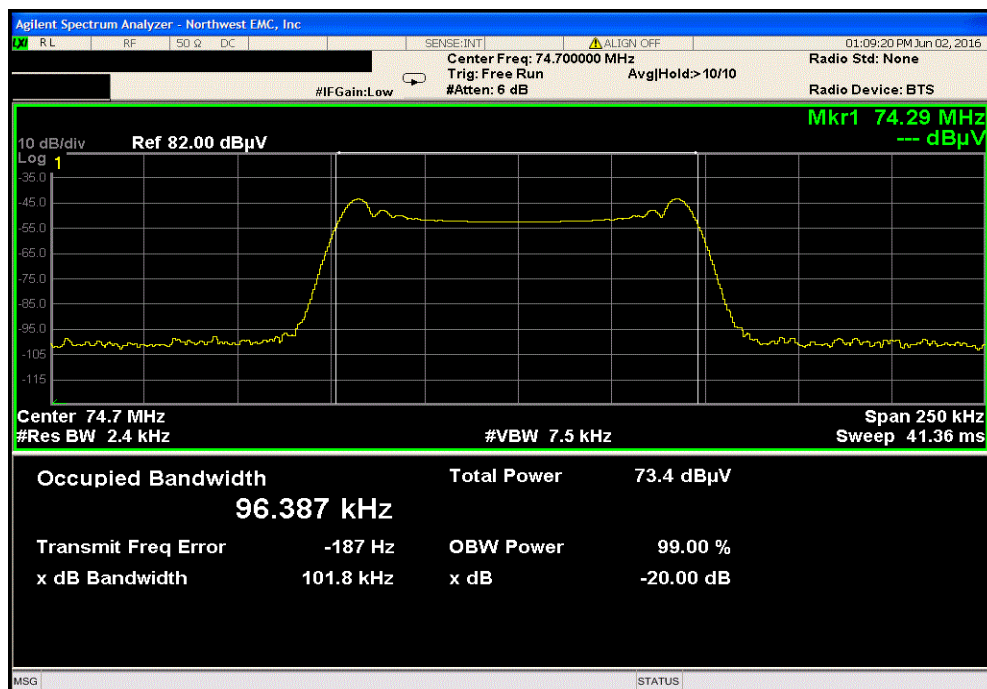
EUT: T45NET-D		Work Order: WILM0013	
Serial Number: 3		Date: 06/02/16	
Customer: Williams Sound, LLC		Temperature: 22.4°C	
Attendees: Lawrence Herrington, Kelly Williams		Humidity: 42%	
Project: None		Barometric Pres.: 988.1	
Tested by: Dustin Sparks	Power: 110VAC/60Hz	Job Site: MN05	
TEST SPECIFICATIONS			
FCC 15.237:2016		Test Method	
		ANSI C63.10:2013	
COMMENTS			
ANT005 antenna			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	12	Signature 	
		Value	Limit
Low Channel, 72.1 MHz		101.6 kHz	< 200 kHz
Mid Channel, 74.7 MHz		101.8 kHz	< 200 kHz
High Channel, 75.9 MHz		102.0 kHz	< 200 kHz
			Result
			Pass
			Pass
			Pass

OCCUPIED BANDWIDTH

Low Channel, 72.1 MHz						
				Value	Limit	Result
				101.6 kHz	< 200 kHz	Pass

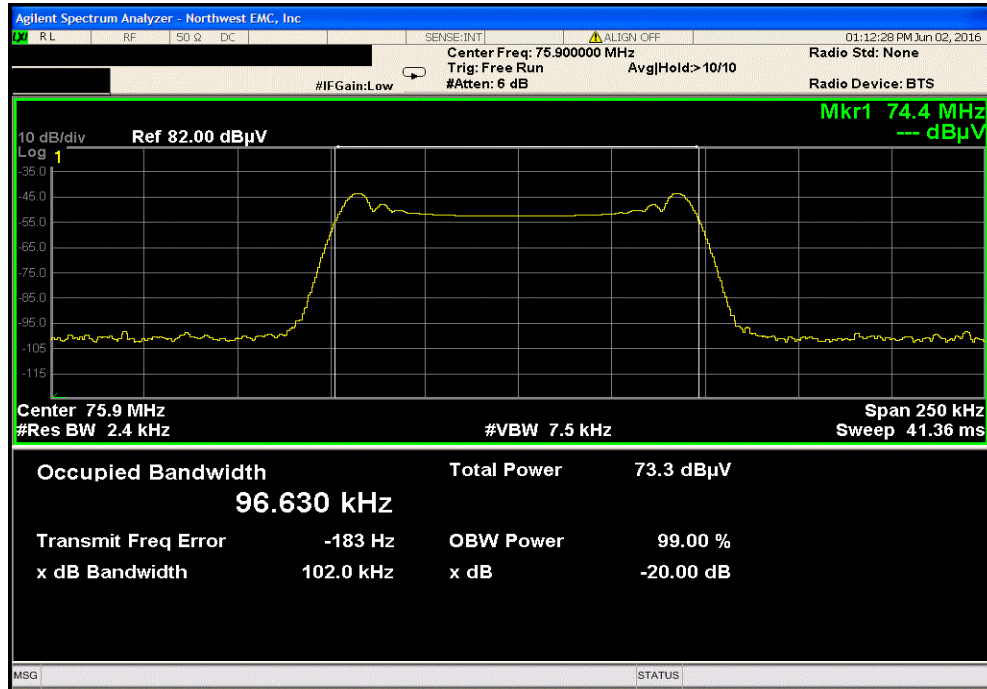


Mid Channel, 74.7 MHz						
				Value	Limit	Result
				101.8 kHz	< 200 kHz	Pass



OCCUPIED BANDWIDTH

High Channel, 75.9 MHz						
				Value	Limit	Result
				102.0 kHz	< 200 kHz	Pass



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

Transmitting 72.1 MHz, 74.7 MHz, and 75.9 MHz CW

POWER SETTINGS INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

WILM0013 - 5

WILM0013 - 6

WILM0013 - 7

WILM0013 - 8

FREQUENCY RANGE INVESTIGATED

Start Frequency 72 MHz

Stop Frequency 76 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 (mo)
Attenuator	Fairview Microwave	SA18E-10	TYA	10/21/2015	12
Cable	ESM Cable Corp.	Bilog Cables	MNH	12/7/2015	12
Antenna - Biconilog	Teseq	CBL 6141B	AYD	1/6/2016	24
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFI	1/27/2016	12

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

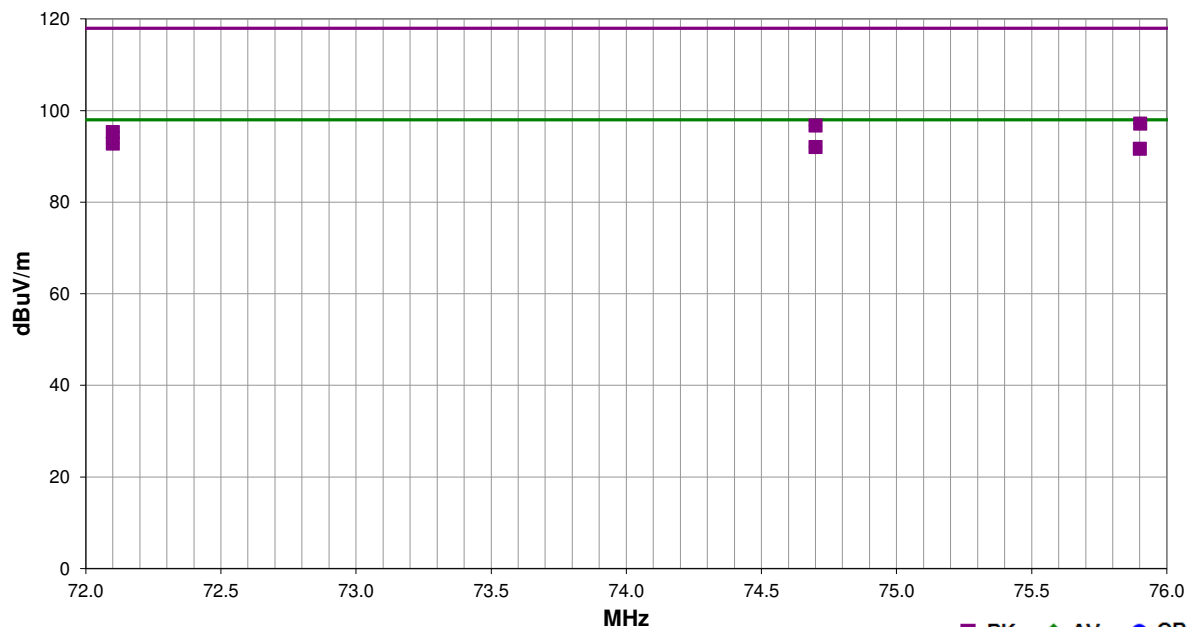
TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was transmitting and while set at the lowest channel, a middle channel, and the highest channel available. While scanning, emissions from the EUT were maximized by rotating the EUT, adjusting the measurement antenna height and polarization, and manipulating the EUT and EUT antenna in 3 orthogonal planes.

Work Order:	WILM0013	Date:	05/31/16	
Project:	None	Temperature:	22.1 °C	
Job Site:	MN05	Humidity:	56.3% RH	
Serial Number:	3	Barometric Pres.:	1014 mbar	
EUT:	T45NET-D			
Configuration:	5			
Customer:	Williams Sound, LLC			
Attendees:	Lawrence Herrington, Kelly Williams, Tom Lake			
EUT Power:	110VAC/60Hz			
Operating Mode:	Transmitting 72.1 MHz (low channel), 74.7 MHz (mid channel), and 75.9 MHz (high channel) CW			
Deviations:	None			
Comments:	ANT025 antenna, R36 and R35=330 ohms, R33=36 ohms, R40=39 ohms. Per manufacturer, EUT antenna will always be mounted in vertical position. Coax port is only populated when external antenna is used.			

Test Specifications	Test Method
FCC 15.237:2016	ANSI C63.10:2013

Run #	17	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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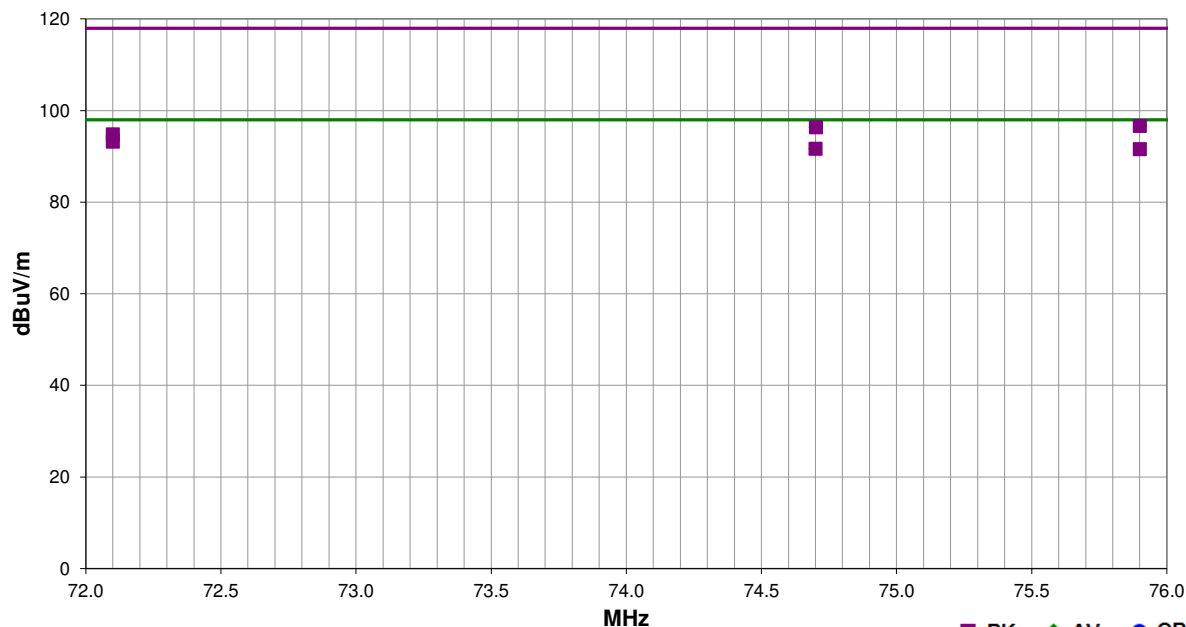


Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
75.900	75.4	11.8	1.0	231.0	3.0	10.0	Vert	AV	0.0	97.2	98.0	-0.8	High channel
74.700	75.0	11.7	1.0	215.0	3.0	10.0	Vert	AV	0.0	96.7	98.0	-1.3	Mid channel
72.102	73.4	11.8	1.0	235.9	3.0	10.0	Vert	AV	0.0	95.2	98.0	-2.8	Low channel
72.100	71.0	11.8	4.0	346.0	3.0	10.0	Horz	AV	0.0	92.8	98.0	-5.2	Low channel
74.700	70.3	11.7	4.0	347.9	3.0	10.0	Horz	AV	0.0	92.0	98.0	-6.0	Mid channel
75.900	69.9	11.8	4.0	336.9	3.0	10.0	Horz	AV	0.0	91.7	98.0	-6.3	High channel
75.902	75.4	11.8	1.0	231.0	3.0	10.0	Vert	PK	0.0	97.2	118.0	-20.8	High channel
74.700	75.0	11.7	1.0	215.0	3.0	10.0	Vert	PK	0.0	96.7	118.0	-21.3	Mid channel
72.100	73.5	11.8	1.0	235.9	3.0	10.0	Vert	PK	0.0	95.3	118.0	-22.7	Low channel
72.100	71.0	11.8	4.0	346.0	3.0	10.0	Horz	PK	0.0	92.8	118.0	-25.2	Low channel
74.700	70.3	11.7	4.0	347.9	3.0	10.0	Horz	PK	0.0	92.0	118.0	-26.0	Mid channel
75.900	69.9	11.8	4.0	336.9	3.0	10.0	Horz	PK	0.0	91.7	118.0	-26.3	High channel

Work Order:	WILM0013	Date:	05/31/16	
Project:	None	Temperature:	22.1 °C	
Job Site:	MN05	Humidity:	56.3% RH	
Serial Number:	3	Barometric Pres.:	1014 mbar	
EUT:	T45NET-D			
Configuration:	6			
Customer:	Williams Sound, LLC			
Attendees:	Lawrence Herrington, Kelly Williams, Tom Lake			
EUT Power:	110VAC/60Hz			
Operating Mode:	Transmitting 72.1 MHz (low channel), 74.7 MHz (mid channel), and 75.9 MHz (high channel) CW			
Deviations:	None			
Comments:	ANT005 antenna, R36 and R35=330 ohms, R33=36 ohms, R40=39 ohms. Per manufacturer, EUT antenna will always be mounted in vertical position. Coax port is only populated when external antenna is used.			

Test Specifications	Test Method
FCC 15.237:2016	ANSI C63.10:2013

Run #	19	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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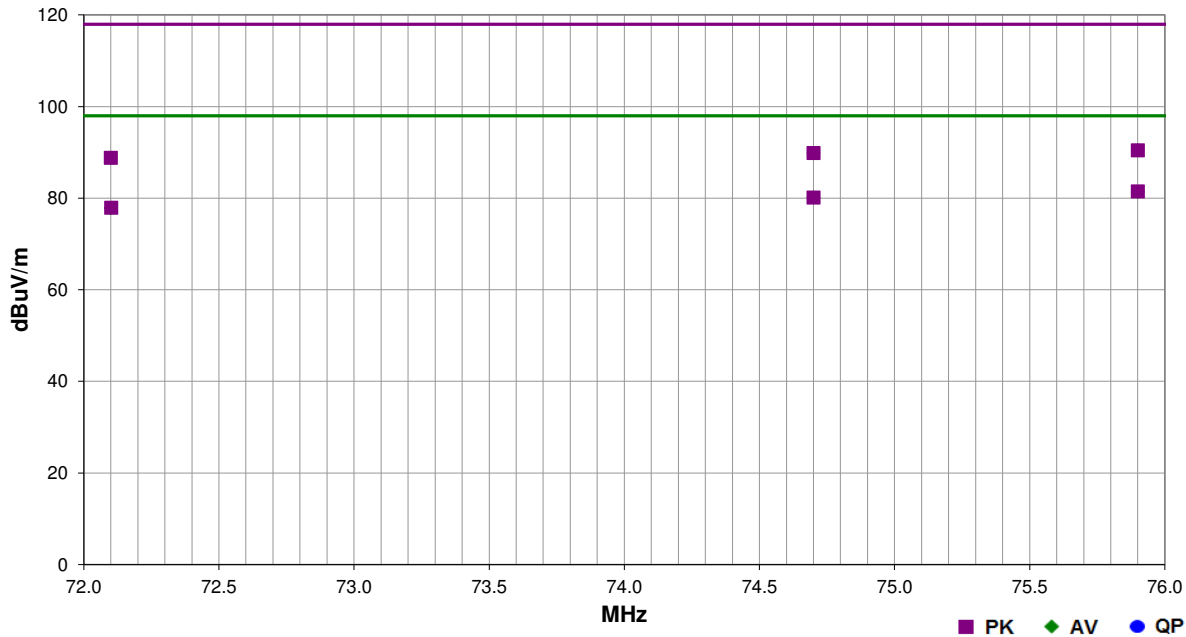


Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
75.902	74.9	11.8	1.0	24.0	3.0	10.0	Vert	AV	0.0	96.7	98.0	-1.3	High channel
74.700	74.6	11.7	1.0	6.0	3.0	10.0	Vert	AV	0.0	96.3	98.0	-1.7	Mid channel
72.100	73.0	11.8	1.3	5.1	3.0	10.0	Vert	AV	0.0	94.8	98.0	-3.2	Low channel
72.100	71.4	11.8	4.0	348.9	3.0	10.0	Horz	AV	0.0	93.2	98.0	-4.8	Low channel
74.700	69.9	11.7	3.9	235.0	3.0	10.0	Horz	AV	0.0	91.6	98.0	-6.4	Mid channel
75.900	69.8	11.8	4.0	231.0	3.0	10.0	Horz	AV	0.0	91.6	98.0	-6.4	High channel
75.900	74.9	11.8	1.0	24.0	3.0	10.0	Vert	PK	0.0	96.7	118.0	-21.3	High channel
74.702	74.6	11.7	1.0	6.0	3.0	10.0	Vert	PK	0.0	96.3	118.0	-21.7	Mid channel
72.100	73.0	11.8	1.3	5.1	3.0	10.0	Vert	PK	0.0	94.8	118.0	-23.2	Low channel
72.100	71.4	11.8	4.0	348.9	3.0	10.0	Horz	PK	0.0	93.2	118.0	-24.8	Low channel
74.700	69.9	11.7	3.9	235.0	3.0	10.0	Horz	PK	0.0	91.6	118.0	-26.4	Mid channel
75.900	69.8	11.8	4.0	231.0	3.0	10.0	Horz	PK	0.0	91.6	118.0	-26.4	High channel

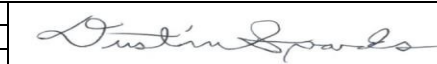
Work Order:	WILM0013	Date:	05/31/16	
Project:	None	Temperature:	22.1 °C	
Job Site:	MN05	Humidity:	56.3% RH	
Serial Number:	3	Barometric Pres.:	1014 mbar	
EUT:	T45NET-D			
Configuration:	7			
Customer:	Williams Sound, LLC			
Attendees:	Lawrence Herrington, Kelly Williams, Tom Lake			
EUT Power:	110VAC/60Hz			
Operating Mode:	Transmitting 72.1 MHz (low channel), 74.7 MHz (mid channel), and 75.9 MHz (high channel) CW			
Deviations:	None			
Comments:	ANT024 antenna, R36 and R35=330 ohms, R33=36 ohms, R40=39 ohms. Per manufacturer, EUT antenna will always be mounted in vertical position. Coax port is only populated when external antenna is used.			

Test Specifications	Test Method
FCC 15.237:2016	ANSI C63.10:2013

Run #	20	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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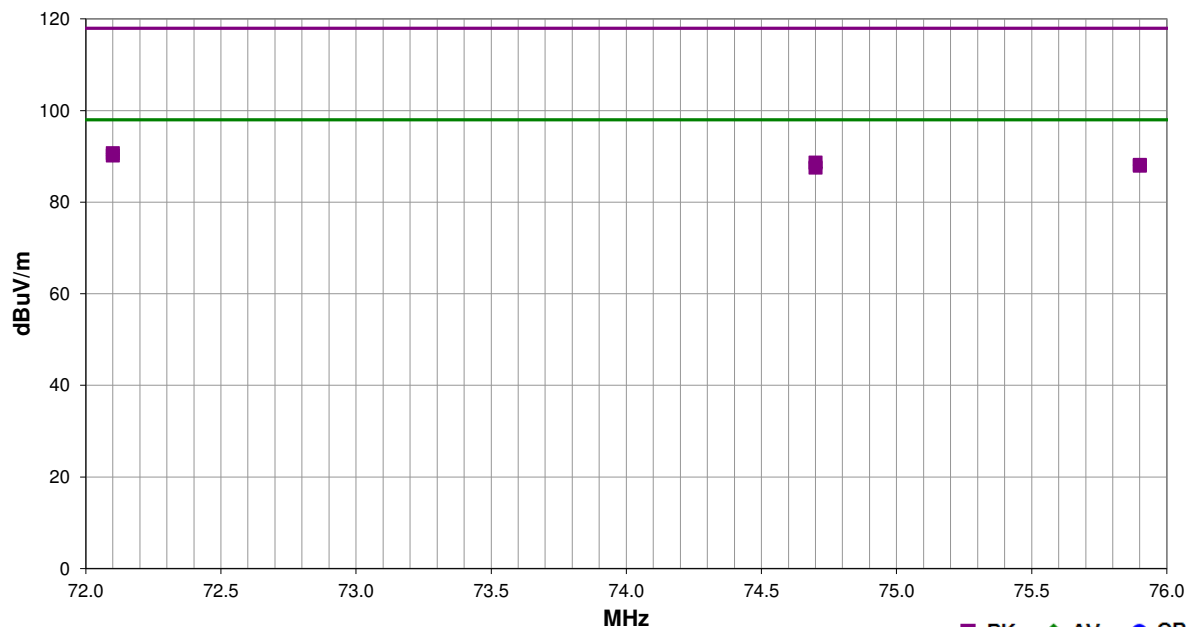


Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
75.900	68.7	11.8	1.0	242.0	3.0	10.0	Vert	AV	0.0	90.5	98.0	-7.5	High channel
74.700	68.1	11.7	1.0	239.0	3.0	10.0	Vert	AV	0.0	89.8	98.0	-8.2	Mid channel
72.100	67.0	11.8	1.4	279.0	3.0	10.0	Vert	AV	0.0	88.8	98.0	-9.2	Low channel
75.900	59.6	11.8	2.1	163.1	3.0	10.0	Horz	AV	0.0	81.4	98.0	-16.6	High channel
74.700	58.4	11.7	2.1	179.0	3.0	10.0	Horz	AV	0.0	80.1	98.0	-17.9	Mid channel
72.100	56.0	11.8	2.1	183.0	3.0	10.0	Horz	AV	0.0	77.8	98.0	-20.2	Low channel
75.900	68.7	11.8	1.0	242.0	3.0	10.0	Vert	PK	0.0	90.5	118.0	-27.5	High channel
74.700	68.1	11.7	1.0	239.0	3.0	10.0	Vert	PK	0.0	89.8	118.0	-28.2	Mid channel
72.100	67.0	11.8	1.4	279.0	3.0	10.0	Vert	PK	0.0	88.8	118.0	-29.2	Low channel
75.900	59.7	11.8	2.1	163.1	3.0	10.0	Horz	PK	0.0	81.5	118.0	-36.5	High channel
74.700	58.4	11.7	2.1	179.0	3.0	10.0	Horz	PK	0.0	80.1	118.0	-37.9	Mid channel
72.102	56.1	11.8	2.1	183.0	3.0	10.0	Horz	PK	0.0	77.9	118.0	-40.1	Low channel

Work Order:	WILM0013	Date:	05/31/16	
Project:	None	Temperature:	22.1 °C	
Job Site:	MN05	Humidity:	56.3% RH	
Serial Number:	3	Barometric Pres.:	1014 mbar	
EUT:	T45NET-D			
Configuration:	8			
Customer:	Williams Sound, LLC			
Attendees:	Lawrence Herrington, Kelly Williams, Tom Lake			
EUT Power:	110VAC/60Hz			
Operating Mode:	Transmitting 72.1 MHz (low channel), 74.7 MHz (mid channel), and 75.9 MHz (high channel) CW			
Deviations:	None			
Comments:	ANT021 antenna, R36 and R35=330 ohms, R33=36 ohms, R40=39 ohms. Per manufacturer, EUT antenna will always be mounted in vertical position. Coax port is only populated when external antenna is used.			

Test Specifications	Test Method
FCC 15.237:2016	ANSI C63.10:2013

Run #	21	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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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
72.100	68.8	11.8	3.9	306.0	3.0	10.0	Horz	AV	0.0	90.6	98.0	-7.4	Low channel
72.100	68.4	11.8	1.7	74.0	3.0	10.0	Vert	AV	0.0	90.2	98.0	-7.8	Low channel
74.700	66.8	11.7	4.0	147.0	3.0	10.0	Horz	AV	0.0	88.5	98.0	-9.5	Mid channel
75.900	66.4	11.8	4.0	156.1	3.0	10.0	Horz	AV	0.0	88.2	98.0	-9.8	High channel
75.900	66.2	11.8	1.0	86.0	3.0	10.0	Vert	AV	0.0	88.0	98.0	-10.0	High channel
74.702	65.8	11.7	1.0	72.0	3.0	10.0	Vert	AV	0.0	87.5	98.0	-10.5	Mid channel
72.100	68.9	11.8	3.9	306.0	3.0	10.0	Horz	PK	0.0	90.7	118.0	-27.3	Low channel
72.100	68.4	11.8	1.7	74.0	3.0	10.0	Vert	PK	0.0	90.2	118.0	-27.8	Low channel
74.700	66.9	11.7	4.0	147.0	3.0	10.0	Horz	PK	0.0	88.6	118.0	-29.4	Mid channel
75.900	66.4	11.8	4.0	156.1	3.0	10.0	Horz	PK	0.0	88.2	118.0	-29.8	High channel
75.900	66.2	11.8	1.0	86.0	3.0	10.0	Vert	PK	0.0	88.0	118.0	-30.0	High channel
74.700	65.8	11.7	1.0	72.0	3.0	10.0	Vert	PK	0.0	87.5	118.0	-30.5	Mid channel

FIELD STRENGTH OF HARMONICS AND 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 - HARMONICS

Transmitting 72.1 MHz (low channel), 74.7 MHz (mid channel), and 75.9 MHz (high channel); modulated with 1000 Hz sine wave at 200mVRMS.

MODES OF OPERATION - BAND EDGE

Transmitting 72.1 MHz, 72.9 MHz (low band), 74.7 MHz (mid band), and 75.3 MHz, 75.9 MHz (high band); modulated with 1000 Hz sine wave at 200mVRMS.

POWER SETTINGS INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

WILM0013 - 12

WILM0013 - 11

WILM0013 - 10

WILM0013 - 9

FREQUENCY RANGE INVESTIGATED

Start Frequency | 30 MHz

Stop Frequency | 1000 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 (mo)
Attenuator	Fairview Microwave	SA18E-20	TWZ	10/21/2015	12
Filter - High Pass	Mini Circuits	BHP-150+	HIA	11/12/2015	12
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AVO	12/10/2015	12
Cable	ESM Cable Corp.	Bilog Cables	MNH	12/7/2015	12
Antenna - Biconilog	Teseq	CBL 6141B	AYD	1/6/2016	24
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFI	1/27/2016	12

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

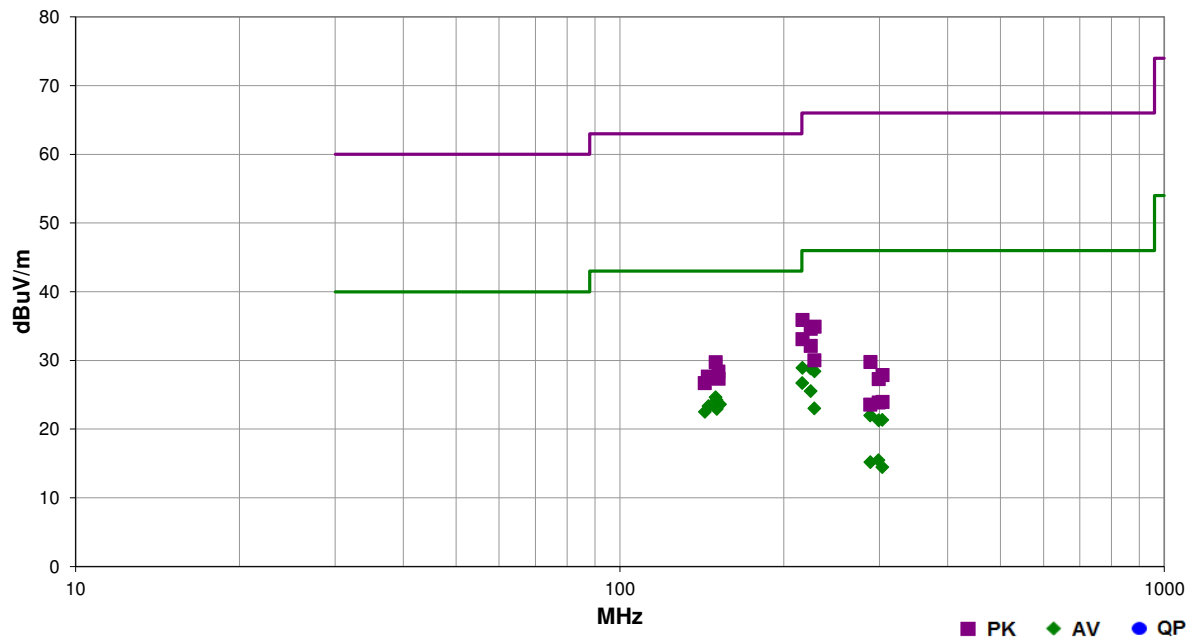
The highest gain of each type of antenna to be used with the EUT was tested. The EUT was configured for low, mid, and high band transmit frequencies. For each configuration, the spectrum was scanned throughout the specified range. In addition, measurements were made in the restricted bands to verify compliance. While scanning, emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and the EUT antenna in three orthogonal axis, and adjusting measurement antenna height and polarization. A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.

Measurements at the band edge were taken according to the method called out in ANSI C63.10:2013 section 6.10.6 for Marker-Delta Method. The fundamental was measured using standard bandwidths and measurement detectors. A screen capture using a resolution bandwidth greater than the 1 percent emissions bandwidth was taken using a marker delta measurement of the highest value outside of the band compared to the highest value in the band. This offset was added to the reading of the fundamental to calculate the band edge reading.

Work Order:	WILM0013	Date:	06/01/16		
Project:	None	Temperature:	22.8 °C		
Job Site:	MN05	Humidity:	51.5% RH		
Serial Number:	3	Barometric Pres.:	1013 mbar	Tested by:	Dustin Sparks
EUT:	T45NET-D				
Configuration:	9				
Customer:	Williams Sound, LLC				
Attendees:	Lawrence Herrington, Kelly Williams				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting 72.1 MHz (low channel), 74.7 MHz (mid channel), and 75.9 MHz (high channel); modulated with 1000 Hz sine wave at 200mVRMS.				
Deviations:	None				
Comments:	ANT025 antenna. Per manufacturer, EUT antenna will always be mounted in vertical position. Coax port is only populated when external antenna is used.				

Test Specifications	Test Method
FCC 15.237:2015	ANSI C63.10:2009

Run #	27	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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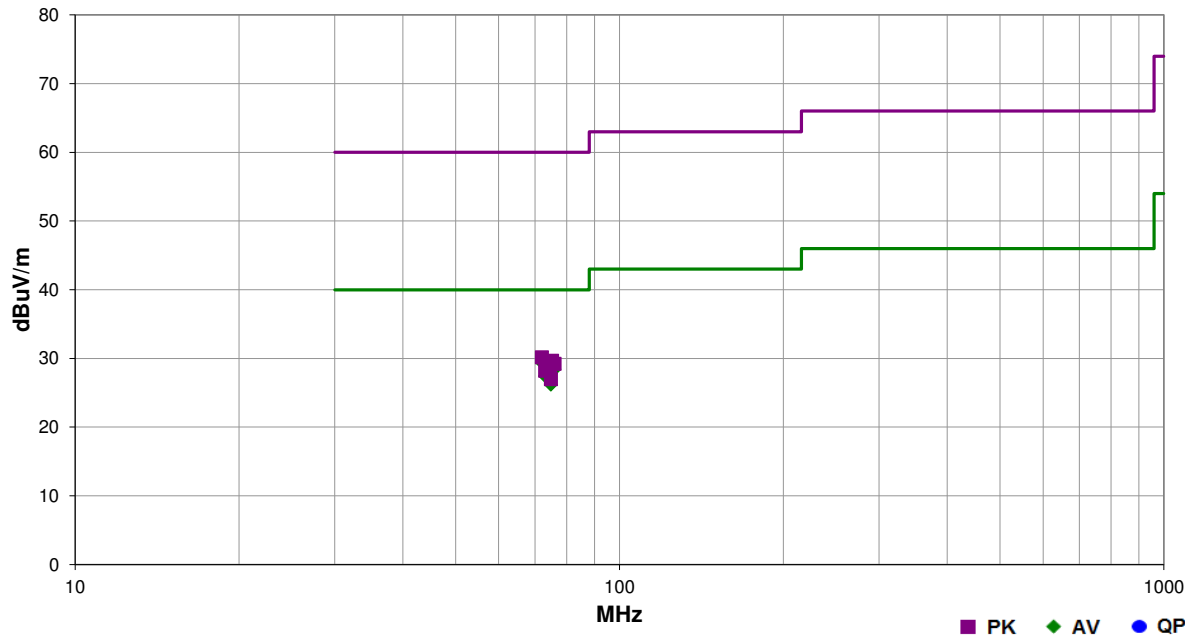
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
216.420	32.8	-3.9	1.9	77.1	3.0	0.0	Horz	AV	0.0	28.9	46.0	-17.1	Low channel
224.200	32.5	-3.7	1.5	70.1	3.0	0.0	Horz	AV	0.0	28.8	46.0	-17.2	Mid channel
227.810	32.2	-3.8	1.5	117.0	3.0	0.0	Horz	AV	0.0	28.4	46.0	-17.6	High channel
149.935	28.9	-4.3	1.0	4.1	3.0	0.0	Vert	AV	0.0	24.6	43.0	-18.4	Mid channel
150.600	28.5	-4.3	1.0	22.1	3.0	0.0	Vert	AV	0.0	24.2	43.0	-18.8	High channel
216.370	30.6	-3.9	1.3	319.9	3.0	0.0	Vert	AV	0.0	26.7	46.0	-19.3	Low channel
152.825	28.0	-4.4	1.8	111.0	3.0	0.0	Horz	AV	0.0	23.6	43.0	-19.4	High channel
145.475	27.5	-4.2	1.0	354.0	3.0	0.0	Vert	AV	0.0	23.3	43.0	-19.7	Low channel
150.645	27.2	-4.3	2.5	127.1	3.0	0.0	Horz	AV	0.0	22.9	43.0	-20.1	Mid channel
224.195	29.2	-3.7	1.5	301.9	3.0	0.0	Vert	AV	0.0	25.5	46.0	-20.5	Mid channel
143.290	26.6	-4.1	1.8	326.9	3.0	0.0	Horz	AV	0.0	22.5	43.0	-20.5	Low channel
227.735	26.8	-3.8	1.3	332.0	3.0	0.0	Vert	AV	0.0	23.0	46.0	-23.0	High channel
288.295	24.6	-2.6	1.0	103.0	3.0	0.0	Horz	AV	0.0	22.0	46.0	-24.0	Low channel
303.380	23.1	-1.8	1.0	104.0	3.0	0.0	Horz	AV	0.0	21.3	46.0	-24.7	High channel
298.925	23.4	-2.1	1.1	103.0	3.0	0.0	Horz	AV	0.0	21.3	46.0	-24.7	Mid channel
216.430	39.8	-3.9	1.9	77.1	3.0	0.0	Horz	PK	0.0	35.9	66.0	-30.1	Low channel
298.650	17.6	-2.1	1.2	340.0	3.0	0.0	Vert	AV	0.0	15.5	46.0	-30.5	Mid channel
288.540	17.8	-2.6	2.5	288.0	3.0	0.0	Vert	AV	0.0	15.2	46.0	-30.8	Low channel
227.795	38.7	-3.8	1.5	117.0	3.0	0.0	Horz	PK	0.0	34.9	66.0	-31.1	High channel
224.255	38.3	-3.7	1.5	70.1	3.0	0.0	Horz	PK	0.0	34.6	66.0	-31.4	Mid channel
303.495	16.2	-1.7	1.0	358.0	3.0	0.0	Vert	AV	0.0	14.5	46.0	-31.5	High channel
216.425	37.0	-3.9	1.3	319.9	3.0	0.0	Vert	PK	0.0	33.1	66.0	-32.9	Low channel

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
149.965	34.0	-4.3	1.0	4.1	3.0	0.0	Vert	PK	0.0	29.7	63.0	-33.3	Mid channel
224.120	35.8	-3.7	1.5	301.9	3.0	0.0	Vert	PK	0.0	32.1	66.0	-33.9	Mid channel
151.650	32.7	-4.3	1.0	22.1	3.0	0.0	Vert	PK	0.0	28.4	63.0	-34.6	High channel
145.075	31.8	-4.1	1.0	354.0	3.0	0.0	Vert	PK	0.0	27.7	63.0	-35.3	Low channel
149.515	31.7	-4.3	2.5	127.1	3.0	0.0	Horz	PK	0.0	27.4	63.0	-35.6	Mid channel
151.820	31.7	-4.3	1.8	111.0	3.0	0.0	Horz	PK	0.0	27.4	63.0	-35.6	High channel
227.710	33.8	-3.8	1.3	332.0	3.0	0.0	Vert	PK	0.0	30.0	66.0	-36.0	High channel
288.570	32.4	-2.6	1.0	103.0	3.0	0.0	Horz	PK	0.0	29.8	66.0	-36.2	Low channel
143.195	30.8	-4.1	1.8	326.9	3.0	0.0	Horz	PK	0.0	26.7	63.0	-36.3	Low channel
303.820	29.6	-1.7	1.0	104.0	3.0	0.0	Horz	PK	0.0	27.9	66.0	-38.1	High channel
298.940	29.4	-2.1	1.1	103.0	3.0	0.0	Horz	PK	0.0	27.3	66.0	-38.7	Mid channel
303.750	25.7	-1.7	1.0	358.0	3.0	0.0	Vert	PK	0.0	24.0	66.0	-42.0	High channel
298.825	26.0	-2.1	1.2	340.0	3.0	0.0	Vert	PK	0.0	23.9	66.0	-42.1	Mid channel
288.260	26.2	-2.6	2.5	288.0	3.0	0.0	Vert	PK	0.0	23.6	66.0	-42.4	Low channel

Work Order:	WILM0013	Date:	06/01/16	
Project:	None	Temperature:	22.8 °C	
Job Site:	MN05	Humidity:	51.5% RH	
Serial Number:	3	Barometric Pres.:	1013 mbar	
EUT:	T45NET-D			
Configuration:	9			
Customer:	Williams Sound, LLC			
Attendees:	Lawrence Herrington, Kelly Williams			
EUT Power:	110VAC/60Hz			
Operating Mode:	Transmitting 72.1 MHz, 72.9 MHz (low band), 74.7 MHz (mid band), and 75.3 MHz, 75.9 MHz (high band); modulated with 1000 Hz sine wave at 200mVRMS.			
Deviations:	None			
Comments:	ANT025 antenna. Per manufacturer, EUT antenna will always be mounted in vertical position. Coax port is only populated when external antenna is used.			

Test Specifications	Test Method
FCC 15.237:2015	ANSI C63.10:2009

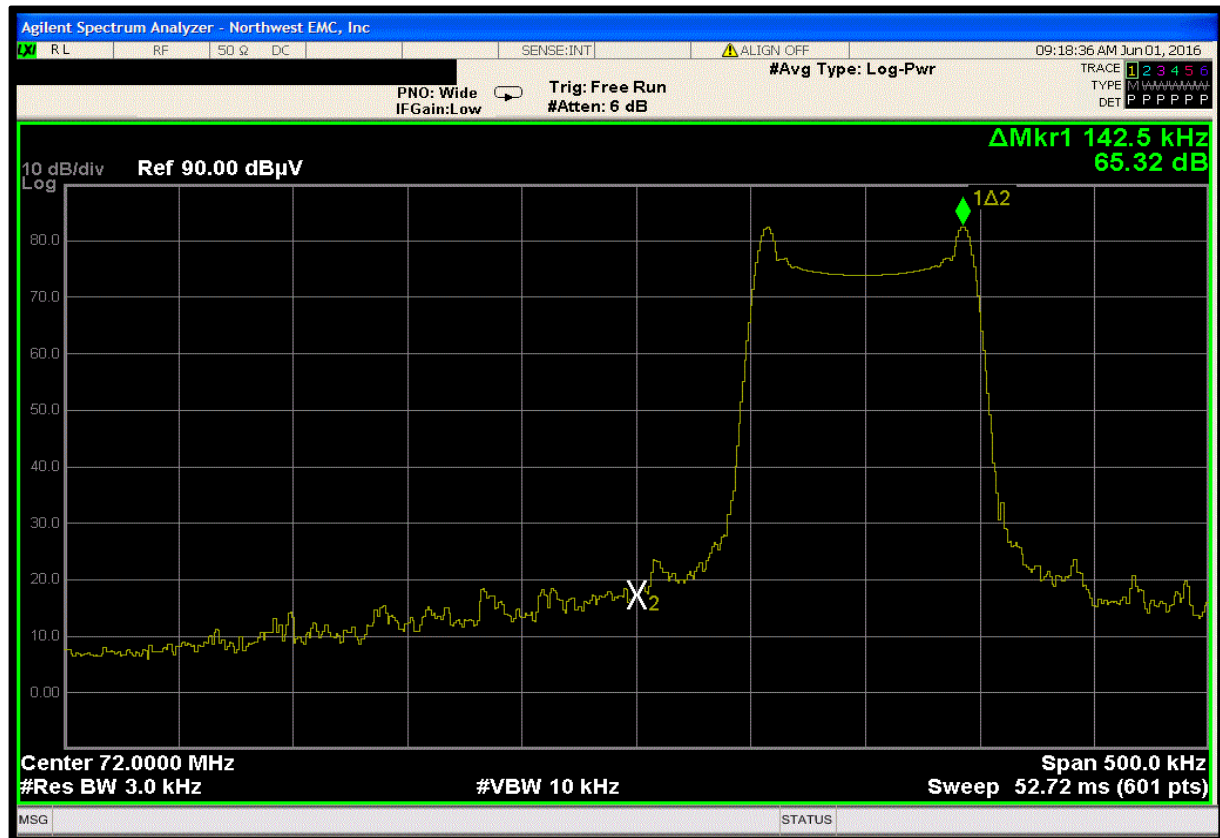
Run #	27	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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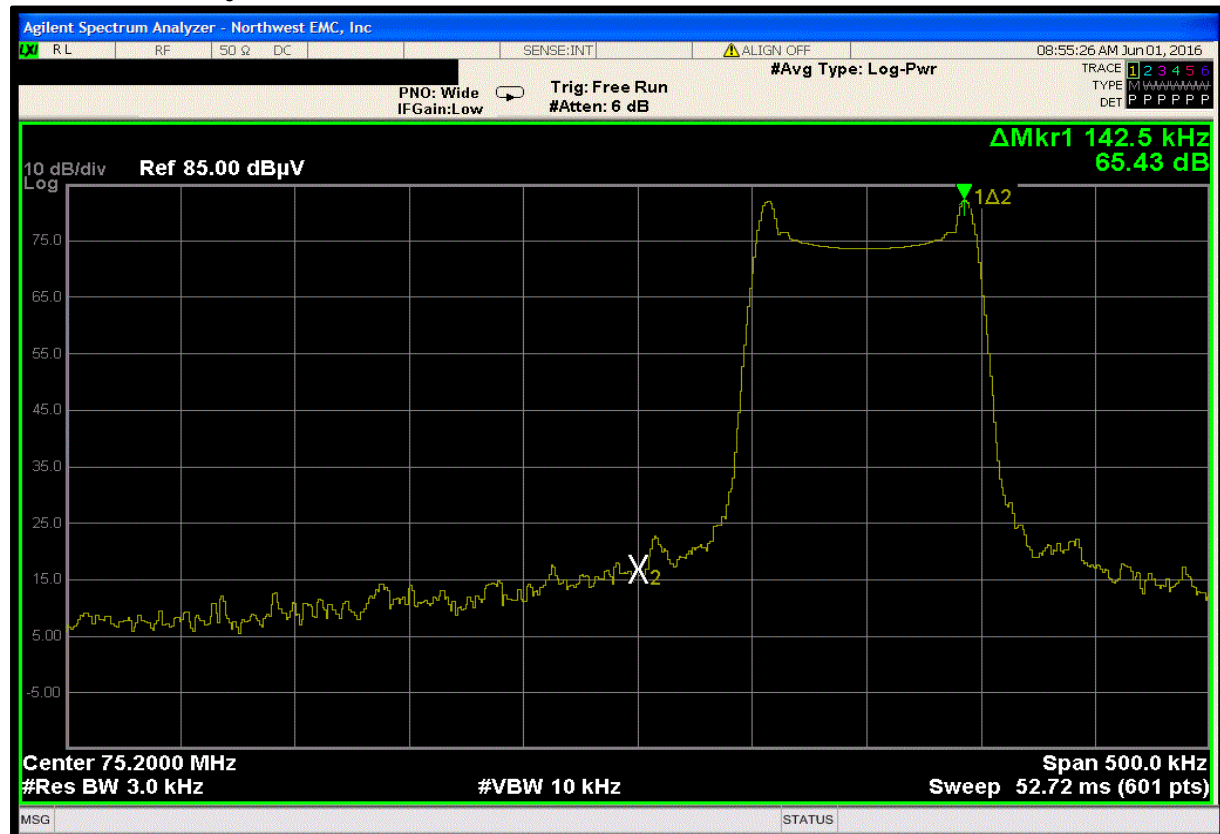
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
72.100	84.3	-9.6	1.2	89.0	3.0	20.0	Vert	AV	0.0	94.7			Fundamental
72.000			1.2	89.0	3.0	20.0	Vert	AV	0.0	29.4	40.0	-10.6	Marker-Delta method: 94.7 + -65.3 dBc = 29.4
75.400	84.0	-9.7	1.0	94.1	3.0	20.0	Vert	AV	0.0	94.3			Fundamental
75.200			1.0	94.1	3.0	20.0	Vert	AV	0.0	28.9	40.0	-11.1	Marker-Delta method: 94.3 + -65.4 dBc = 28.9
75.900	84.1	-9.7	1.0	166.1	3.0	20.0	Vert	AV	0.0	94.4			Fundamental
76.000			1.0	166.1	3.0	20.0	Vert	AV	0.0	28.4	40.0	-11.6	Marker-Delta method: 94.4 + -66.0 dBc = 28.4
74.700	84.2	-9.7	1.0	90.0	3.0	20.0	Vert	AV	0.0	94.5			Fundamental
74.600			1.0	90.0	3.0	20.0	Vert	AV	0.0	27.8	40.0	-12.2	Marker-Delta method: 94.5 + -66.7 dBc = 27.8
72.900	84.2	-9.7	1.0	76.1	3.0	20.0	Vert	AV	0.0	94.5			Fundamental
73.000			1.0	76.1	3.0	20.0	Vert	AV	0.0	27.4	40.0	-12.6	Marker-Delta method: 94.5 + -67.1 dBc = 27.4
74.700	84.2	-9.7	1.0	90.0	3.0	20.0	Vert	AV	0.0	94.5			Fundamental
74.800			1.0	90.0	3.0	20.0	Vert	AV	0.0	26.2	40.0	-13.8	Marker-Delta method: 94.5 + -68.3 dBc = 26.2
72.100	85.1	-9.6	1.2	89.0	3.0	20.0	Vert	PK	0.0	95.5			Fundamental
72.000			1.2	89.0	3.0	20.0	Vert	PK	0.0	30.2	60.0	-29.8	Marker-Delta method: 95.5 + -65.3 dBc = 30.2
75.300	84.8	-9.7	1.0	94.1	3.0	20.0	Vert	PK	0.0	95.1			Fundamental

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
75.200			1.0	94.1	3.0	20.0	Vert	PK	0.0	29.7	60.0	-30.3	Marker-Delta method: 95.1 + -65.4 dBc = 29.7
75.900	84.9	-9.7	1.0	166.1	3.0	20.0	Vert	PK	0.0	95.2			Fundamental Marker-Delta method: 95.2 + -66.0 dBc = 29.2
76.000			1.0	166.1	3.0	20.0	Vert	PK	0.0	29.2	60.0	-30.8	Fundamental Marker-Delta method: 95.3 + -66.7 dBc = 28.6
74.700	85.0	-9.7	1.0	90.0	3.0	20.0	Vert	PK	0.0	95.3			Fundamental Marker-Delta method: 95.3 + -67.1 dBc = 28.2
74.600			1.0	90.0	3.0	20.0	Vert	PK	0.0	28.6	60.0	-31.4	Fundamental Marker-Delta method: 95.3 + -68.3 dBc = 27.0
72.900	85.0	-9.7	1.0	76.1	3.0	20.0	Vert	PK	0.0	95.3			
73.000			1.0	76.1	3.0	20.0	Vert	PK	0.0	28.2	60.0	-31.8	
74.700	85.0	-9.7	1.0	90.0	3.0	20.0	Vert	PK	0.0	95.3			
74.800			1.0	90.0	3.0	20.0	Vert	PK	0.0	27.0	60.0	-33.0	

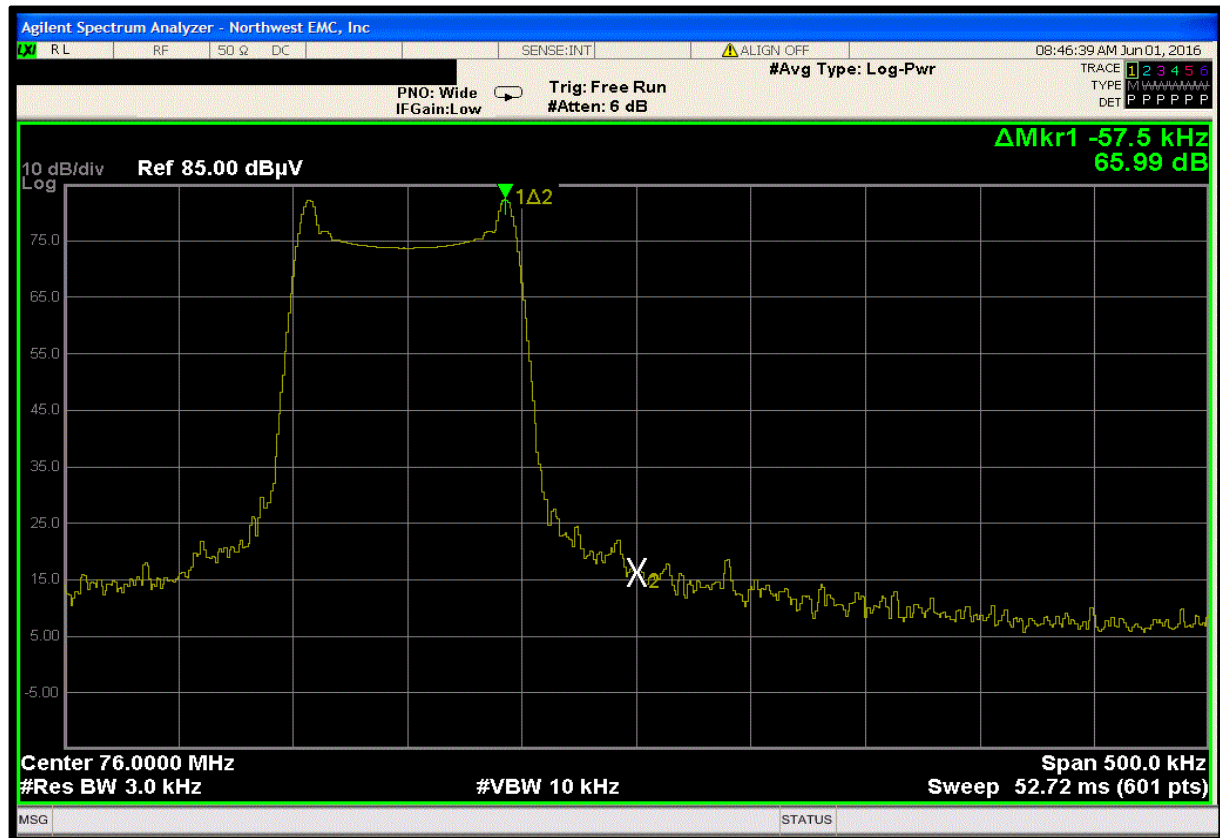
72.0 MHz band edge - ANT025



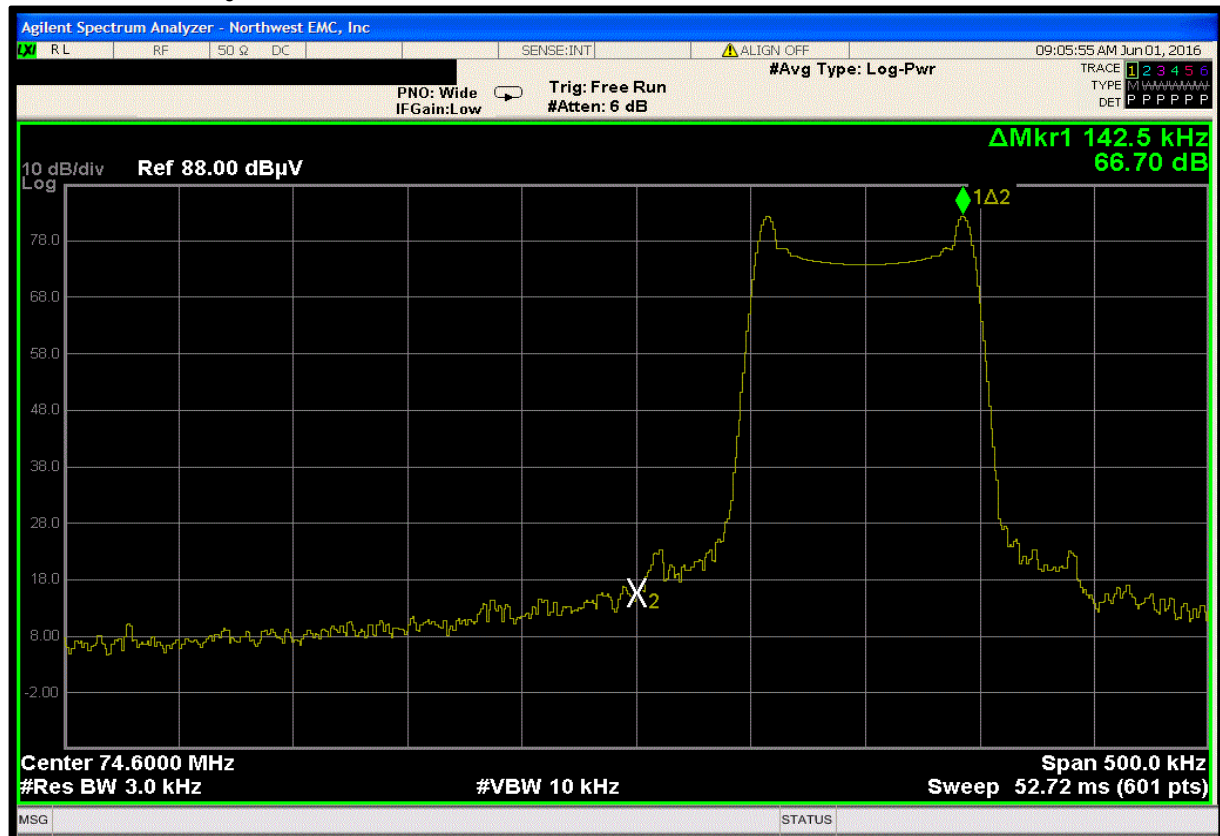
75.2 MHz band edge - ANT025



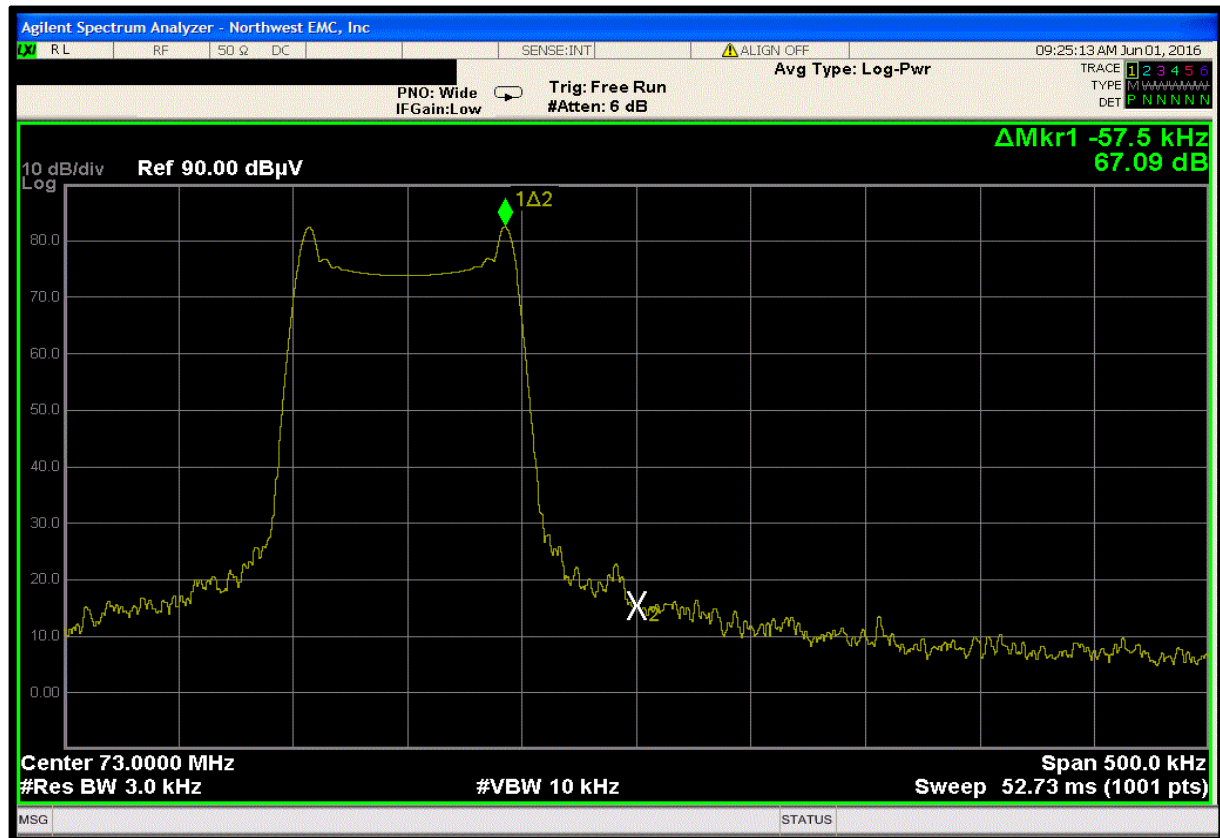
76.0 MHz band edge - ANT025



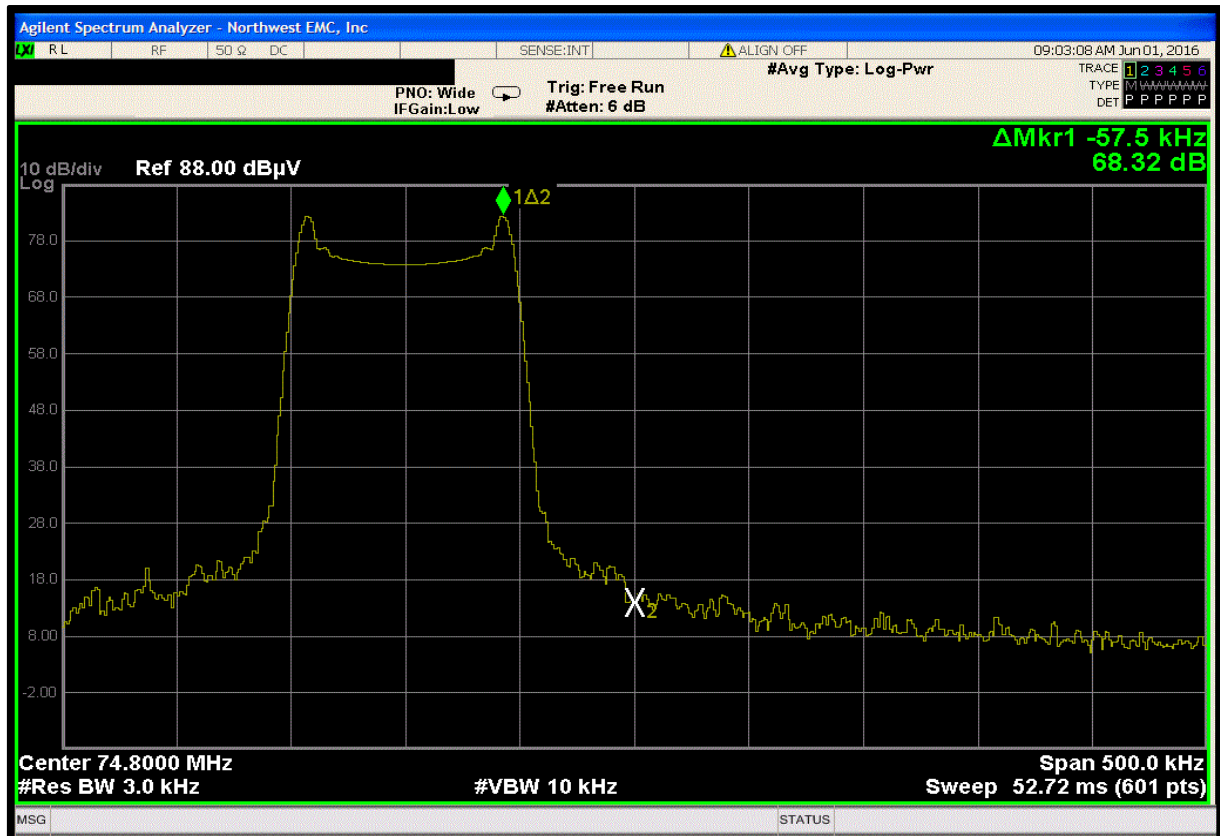
74.6 MHz band edge - ANT025



73.0 MHz band edge - ANT025



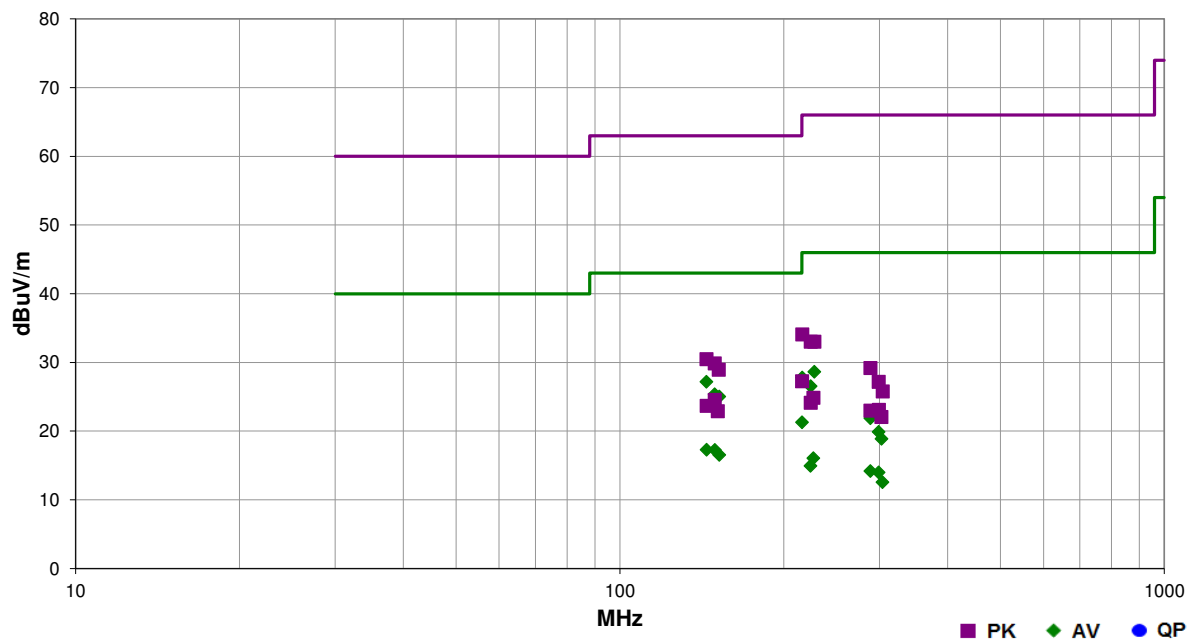
74.8 MHz band edge - ANT025



Work Order:	WILM0013	Date:	06/01/16		
Project:	None	Temperature:	22.8 °C		
Job Site:	MN05	Humidity:	51.5% RH		
Serial Number:	3	Barometric Pres.:	1013 mbar	Tested by:	Dustin Sparks
EUT:	T45NET-D				
Configuration:	10				
Customer:	Williams Sound, LLC				
Attendees:	Lawrence Herrington, Kelly Williams				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting 72.1 MHz (low channel), 74.7 MHz (mid channel), and 75.9 MHz (high channel); modulated with 1000 Hz sine wave at 200mVRMS.				
Deviations:	None				
Comments:	ANT021 antenna. Per manufacturer, EUT antenna will always be mounted in vertical position. Coax port is only populated when external antenna is used.				

Test Specifications	Test Method
FCC 15.237:2015	ANSI C63.10:2009

Run #	34	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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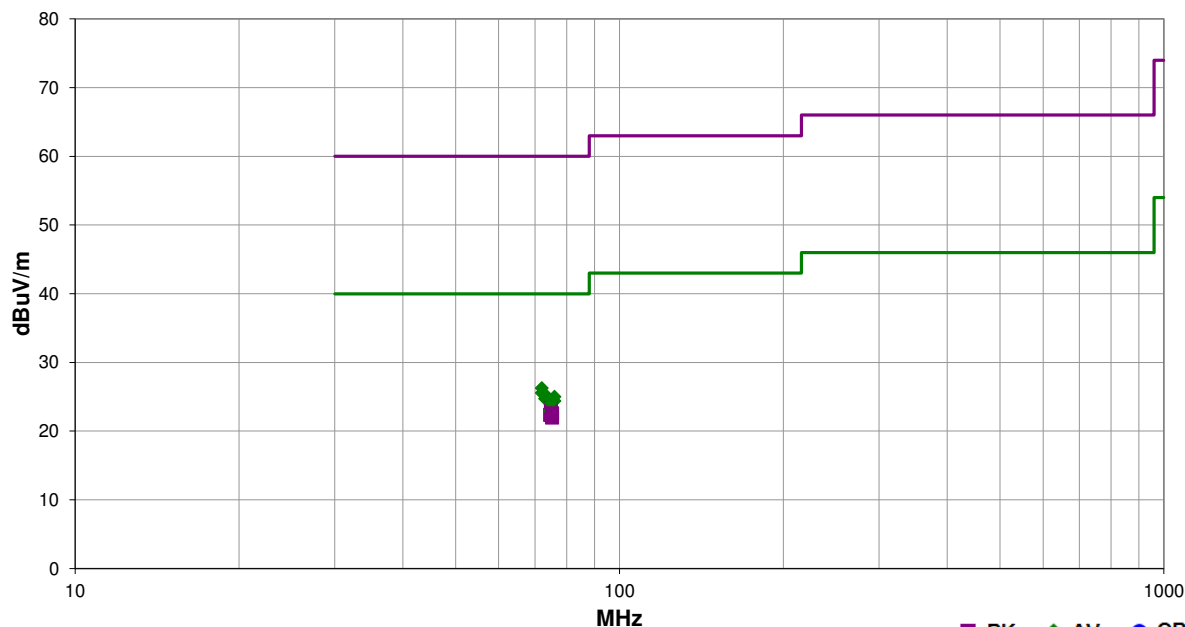
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
144.285	31.3	-4.1	2.1	152.1	3.0	0.0	Horz	AV	0.0	27.2	43.0	-15.8	Low channel
227.575	32.4	-3.8	1.5	103.0	3.0	0.0	Horz	AV	0.0	28.6	46.0	-17.4	High channel
149.415	29.6	-4.3	1.8	110.0	3.0	0.0	Horz	AV	0.0	25.3	43.0	-17.7	Mid channel
152.315	29.4	-4.4	1.6	100.0	3.0	0.0	Horz	AV	0.0	25.0	43.0	-18.0	High channel
216.315	31.7	-3.9	1.9	103.0	3.0	0.0	Horz	AV	0.0	27.8	46.0	-18.2	Low channel
224.165	30.2	-3.7	1.5	92.0	3.0	0.0	Horz	AV	0.0	26.5	46.0	-19.5	Mid channel
288.520	24.5	-2.6	1.0	347.0	3.0	0.0	Horz	AV	0.0	21.9	46.0	-24.1	Low channel
216.150	25.2	-3.9	1.8	28.0	3.0	0.0	Vert	AV	0.0	21.3	46.0	-24.7	Low channel
144.290	21.4	-4.1	1.0	288.0	3.0	0.0	Vert	AV	0.0	17.3	43.0	-25.7	Low channel
149.420	21.5	-4.3	2.7	158.0	3.0	0.0	Vert	AV	0.0	17.2	43.0	-25.8	Mid channel
298.935	22.0	-2.1	1.0	83.1	3.0	0.0	Horz	AV	0.0	19.9	46.0	-26.1	Mid channel
152.310	20.9	-4.4	1.4	300.0	3.0	0.0	Vert	AV	0.0	16.5	43.0	-26.5	High channel
302.385	20.7	-1.8	1.0	355.9	3.0	0.0	Horz	AV	0.0	18.9	46.0	-27.1	High channel
226.725	19.8	-3.8	1.0	91.1	3.0	0.0	Vert	AV	0.0	16.0	46.0	-30.0	High channel
223.985	18.6	-3.7	1.0	276.9	3.0	0.0	Vert	AV	0.0	14.9	46.0	-31.1	Mid channel
288.535	16.8	-2.6	1.2	261.0	3.0	0.0	Vert	AV	0.0	14.2	46.0	-31.8	Low channel
216.360	38.0	-3.9	1.9	103.0	3.0	0.0	Horz	PK	0.0	34.1	66.0	-31.9	Low channel
298.935	16.1	-2.1	1.5	219.0	3.0	0.0	Vert	AV	0.0	14.0	46.0	-32.0	Mid channel
144.210	34.6	-4.1	2.1	152.1	3.0	0.0	Horz	PK	0.0	30.5	63.0	-32.5	Low channel
224.095	36.7	-3.7	1.5	92.0	3.0	0.0	Horz	PK	0.0	33.0	66.0	-33.0	Mid channel
227.615	36.8	-3.8	1.5	103.0	3.0	0.0	Horz	PK	0.0	33.0	66.0	-33.0	High channel
149.360	34.1	-4.3	1.8	110.0	3.0	0.0	Horz	PK	0.0	29.8	63.0	-33.2	Mid channel

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
303.730	14.3	-1.7	1.0	60.0	3.0	0.0	Vert	AV	0.0	12.6	46.0	-33.4	High channel
151.975	33.3	-4.4	1.6	100.0	3.0	0.0	Horz	PK	0.0	28.9	63.0	-34.1	High channel
288.560	31.8	-2.6	1.0	347.0	3.0	0.0	Horz	PK	0.0	29.2	66.0	-36.8	Low channel
149.360	28.8	-4.3	2.7	158.0	3.0	0.0	Vert	PK	0.0	24.5	63.0	-38.5	Mid channel
216.120	31.2	-3.9	1.8	28.0	3.0	0.0	Vert	PK	0.0	27.3	66.0	-38.7	Low channel
298.940	29.3	-2.1	1.0	83.1	3.0	0.0	Horz	PK	0.0	27.2	66.0	-38.8	Mid channel
144.305	27.8	-4.1	1.0	288.0	3.0	0.0	Vert	PK	0.0	23.7	63.0	-39.3	Low channel
151.275	27.2	-4.3	1.4	300.0	3.0	0.0	Vert	PK	0.0	22.9	63.0	-40.1	High channel
303.985	27.5	-1.7	1.0	355.9	3.0	0.0	Horz	PK	0.0	25.8	66.0	-40.2	High channel
226.780	28.6	-3.8	1.0	91.1	3.0	0.0	Vert	PK	0.0	24.8	66.0	-41.2	High channel
224.245	27.8	-3.7	1.0	276.9	3.0	0.0	Vert	PK	0.0	24.1	66.0	-41.9	Mid channel
299.005	25.2	-2.1	1.5	219.0	3.0	0.0	Vert	PK	0.0	23.1	66.0	-42.9	Mid channel
288.535	25.6	-2.6	1.2	261.0	3.0	0.0	Vert	PK	0.0	23.0	66.0	-43.0	Low channel
302.255	23.9	-1.9	1.0	60.0	3.0	0.0	Vert	PK	0.0	22.1	66.0	-44.0	High channel

Work Order:	WILM0013	Date:	06/01/16	
Project:	None	Temperature:	22.8 °C	
Job Site:	MN05	Humidity:	51.5% RH	
Serial Number:	3	Barometric Pres.:	1013 mbar	
EUT:	T45NET-D			
Configuration:	10			
Customer:	Williams Sound, LLC			
Attendees:	Lawrence Herrington, Kelly Williams			
EUT Power:	110VAC/60Hz			
Operating Mode:	Transmitting 72.1 MHz, 72.9 MHz (low band), 74.7 MHz (mid band), and 75.3 MHz, 75.9 MHz (high band); modulated with 1000 Hz sine wave at 200mVRMS.			
Deviations:	None			
Comments:	ANT021 antenna. Per manufacturer, EUT antenna will always be mounted in vertical position. Coax port is only populated when external antenna is used.			

Test Specifications	Test Method
FCC 15.237:2015	ANSI C63.10:2009

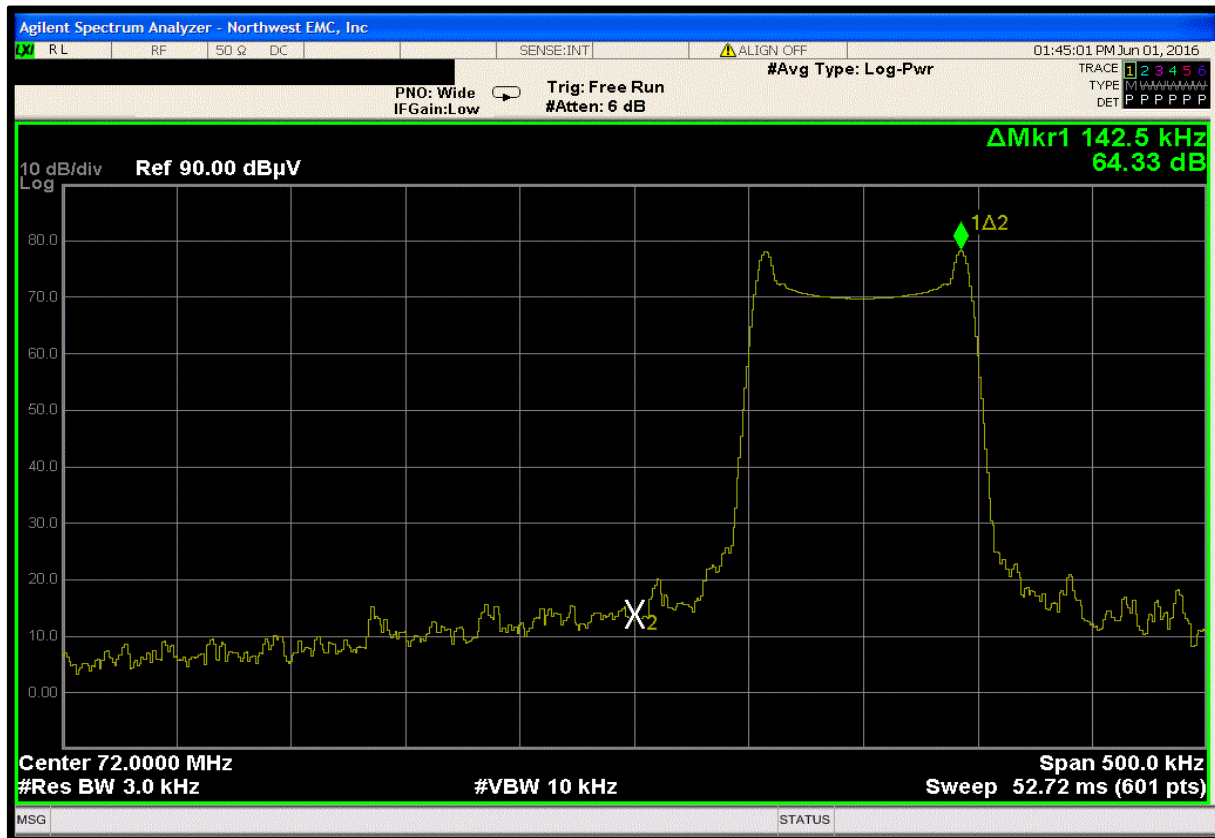
Run #	34	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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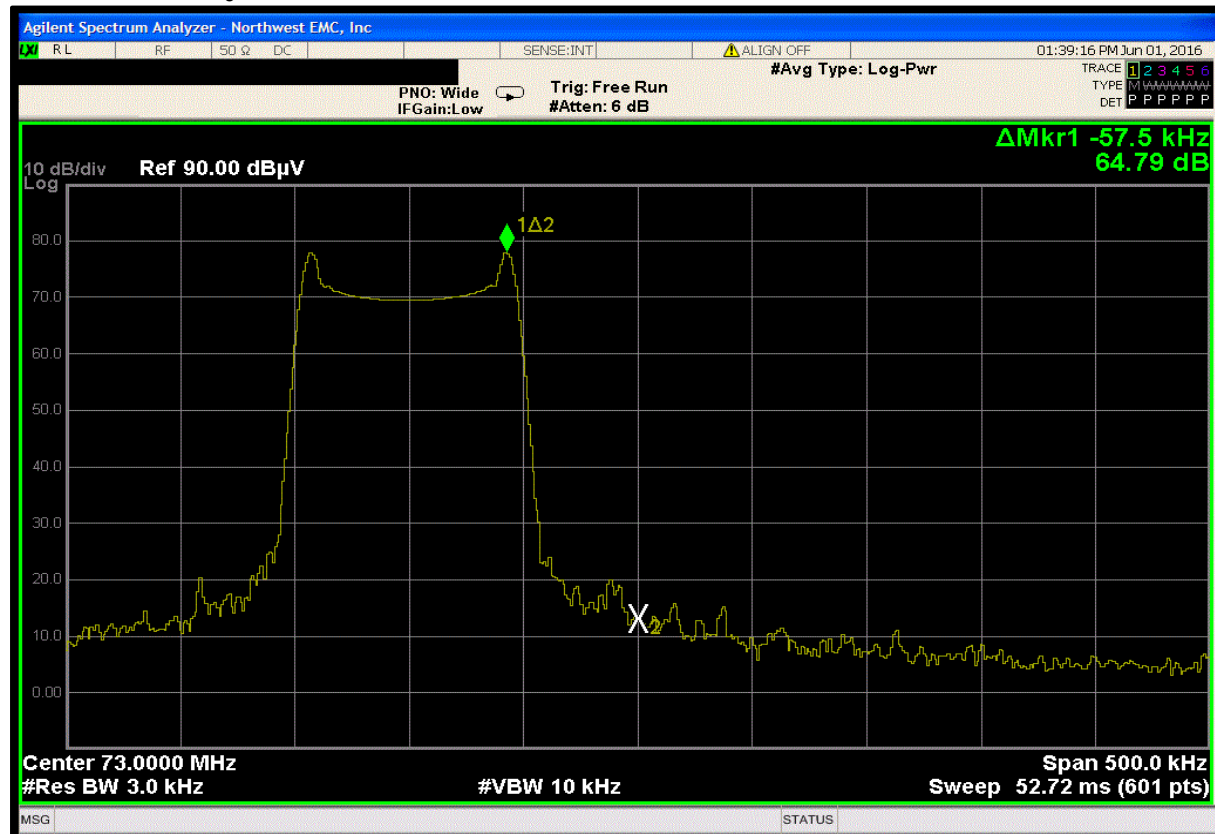
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
72.100	79.5	-9.6	1.0	62.1	3.0	20.0	Vert	AV	0.0	89.9			Fundamental
72.000			1.0	62.1	3.0	20.0	Vert	AV	0.0	25.6	40.0	-14.4	Marker-Delta method: 89.9 + -64.3 dBc = 25.6
72.900	79.2	-9.7	1.0	72.0	3.0	20.0	Vert	AV	0.0	89.5			Fundamental
73.000			1.0	72.0	3.0	20.0	Vert	AV	0.0	24.7	40.0	-15.3	Marker-Delta method: 89.5 + -64.8 dBc = 24.7
75.900	77.6	-9.7	1.2	82.0	3.0	20.0	Vert	AV	0.0	87.9			Fundamental
76.000			1.2	82.0	3.0	20.0	Vert	AV	0.0	24.4	40.0	-15.6	Marker-Delta method: 87.9 + -63.5 dBc = 24.4
74.800	78.6	-9.7	1.0	86.0	3.0	20.0	Vert	AV	0.0	88.9			Fundamental
74.800			1.0	86.0	3.0	20.0	Vert	AV	0.0	23.5	40.0	-16.5	Marker-Delta method: 88.9 + -65.4 dBc = 23.5
74.700	78.6	-9.7	1.0	86.0	3.0	20.0	Vert	AV	0.0	88.9			Fundamental
74.600			1.0	86.0	3.0	20.0	Vert	AV	0.0	22.4	40.0	-17.6	Marker-Delta method: 88.9 + -66.5 dBc = 22.4
75.300	78.3	-9.7	1.0	99.0	3.0	20.0	Vert	AV	0.0	88.6			Fundamental
75.200			1.0	99.0	3.0	20.0	Vert	AV	0.0	22.0	40.0	-18.0	Marker-Delta method: 88.6 + -66.6 dBc = 22.0
72.100	80.2	-9.6	1.0	62.1	3.0	20.0	Vert	PK	0.0	90.6			Fundamental
72.000			1.0	62.1	3.0	20.0	Vert	PK	0.0	26.3	60.0	-33.7	Marker-Delta method: 90.6 + -64.3 dBc = 26.3
72.900	79.8	-9.7	1.0	72.0	3.0	20.0	Vert	PK	0.0	90.1			Fundamental

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
73.000			1.0	72.0	3.0	20.0	Vert	PK	0.0	25.3	60.0	-34.7	Marker-Delta method: 90.1 + -64.8 dBc = 25.3
75.900	78.2	-9.7	1.2	82.0	3.0	20.0	Vert	PK	0.0	88.5			Fundamental Marker-Delta method: 88.5 + -63.5 dBc = 25.0
76.000			1.2	82.0	3.0	20.0	Vert	PK	0.0	25.0	60.0	-35.0	Fundamental Marker-Delta method: 88.5 + -63.5 dBc = 25.0
74.700	79.2	-9.7	1.0	86.0	3.0	20.0	Vert	PK	0.0	89.5			Fundamental Marker-Delta method: 89.5 + -65.4 dBc = 22.4
74.800			1.0	86.0	3.0	20.0	Vert	PK	0.0	24.1	60.0	-35.9	Fundamental Marker-Delta method: 88.5 + -66.5 dBc = 23.0
74.700	79.2	-9.7	1.0	86.0	3.0	20.0	Vert	PK	0.0	89.5			Fundamental Marker-Delta method: 88.5 + -66.5 dBc = 23.0
74.600			1.0	86.0	3.0	20.0	Vert	PK	0.0	23.0	60.0	-37.0	Fundamental Marker-Delta method: 89.2 + -66.6 dBc = 22.6
75.300	78.9	-9.7	1.0	99.0	3.0	20.0	Vert	PK	0.0	89.2			Fundamental Marker-Delta method: 89.2 + -66.6 dBc = 22.6
75.200			1.0	99.0	3.0	20.0	Vert	PK	0.0	22.6	60.0	-37.4	

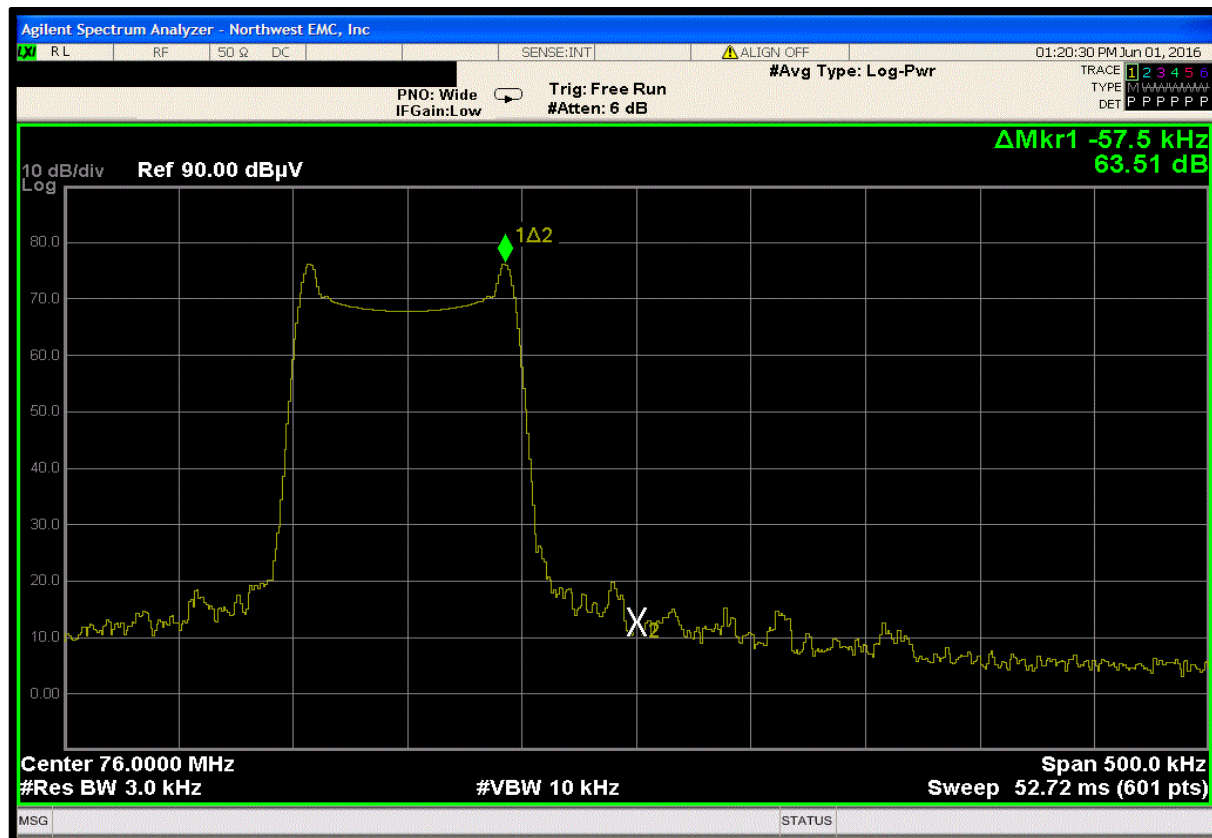
72.0 MHz band edge - ANT021



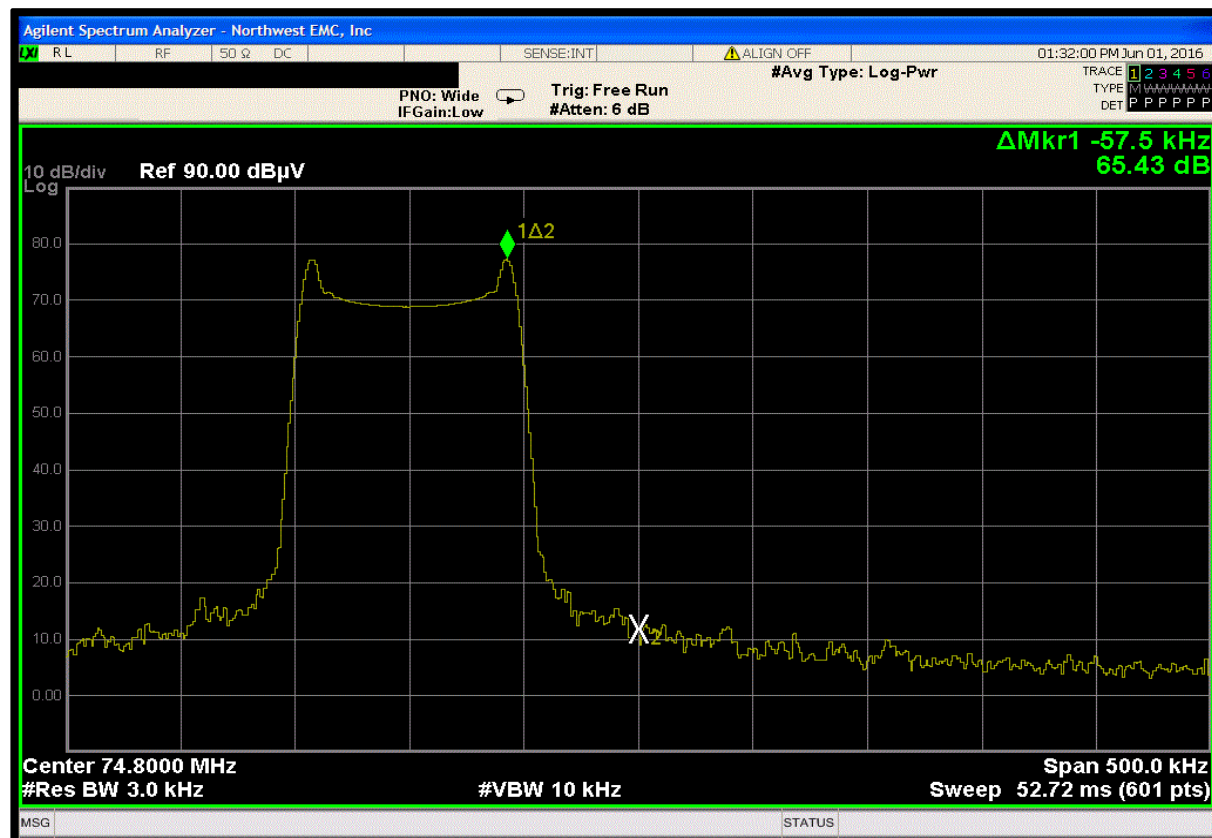
73.0 MHz band edge - ANT021



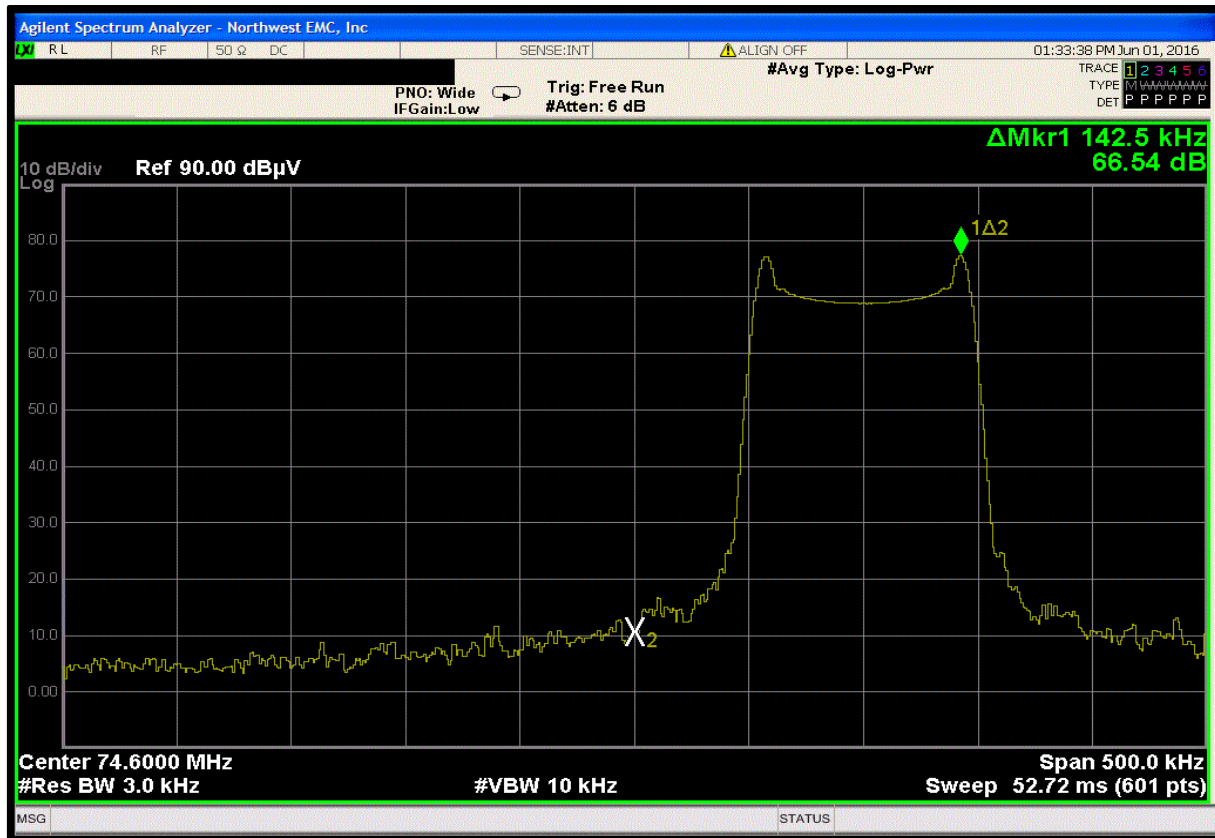
76.0 MHz band edge - ANT021



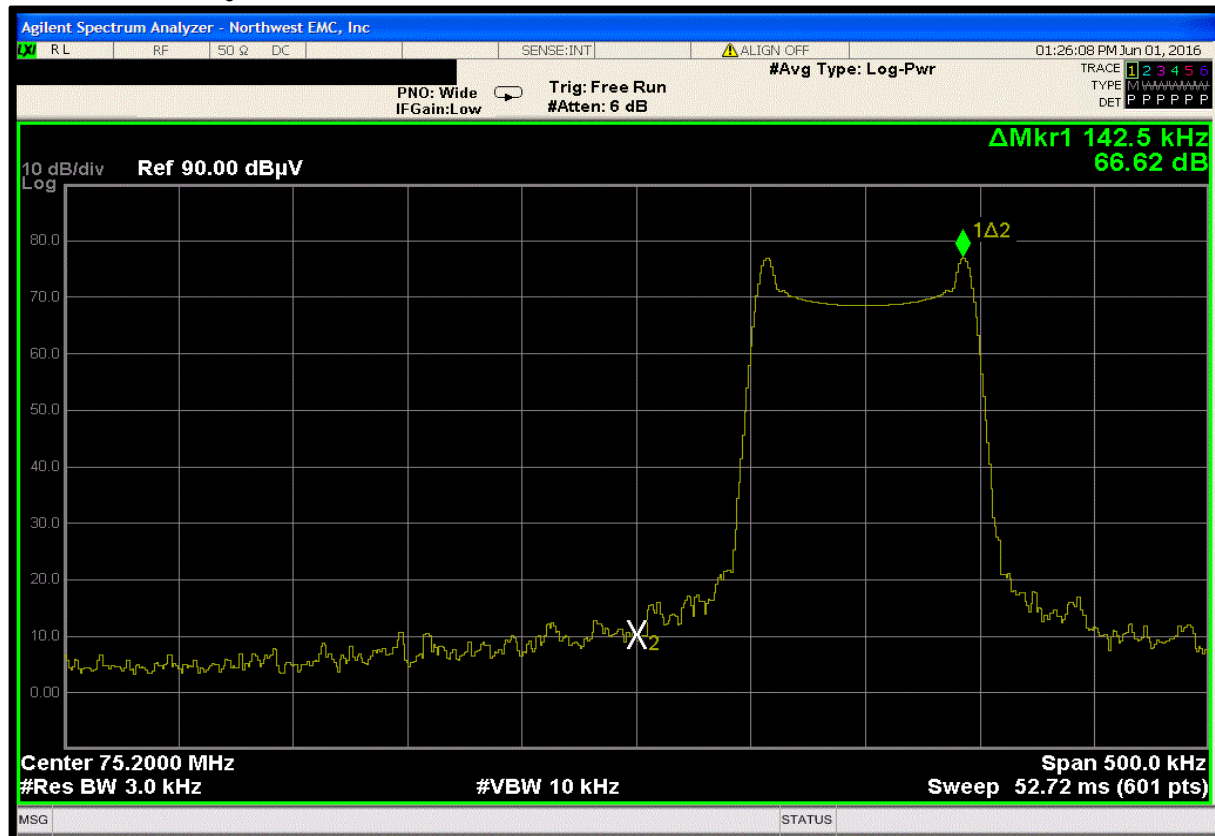
74.8 MHz band edge - ANT021



74.6 MHz band edge - ANT021



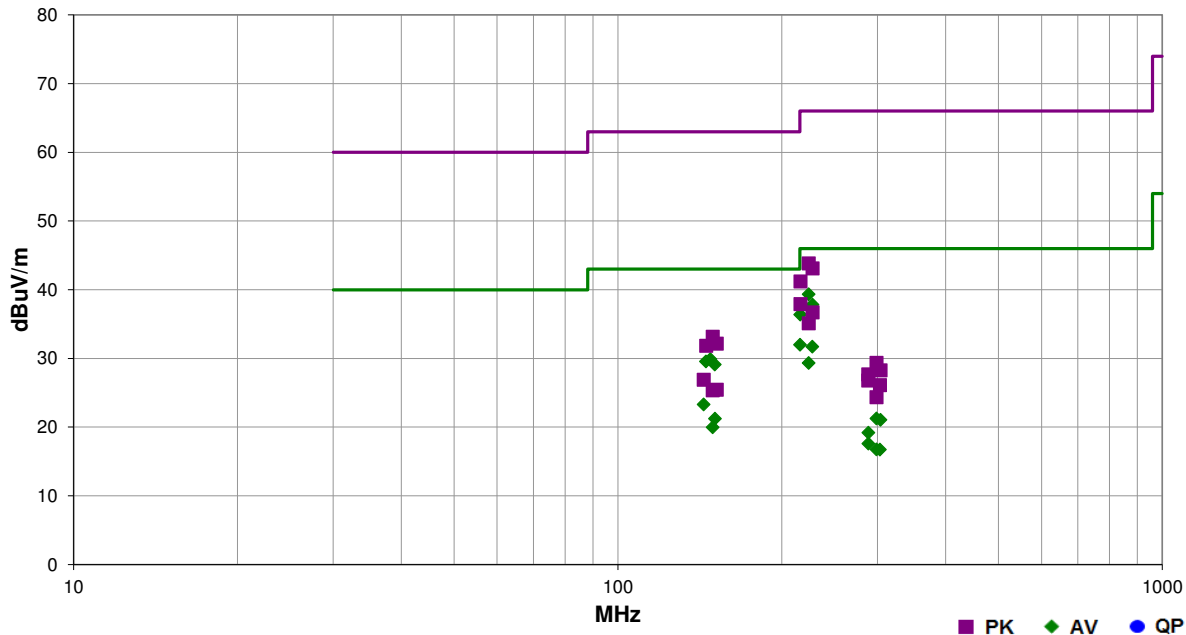
75.2 MHz band edge - ANT021



Work Order:	WILM0013	Date:	06/01/16	
Project:	None	Temperature:	22.8 °C	
Job Site:	MN05	Humidity:	51.5% RH	
Serial Number:	3	Barometric Pres.:	1013 mbar	
EUT:	T45NET-D			
Configuration:	11			
Customer:	Williams Sound, LLC			
Attendees:	Lawrence Herrington, Kelly Williams			
EUT Power:	110VAC/60Hz			
Operating Mode:	Transmitting 72.1 MHz (low channel), 74.7 MHz (mid channel), and 75.9 MHz (high channel); modulated with 1000 Hz sine wave at 200mVRMS.			
Deviations:	None			
Comments:	ANT024 antenna. Per manufacturer, EUT antenna will always be mounted in vertical position. Coax port is only populated when external antenna is used.			

Test Specifications	Test Method
FCC 15.237:2015	ANSI C63.10:2009

Run #	42	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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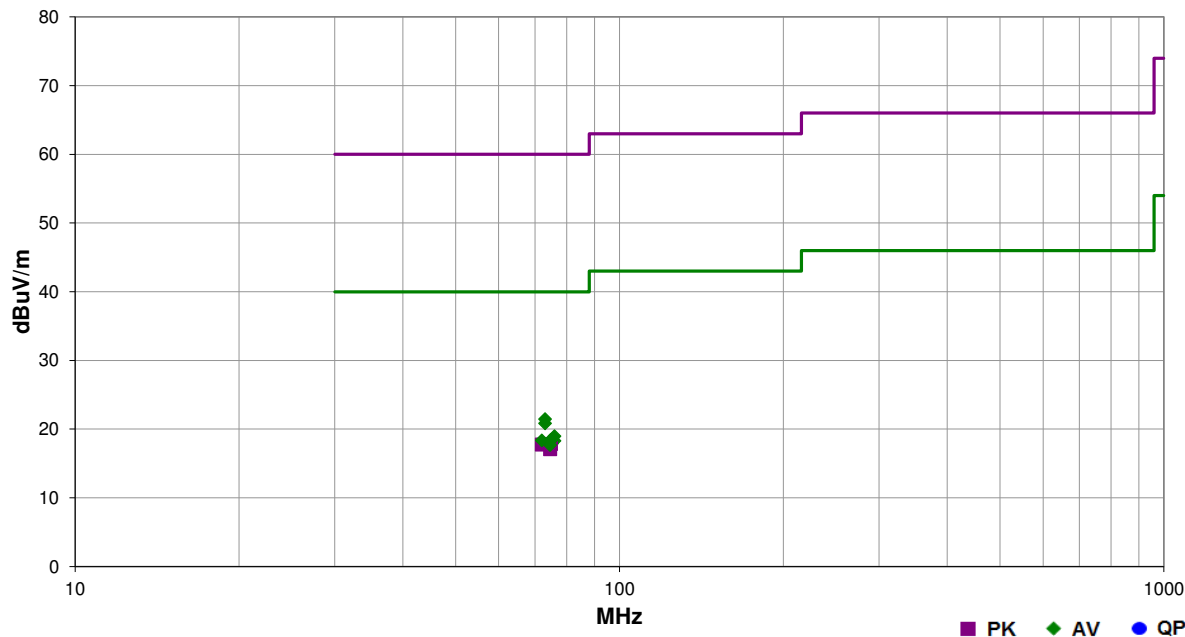
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
224.185	43.0	-3.7	1.1	9.0	3.0	0.0	Horz	AV	0.0	39.3	46.0	-6.7	Mid channel
227.775	41.6	-3.8	1.2	353.0	3.0	0.0	Horz	AV	0.0	37.8	46.0	-8.2	High channel
216.215	40.3	-3.9	1.0	30.1	3.0	0.0	Horz	AV	0.0	36.4	46.0	-9.6	Low channel
147.920	34.1	-4.2	2.0	62.1	3.0	0.0	Horz	AV	0.0	29.9	43.0	-13.1	Mid channel
145.205	33.7	-4.1	2.1	64.0	3.0	0.0	Horz	AV	0.0	29.6	43.0	-13.4	Low channel
150.735	33.4	-4.3	1.9	54.1	3.0	0.0	Horz	AV	0.0	29.1	43.0	-13.9	High channel
216.190	35.9	-3.9	1.6	49.0	3.0	0.0	Vert	AV	0.0	32.0	46.0	-14.0	Low channel
227.630	35.5	-3.8	1.1	42.0	3.0	0.0	Vert	AV	0.0	31.7	46.0	-14.3	High channel
224.180	33.0	-3.7	1.0	46.0	3.0	0.0	Vert	AV	0.0	29.3	46.0	-16.7	Mid channel
143.740	27.4	-4.1	1.3	263.0	3.0	0.0	Vert	AV	0.0	23.3	43.0	-19.7	Low channel
150.785	25.5	-4.3	1.6	254.0	3.0	0.0	Vert	AV	0.0	21.2	43.0	-21.8	High channel
224.215	47.5	-3.7	1.1	9.0	3.0	0.0	Horz	PK	0.0	43.8	66.0	-22.2	Mid channel
227.820	46.9	-3.8	1.2	353.0	3.0	0.0	Horz	PK	0.0	43.1	66.0	-22.9	High channel
149.325	24.2	-4.2	1.0	201.0	3.0	0.0	Vert	AV	0.0	20.0	43.0	-23.0	Mid channel
298.650	23.4	-2.1	1.0	34.1	3.0	0.0	Horz	AV	0.0	21.3	46.0	-24.7	Mid channel
216.435	45.1	-3.9	1.0	30.1	3.0	0.0	Horz	PK	0.0	41.2	66.0	-24.8	Low channel
303.705	22.8	-1.7	1.0	275.0	3.0	0.0	Horz	AV	0.0	21.1	46.0	-24.9	High channel
288.535	21.8	-2.6	1.0	257.9	3.0	0.0	Horz	AV	0.0	19.2	46.0	-26.8	Low channel
216.450	41.8	-3.9	1.6	49.0	3.0	0.0	Vert	PK	0.0	37.9	66.0	-28.1	Low channel
288.510	20.2	-2.6	1.0	111.0	3.0	0.0	Vert	AV	0.0	17.6	46.0	-28.4	Low channel
298.650	18.9	-2.1	1.3	111.0	3.0	0.0	Vert	AV	0.0	16.8	46.0	-29.2	Mid channel
303.095	18.5	-1.8	1.0	99.0	3.0	0.0	Vert	AV	0.0	16.7	46.0	-29.3	High channel

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
227.840	40.5	-3.8	1.1	42.0	3.0	0.0	Vert	PK	0.0	36.7	66.0	-29.3	High channel
149.325	37.4	-4.2	2.0	62.1	3.0	0.0	Horz	PK	0.0	33.2	63.0	-29.8	Mid channel
151.890	36.5	-4.3	1.9	54.1	3.0	0.0	Horz	PK	0.0	32.2	63.0	-30.8	High channel
224.240	38.8	-3.7	1.0	46.0	3.0	0.0	Vert	PK	0.0	35.1	66.0	-30.9	Mid channel
145.260	36.0	-4.1	2.1	64.0	3.0	0.0	Horz	PK	0.0	31.9	63.0	-31.1	Low channel
143.790	31.0	-4.1	1.3	263.0	3.0	0.0	Vert	PK	0.0	26.9	63.0	-36.1	Low channel
298.595	31.5	-2.1	1.0	34.1	3.0	0.0	Horz	PK	0.0	29.4	66.0	-36.6	Mid channel
151.880	29.8	-4.3	1.6	254.0	3.0	0.0	Vert	PK	0.0	25.5	63.0	-37.5	High channel
149.310	29.6	-4.2	1.0	201.0	3.0	0.0	Vert	PK	0.0	25.4	63.0	-37.6	Mid channel
303.780	30.0	-1.7	1.0	275.0	3.0	0.0	Horz	PK	0.0	28.3	66.0	-37.7	High channel
288.330	30.3	-2.6	1.0	111.0	3.0	0.0	Vert	PK	0.0	27.7	66.0	-38.3	Low channel
288.250	29.4	-2.6	1.0	257.9	3.0	0.0	Horz	PK	0.0	26.8	66.0	-39.2	Low channel
303.050	27.9	-1.8	1.0	99.0	3.0	0.0	Vert	PK	0.0	26.1	66.0	-39.9	High channel
298.640	26.5	-2.1	1.3	111.0	3.0	0.0	Vert	PK	0.0	24.4	66.0	-41.6	Mid channel

Work Order:	WILM0013	Date:	06/01/16	
Project:	None	Temperature:	22.8 °C	
Job Site:	MN05	Humidity:	51.5% RH	
Serial Number:	3	Barometric Pres.:	1013 mbar	
EUT:	T45NET-D			
Configuration:	11			
Customer:	Williams Sound, LLC			
Attendees:	Lawrence Herrington, Kelly Williams			
EUT Power:	110VAC/60Hz			
Operating Mode:	Transmitting 72.1 MHz, 72.9 MHz (low band), 74.7 MHz (mid band), and 75.3 MHz, 75.9 MHz (high band); modulated with 1000 Hz sine wave at 200mVRMS.			
Deviations:	None			
Comments:	ANT024 antenna. Per manufacturer, EUT antenna will always be mounted in vertical position. Coax port is only populated when external antenna is used.			

Test Specifications	Test Method
FCC 15.237:2015	ANSI C63.10:2009

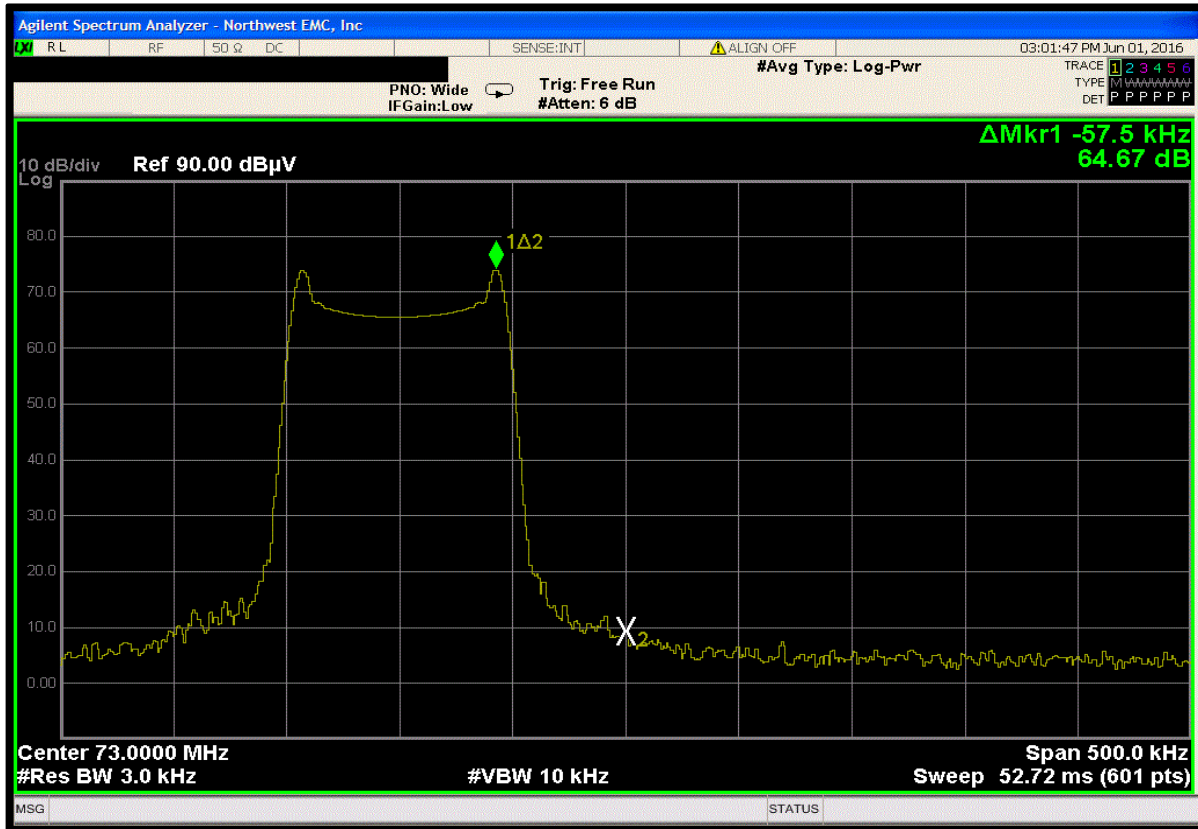
Run #	42	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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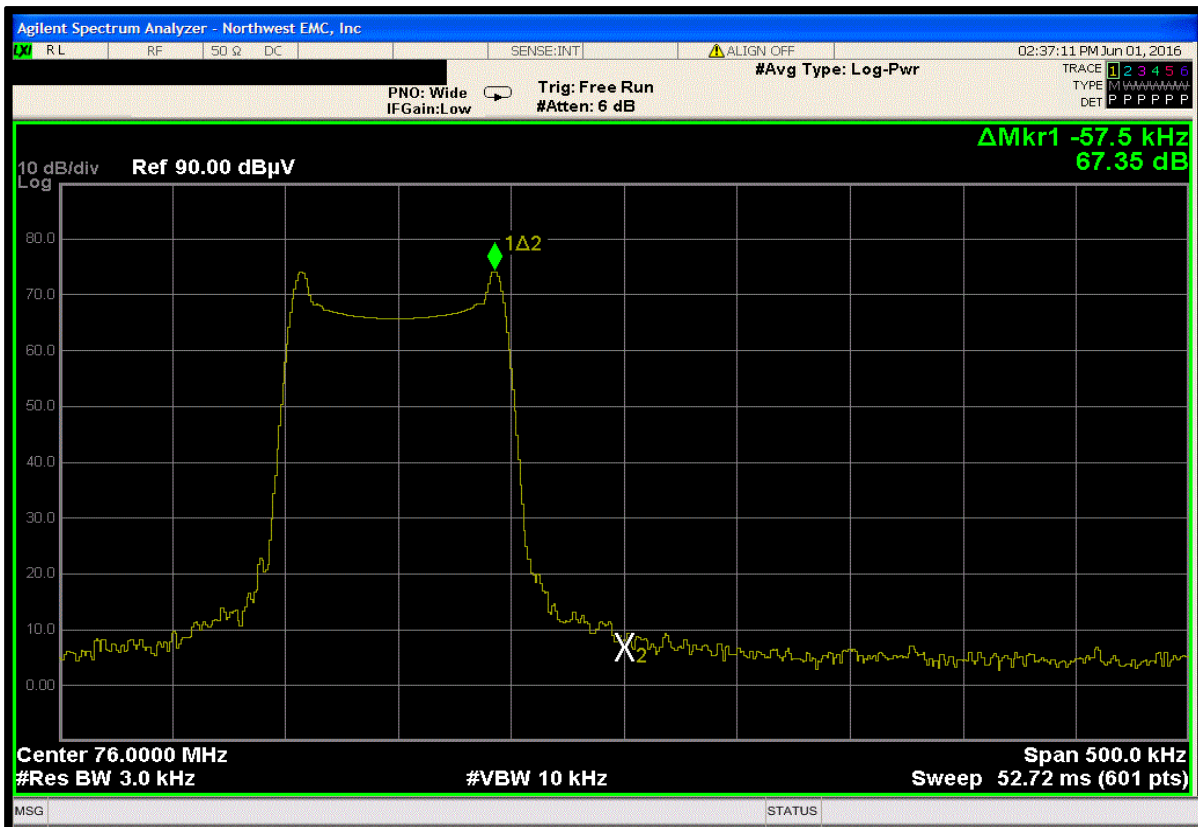
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
72.900	75.3	-9.8	1.0	329.9	3.0	20.0	Vert	AV	0.0	85.5			Fundamental
73.000			1.0	329.9	3.0	20.0	Vert	AV	0.0	20.8	40.0	-19.2	Marker-Delta method: 85.5 + -64.7 dBc = 20.8
75.900	75.5	-9.8	1.0	311.0	3.0	20.0	Vert	AV	0.0	85.7			Fundamental
76.000			1.0	311.0	3.0	20.0	Vert	AV	0.0	18.3	40.0	-21.7	Marker-Delta method: 85.7 + -67.4 dBc = 18.3
75.300	75.4	-9.8	1.2	326.9	3.0	20.0	Vert	AV	0.0	85.6			Fundamental
75.200			1.2	326.9	3.0	20.0	Vert	AV	0.0	17.9	40.0	-22.1	Marker-Delta method: 85.6 + -67.7 dBc = 17.9
74.700	75.4	-9.8	1.3	308.9	3.0	20.0	Vert	AV	0.0	85.6			Fundamental
74.800			1.3	308.9	3.0	20.0	Vert	AV	0.0	17.8	40.0	-22.2	Marker-Delta method: 85.6 + -67.8 dBc = 17.8
72.100	75.4	-9.7	1.4	315.0	3.0	20.0	Vert	AV	0.0	85.7			Fundamental
72.000			1.4	315.0	3.0	20.0	Vert	AV	0.0	17.7	40.0	-22.3	Marker-Delta method: 85.7 + -67.9 dBc = 17.7
74.700	75.4	-9.8	1.3	308.9	3.0	20.0	Vert	AV	0.0	85.6			Fundamental
74.600			1.3	308.9	3.0	20.0	Vert	AV	0.0	17.1	40.0	-22.9	Marker-Delta method: 85.6 + -68.5 dBc = 17.1
72.900	75.9	-9.8	1.0	329.9	3.0	20.0	Vert	PK	0.0	86.1			Fundamental
73.000			1.0	329.9	3.0	20.0	Vert	PK	0.0	21.4	60.0	-38.6	Marker-Delta method: 86.1 + -64.7 dBc = 21.4
75.900	76.1	-9.8	1.0	311.0	3.0	20.0	Vert	PK	0.0	86.3			Fundamental

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
76.000			1.0	311.0	3.0	20.0	Vert	PK	0.0	19.0	60.0	-41.1	Marker-Delta method: 86.3 + -67.4 dBc = 19.0
75.300	76.0	-9.8	1.2	326.9	3.0	20.0	Vert	PK	0.0	86.2			Fundamental Marker-Delta method: 86.2 + -67.7 dBc = 18.5
75.200			1.2	326.9	3.0	20.0	Vert	PK	0.0	18.5	60.0	-41.5	Fundamental Marker-Delta method: 86.2 + -67.8 dBc = 18.3
74.700	76.0	-9.8	1.3	308.9	3.0	20.0	Vert	PK	0.0	86.2			Fundamental Marker-Delta method: 86.2 + -67.8 dBc = 18.3
74.800			1.3	308.9	3.0	20.0	Vert	PK	0.0	18.4	60.0	-41.6	Fundamental Marker-Delta method: 86.3 + -67.9 dBc = 18.3
72.100	76.0	-9.7	1.4	315.0	3.0	20.0	Vert	PK	0.0	86.3			Fundamental Marker-Delta method: 86.3 + -67.9 dBc = 18.3
72.000			1.4	315.0	3.0	20.0	Vert	PK	0.0	18.3	60.0	-41.7	Fundamental Marker-Delta method: 86.2 + -68.5 dBc = 17.7
74.700	76.0	-9.8	1.3	308.9	3.0	20.0	Vert	PK	0.0	86.2			
74.600			1.3	308.9	3.0	20.0	Vert	PK	0.0	17.7	60.0	-42.3	

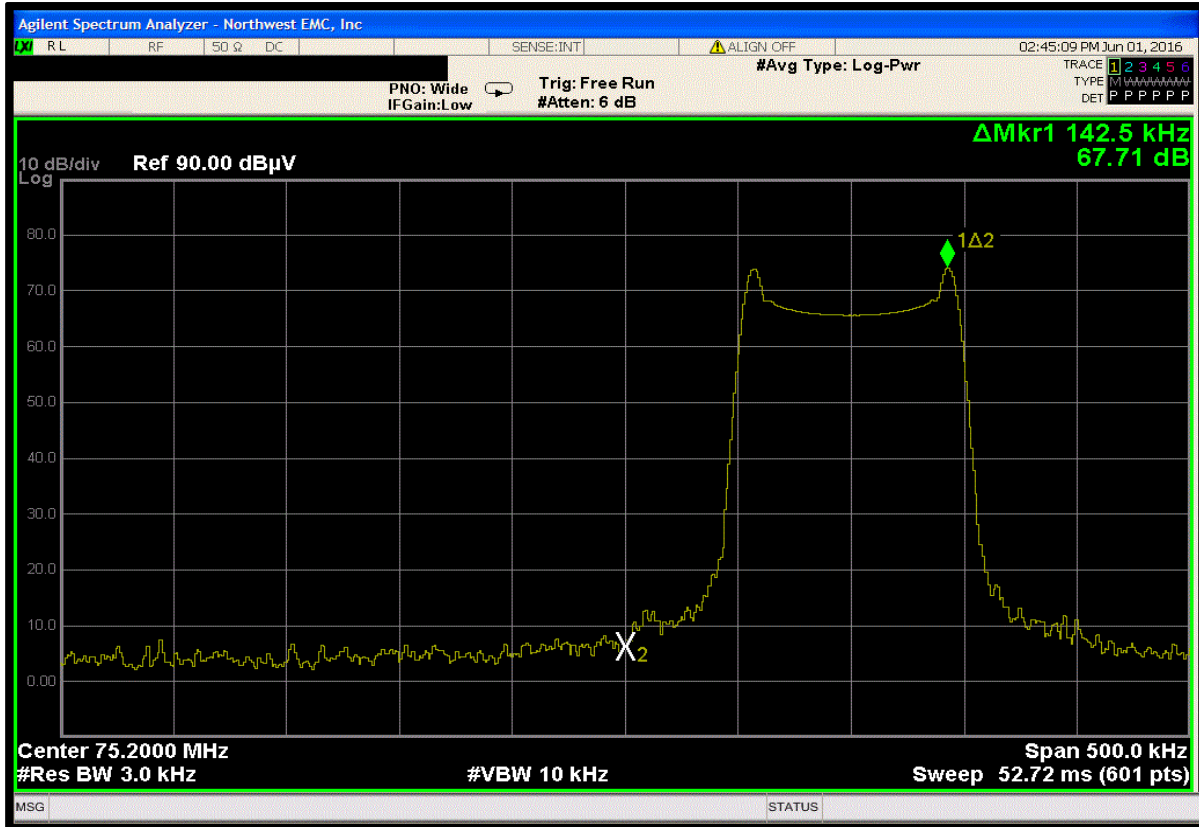
73.0 MHz band edge - ANT024



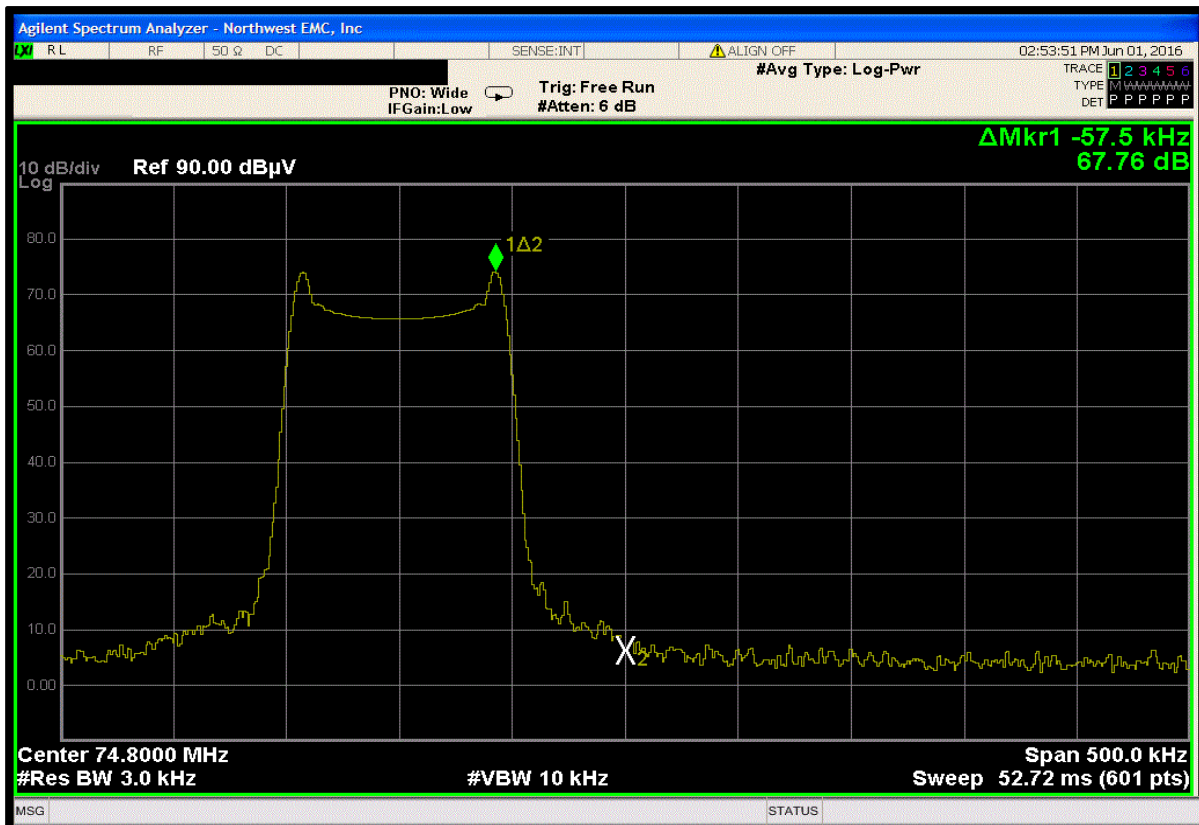
76.0 MHz band edge - ANT024



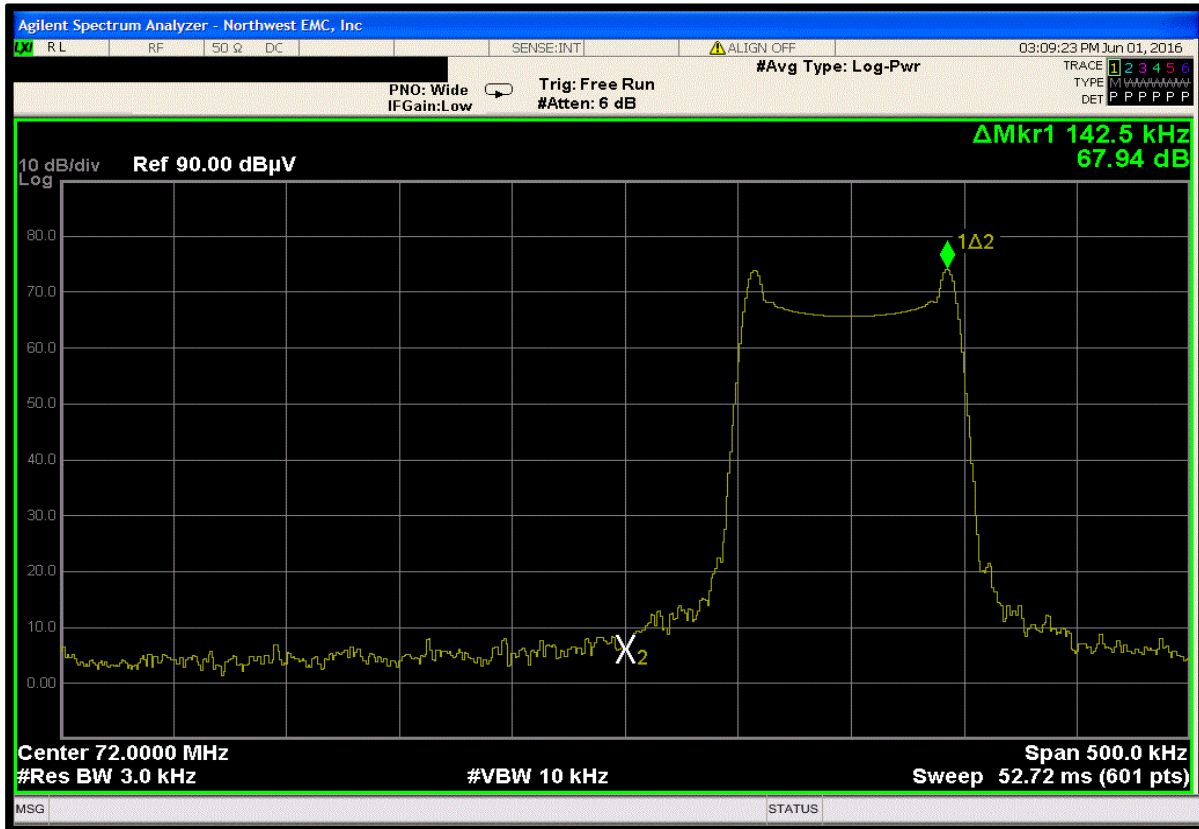
75.2 MHz band edge - ANT024



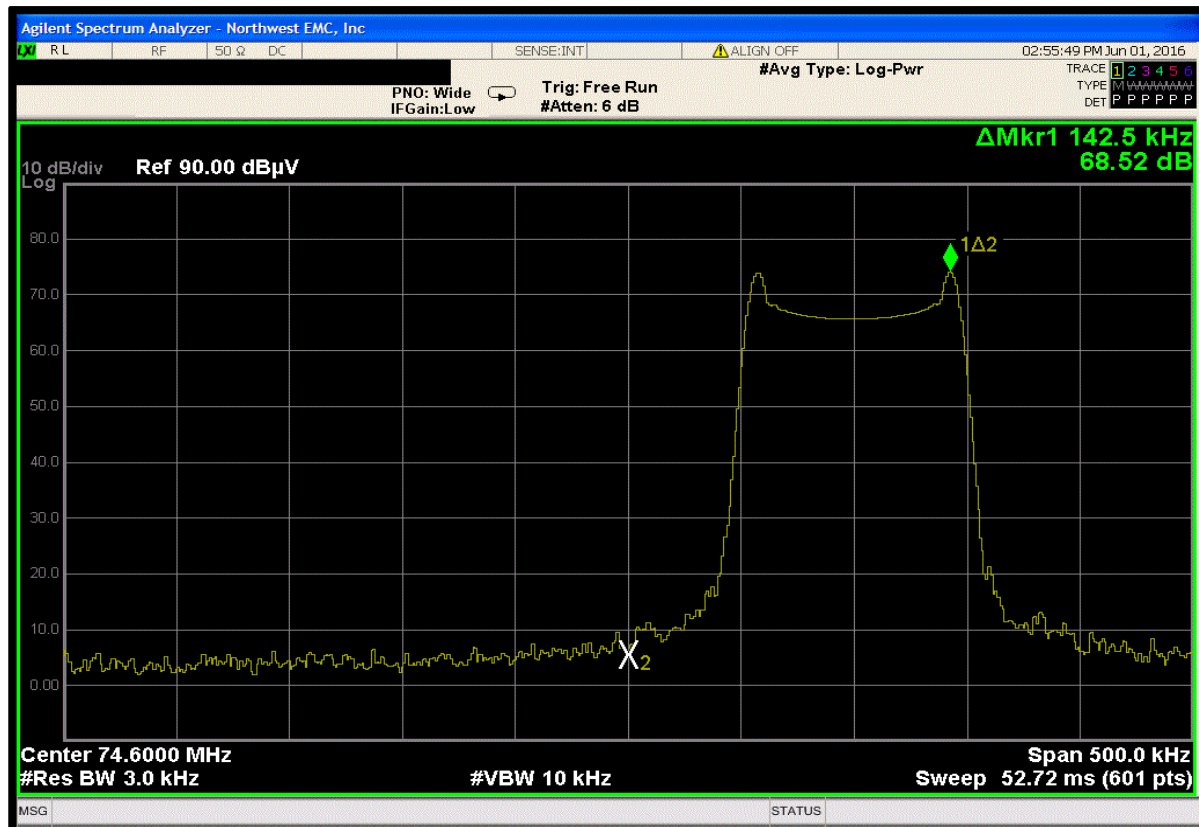
74.8 MHz band edge - ANT024



72.0 MHz band edge - ANT024



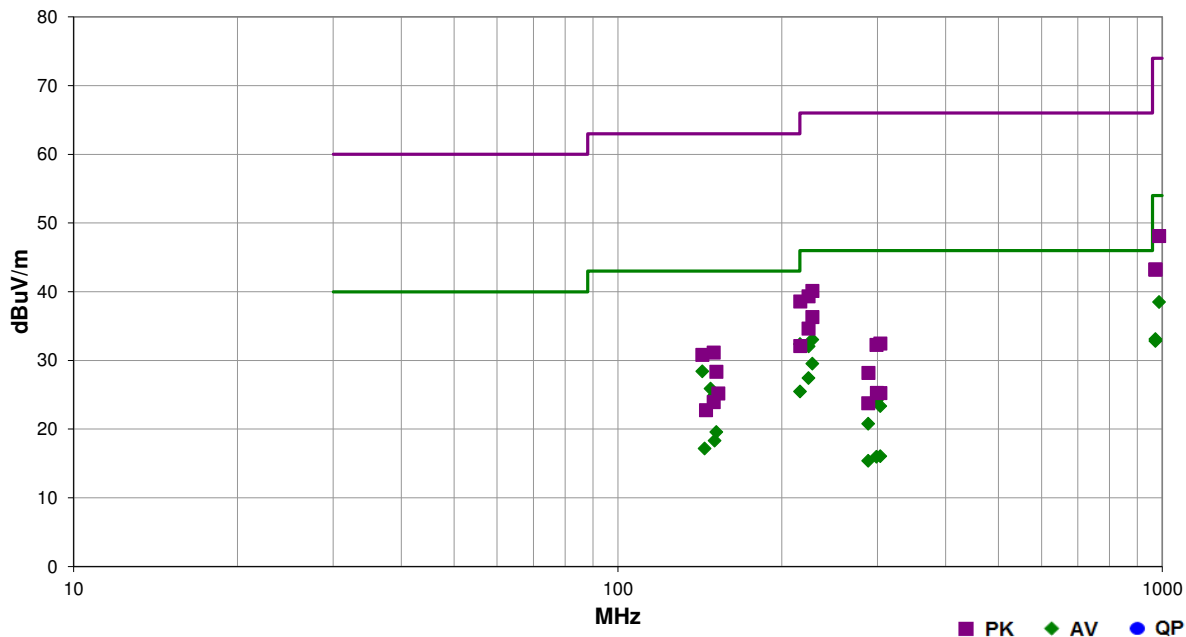
74.6 MHz band edge - ANT024



Work Order:	WILM0013	Date:	06/02/16	
Project:	None	Temperature:	22.1 °C	
Job Site:	MN05	Humidity:	48.1% RH	
Serial Number:	3	Barometric Pres.:	1020 mbar	
EUT:	T45NET-D			
Configuration:	12			
Customer:	Williams Sound, LLC			
Attendees:	Lawrence Herrington, Kelly Williams			
EUT Power:	110VAC/60Hz			
Operating Mode:	Transmitting 72.1 MHz (low channel), 74.7 MHz (mid channel), and 75.9 MHz (high channel); modulated with 1000 Hz sine wave at 200mVRMS.			
Deviations:	None			
Comments:	ANT005 antenna. Per manufacturer, EUT antenna will always be mounted in vertical position. Coax port is only populated when external antenna is used.			

Test Specifications	Test Method
FCC 15.237:2015	ANSI C63.10:2009

Run #	53	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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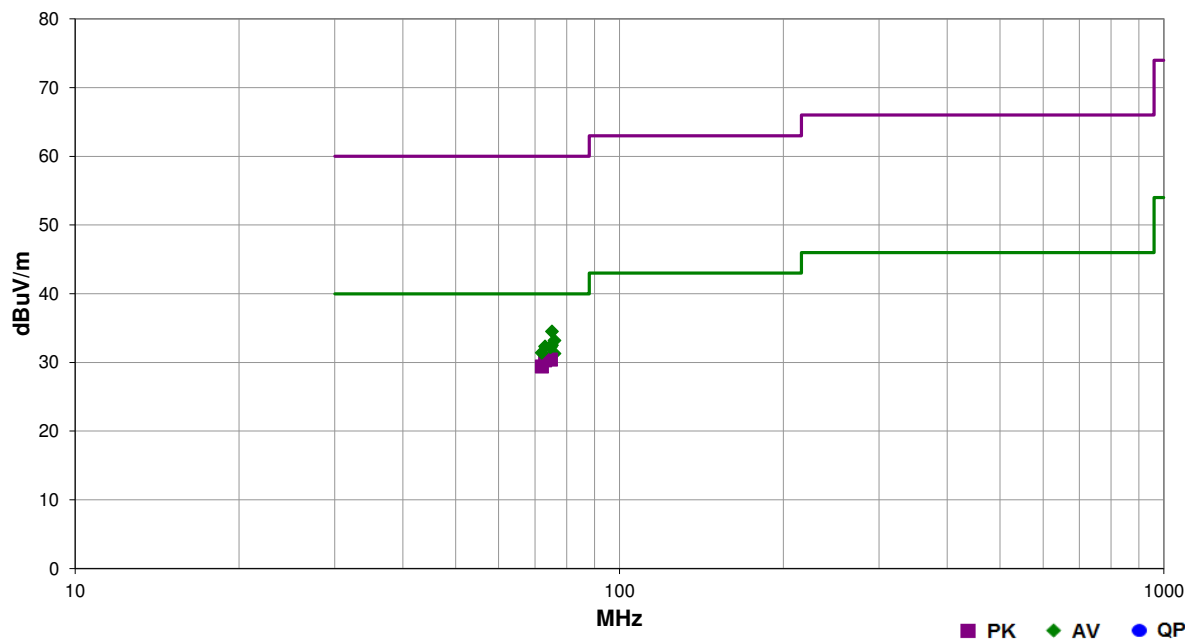
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
227.595	36.8	-3.8	1.3	198.0	3.0	0.0	Horz	AV	0.0	33.0	46.0	-13.0	High channel
216.190	36.3	-3.9	1.3	11.1	3.0	0.0	Horz	AV	0.0	32.4	46.0	-13.6	Low channel
224.210	35.7	-3.7	1.4	196.1	3.0	0.0	Horz	AV	0.0	32.0	46.0	-14.0	Mid channel
142.915	32.5	-4.1	1.9	147.0	3.0	0.0	Horz	AV	0.0	28.4	43.0	-14.6	Low channel
987.259	25.3	13.2	1.4	209.1	3.0	0.0	Horz	AV	0.0	38.5	54.0	-15.5	High channel
227.600	33.3	-3.8	1.8	239.0	3.0	0.0	Vert	AV	0.0	29.5	46.0	-16.5	High channel
148.005	30.1	-4.2	1.8	151.0	3.0	0.0	Horz	AV	0.0	25.9	43.0	-17.1	Mid channel
150.325	29.2	-4.3	1.6	155.1	3.0	0.0	Horz	AV	0.0	24.9	43.0	-18.1	High channel
224.000	31.1	-3.7	1.0	348.9	3.0	0.0	Vert	AV	0.0	27.4	46.0	-18.6	Mid channel
216.190	29.4	-3.9	3.0	278.0	3.0	0.0	Vert	AV	0.0	25.5	46.0	-20.5	Low channel
971.640	19.5	13.6	1.0	360.0	3.0	0.0	Horz	AV	0.0	33.1	54.0	-20.9	Mid channel
971.655	19.2	13.6	1.0	68.0	3.0	0.0	Vert	AV	0.0	32.8	54.0	-21.2	Mid channel
298.960	26.3	-2.1	1.0	99.0	3.0	0.0	Horz	AV	0.0	24.2	46.0	-21.8	Mid channel
303.440	25.1	-1.8	1.1	99.0	3.0	0.0	Horz	AV	0.0	23.3	46.0	-22.7	High channel
151.720	23.9	-4.3	1.0	53.0	3.0	0.0	Vert	AV	0.0	19.6	43.0	-23.4	High channel
150.600	22.6	-4.3	1.0	43.0	3.0	0.0	Vert	AV	0.0	18.3	43.0	-24.7	Mid channel
288.240	23.4	-2.6	1.0	229.9	3.0	0.0	Horz	AV	0.0	20.8	46.0	-25.2	Low channel
144.315	21.3	-4.1	1.0	354.9	3.0	0.0	Vert	AV	0.0	17.2	43.0	-25.8	Low channel
227.600	43.9	-3.8	1.3	198.0	3.0	0.0	Horz	PK	0.0	40.1	66.0	-25.9	High channel
987.224	34.9	13.2	1.4	209.1	3.0	0.0	Horz	PK	0.0	48.1	74.0	-25.9	High channel
223.955	43.0	-3.7	1.4	196.1	3.0	0.0	Horz	PK	0.0	39.3	66.0	-26.7	Mid channel
216.240	42.5	-3.9	1.3	11.1	3.0	0.0	Horz	PK	0.0	38.6	66.0	-27.4	Low channel

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
227.675	40.1	-3.8	1.8	239.0	3.0	0.0	Vert	PK	0.0	36.3	66.0	-29.7	High channel
303.450	17.8	-1.8	1.0	10.0	3.0	0.0	Vert	AV	0.0	16.0	46.0	-30.0	High channel
298.635	18.1	-2.1	1.5	39.0	3.0	0.0	Vert	AV	0.0	16.0	46.0	-30.0	Mid channel
288.240	18.0	-2.6	1.0	234.0	3.0	0.0	Vert	AV	0.0	15.4	46.0	-30.6	Low channel
970.895	29.6	13.6	1.0	360.0	3.0	0.0	Horz	PK	0.0	43.2	74.0	-30.8	Mid channel
971.675	29.6	13.6	1.0	68.0	3.0	0.0	Vert	PK	0.0	43.2	74.0	-30.8	Mid channel
224.035	38.3	-3.7	1.0	348.9	3.0	0.0	Vert	PK	0.0	34.6	66.0	-31.4	Mid channel
149.955	35.4	-4.3	1.8	151.0	3.0	0.0	Horz	PK	0.0	31.1	63.0	-31.9	Mid channel
142.925	34.9	-4.1	1.9	147.0	3.0	0.0	Horz	PK	0.0	30.8	63.0	-32.2	Low channel
303.435	34.2	-1.8	1.1	99.0	3.0	0.0	Horz	PK	0.0	32.4	66.0	-33.6	High channel
298.630	34.4	-2.1	1.0	99.0	3.0	0.0	Horz	PK	0.0	32.3	66.0	-33.7	Mid channel
216.325	36.0	-3.9	3.0	278.0	3.0	0.0	Vert	PK	0.0	32.1	66.0	-33.9	Low channel
151.730	32.7	-4.3	1.6	155.1	3.0	0.0	Horz	PK	0.0	28.4	63.0	-34.6	High channel
152.860	29.6	-4.4	1.0	53.0	3.0	0.0	Vert	PK	0.0	25.2	63.0	-37.8	High channel
288.595	30.8	-2.6	1.0	229.9	3.0	0.0	Horz	PK	0.0	28.2	66.0	-37.8	Low channel
149.970	28.2	-4.3	1.0	43.0	3.0	0.0	Vert	PK	0.0	23.9	63.0	-39.1	Mid channel
145.130	26.9	-4.1	1.0	354.9	3.0	0.0	Vert	PK	0.0	22.8	63.0	-40.2	Low channel
298.970	27.4	-2.1	1.5	39.0	3.0	0.0	Vert	PK	0.0	25.3	66.0	-40.7	Mid channel
303.475	27.0	-1.8	1.0	10.0	3.0	0.0	Vert	PK	0.0	25.2	66.0	-40.8	High channel
288.430	26.4	-2.6	1.0	234.0	3.0	0.0	Vert	PK	0.0	23.8	66.0	-42.2	Low channel

Work Order:	WILM0013	Date:	06/02/16	
Project:	None	Temperature:	22.1 °C	
Job Site:	MN05	Humidity:	48.1% RH	
Serial Number:	3	Barometric Pres.:	1020 mbar	
EUT:	T45NET-D			
Configuration:	12			
Customer:	Williams Sound, LLC			
Attendees:	Lawrence Herrington, Kelly Williams			
EUT Power:	110VAC/60Hz			
Operating Mode:	Transmitting 72.1 MHz, 72.9 MHz (low band), 74.7 MHz (mid band), and 75.3 MHz, 75.9 MHz (high band); modulated with 1000 Hz sine wave at 200mVRMS.			
Deviations:	None			
Comments:	ANT005 antenna. Per manufacturer, EUT antenna will always be mounted in vertical position. Coax port is only populated when external antenna is used.			

Test Specifications	Test Method
FCC 15.237:2015	ANSI C63.10:2009

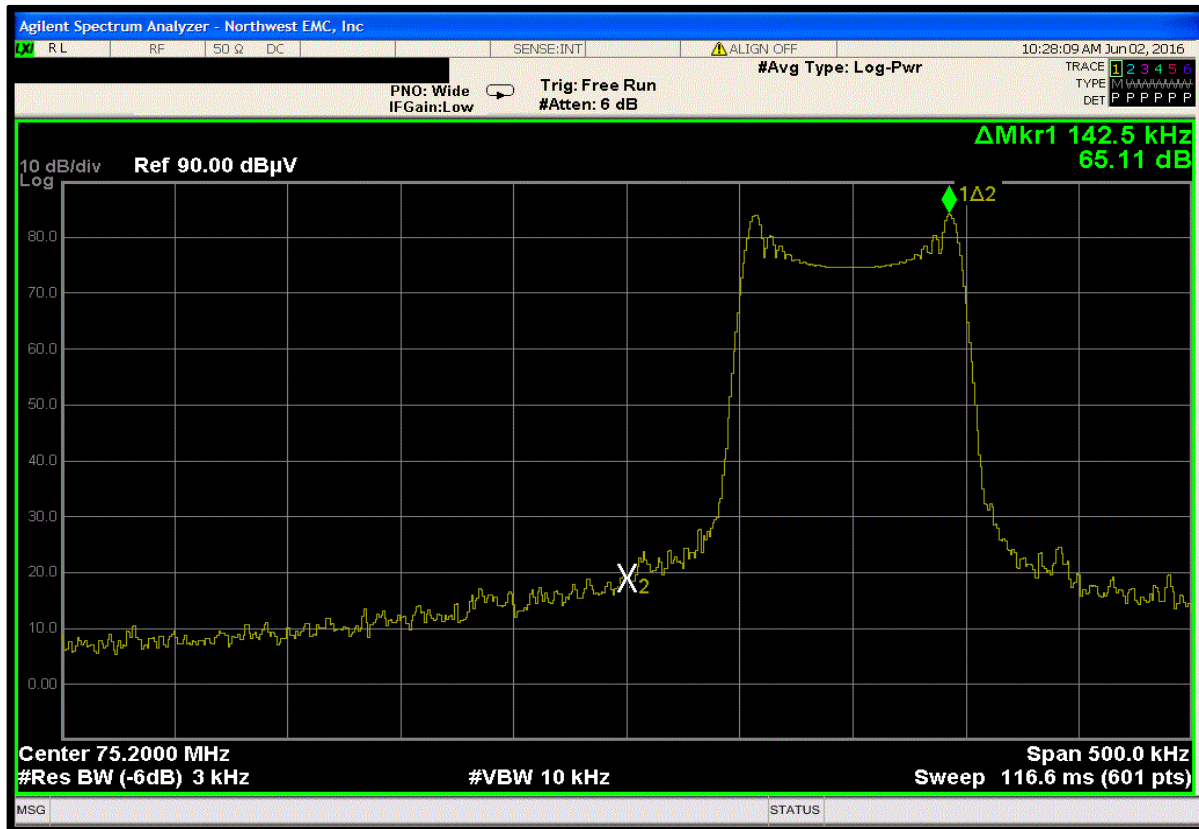
Run #	53	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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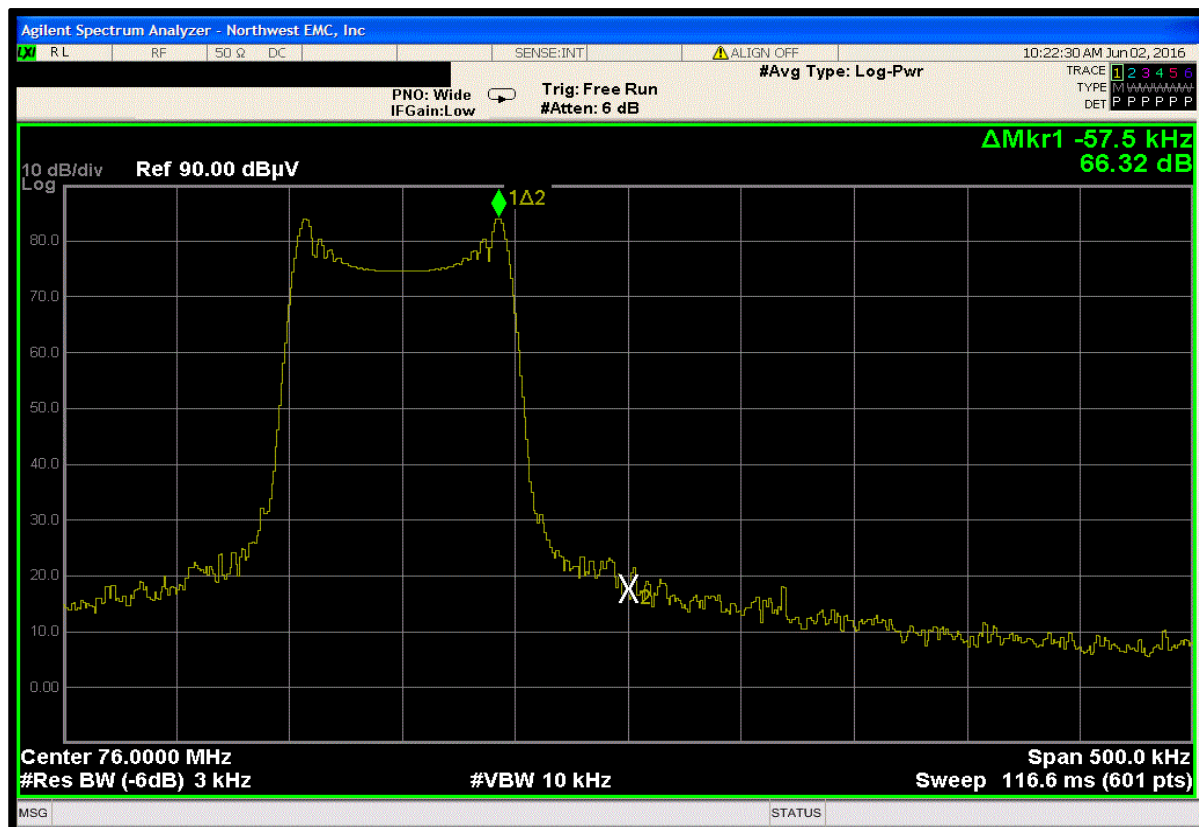
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
75.300	87.4	-9.8	1.0	250.9	3.0	20.0	Vert	AV	0.0	97.6			Fundamental
75.200			1.0	250.9	3.0	20.0	Vert	AV	0.0	32.5	40.0	-7.5	Marker-Delta method: 97.6 + -65.1 dBc = 32.5
75.900	87.4	-9.8	1.0	239.9	3.0	20.0	Vert	AV	0.0	97.6			Fundamental
76.000			1.0	239.9	3.0	20.0	Vert	AV	0.0	31.3	40.0	-8.7	Marker-Delta method: 97.6 + -66.3 dBc = 31.3
74.700	87.4	-9.8	1.0	246.0	3.0	20.0	Vert	AV	0.0	97.6			Fundamental
74.600			1.0	246.0	3.0	20.0	Vert	AV	0.0	30.4	40.0	-9.6	Marker-Delta method: 97.6 + -67.2 dBc = 30.4
74.700	87.4	-9.8	1.0	246.0	3.0	20.0	Vert	AV	0.0	97.6			Fundamental
74.800			1.0	246.0	3.0	20.0	Vert	AV	0.0	30.4	40.0	-9.6	Marker-Delta method: 97.6 + -67.2 dBc = 30.4
72.900	86.0	-9.8	1.0	246.0	3.0	20.0	Vert	AV	0.0	96.2			Fundamental
73.000			1.0	246.0	3.0	20.0	Vert	AV	0.0	30.3	40.0	-9.7	Marker-Delta method: 96.2 + -65.9 dBc = 30.3
72.100	84.7	-9.7	1.6	282.0	3.0	20.0	Vert	AV	0.0	95.0			Fundamental
72.000			1.6	282.0	3.0	20.0	Vert	AV	0.0	29.4	40.0	-10.6	Marker-Delta method: 95.0 + -65.6 dBc = 29.4
75.300	89.4	-9.8	1.0	250.9	3.0	20.0	Vert	PK	0.0	99.6			Fundamental
75.200			1.0	250.9	3.0	20.0	Vert	PK	0.0	34.5	60.0	-25.5	Marker-Delta method: 99.6 + -65.1 dBc = 34.5
75.900	89.3	-9.8	1.0	239.9	3.0	20.0	Vert	PK	0.0	99.5			Fundamental

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
76.000			1.0	239.9	3.0	20.0	Vert	PK	0.0	33.2	60.0	-26.8	Marker-Delta method: 99.5 + -66.3 dBc = 33.2
72.900	88.0	-9.8	1.0	246.0	3.0	20.0	Vert	PK	0.0	98.2			Fundamental Marker-Delta method: 98.2 + -67.2 dBc = 32.3
73.000			1.0	246.0	3.0	20.0	Vert	PK	0.0	32.3	60.0	-27.7	Fundamental Marker-Delta method: 99.4 + -67.2 dBc = 32.2
74.700	89.2	-9.8	1.0	246.0	3.0	20.0	Vert	PK	0.0	99.4			Fundamental Marker-Delta method: 99.4 + -67.2 dBc = 32.2
74.600			1.0	246.0	3.0	20.0	Vert	PK	0.0	32.2	60.0	-27.8	Fundamental Marker-Delta method: 99.4 + -65.9 dBc = 32.2
74.700	89.2	-9.8	1.0	246.0	3.0	20.0	Vert	PK	0.0	99.4			Fundamental Marker-Delta method: 99.4 + -65.9 dBc = 32.2
74.800			1.0	246.0	3.0	20.0	Vert	PK	0.0	32.2	60.0	-27.8	Fundamental Marker-Delta method: 97.0 + -65.6 dBc = 31.4
72.100	86.7	-9.7	1.6	282.0	3.0	20.0	Vert	PK	0.0	97.0			Fundamental Marker-Delta method: 97.0 + -65.6 dBc = 31.4
72.000			1.6	282.0	3.0	20.0	Vert	PK	0.0	31.4	60.0	-28.6	

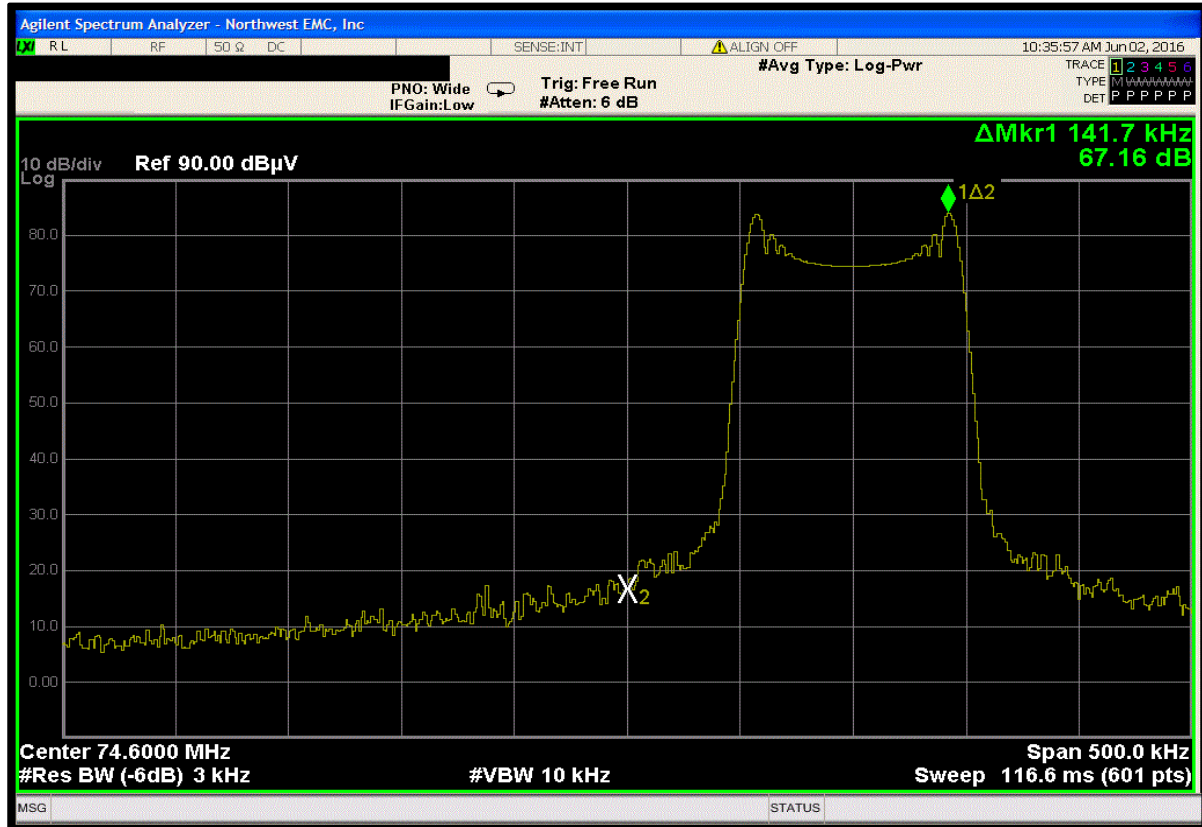
75.2 MHz band edge - ANT005



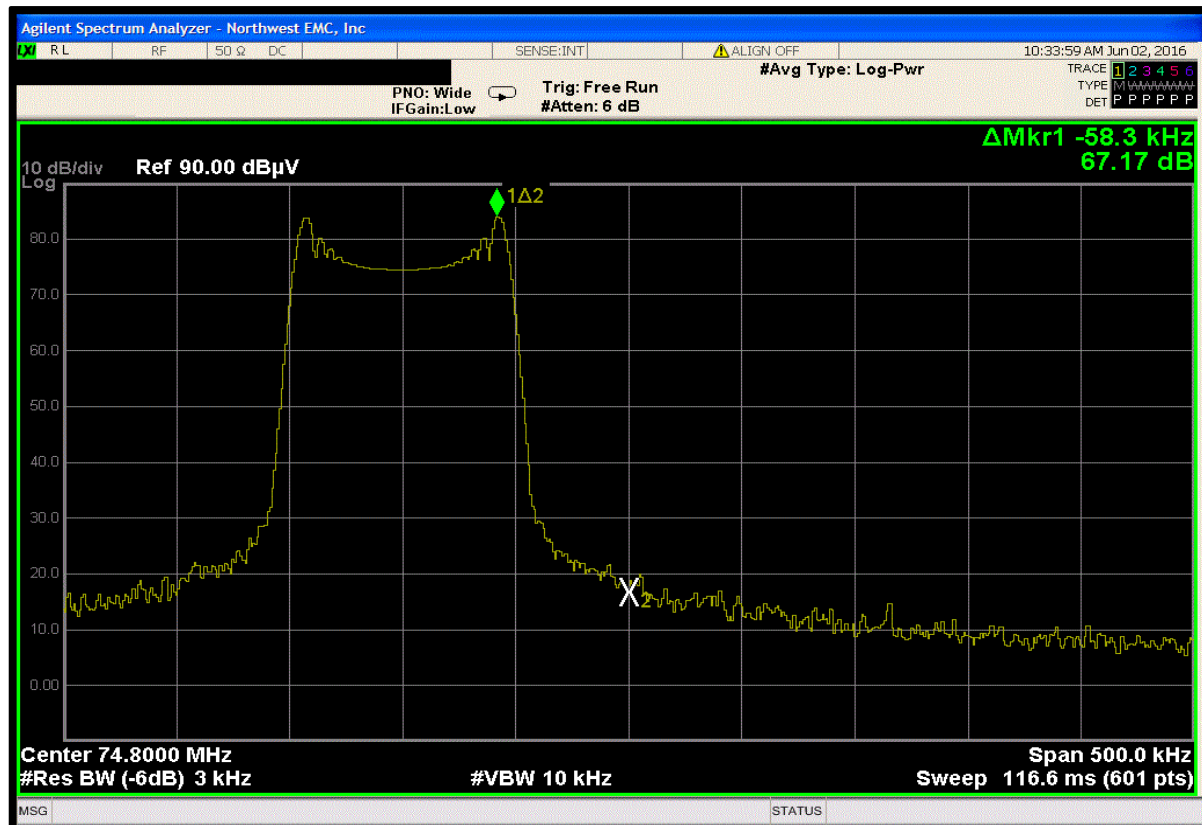
76.0 MHz band edge - ANT005



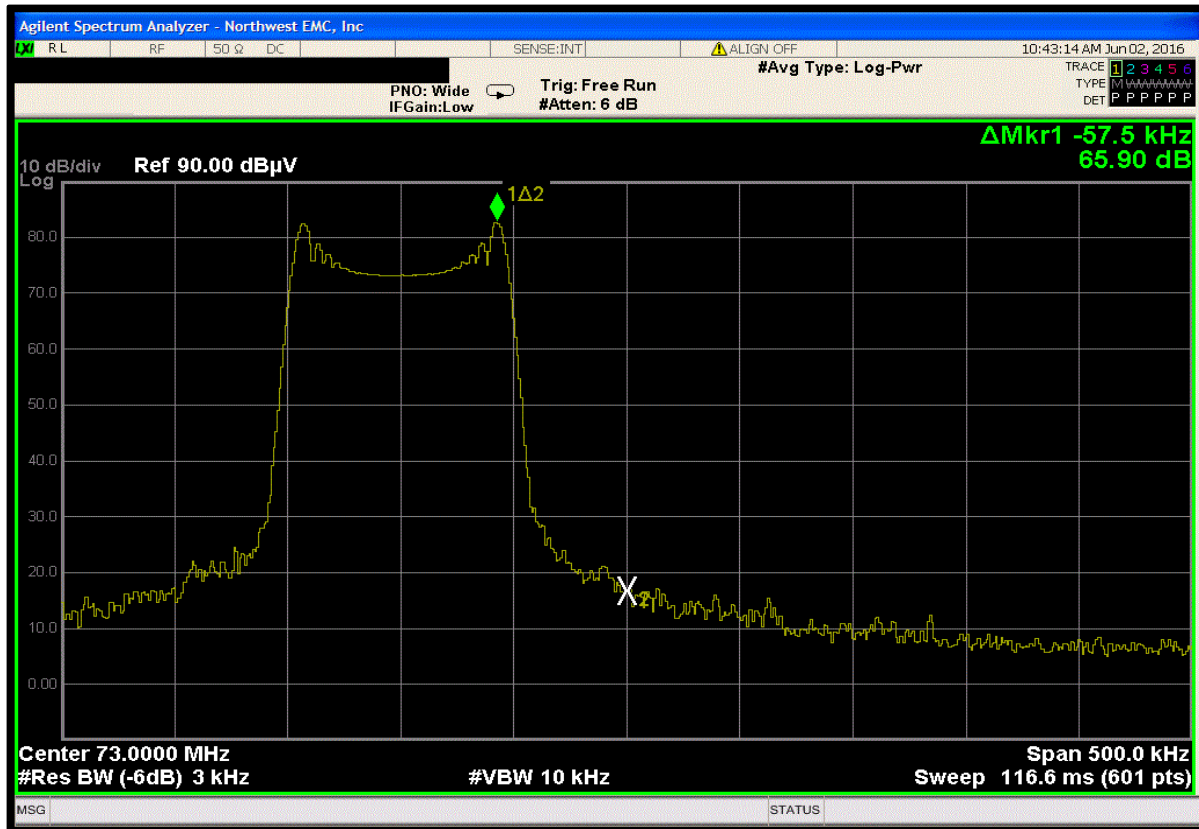
74.6 MHz band edge - ANT005



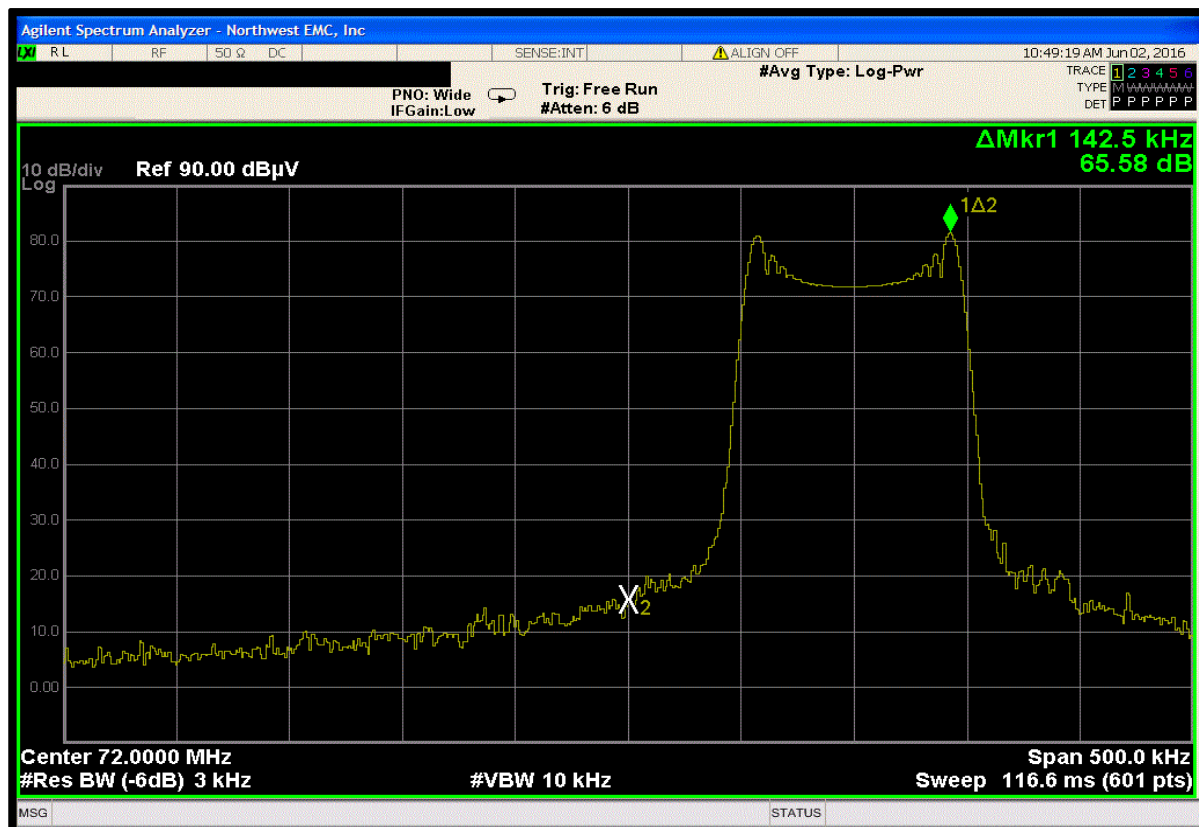
74.8 MHz band edge - ANT005



73.0 MHz band edge - ANT005



72.0 MHz band edge - ANT005



AC - POWERLINE CONDUCTED EMISSIONS

TEST DESCRIPTION

Using the mode of operation and configuration noted within this report, conducted emissions tests were performed. The frequency range investigated (scanned), is also noted in this report. Conducted power line measurements are made, unless otherwise specified, over the frequency range from 150 kHz to 30 MHz to determine the line-to-ground radio-noise voltage that is conducted from the EUT power-input terminals that are directly (or indirectly via separate transformer or power supplies) connected to a public power network. Per the standard, an insulating material was also added to ground plane between the EUT's power and remote I/O cables. Equipment is tested with power cords that are normally used or that have electrical or shielding characteristics that are the same as those cords normally used. Typically those measurements are made using a LISN (Line Impedance Stabilization Network), the 50ohm measuring port is terminated by a 50ohm EMI meter or a 50ohm resistive load. All 50ohm measuring ports of the LISN are terminated by 50ohm. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAS	3/8/2016	3/8/2017
Cable - Conducted Cable Assembly	Northwest EMC	MNC, HGN, TYK	MNCA	1/29/2016	1/29/2017
LISN	Solar Electronics	9252-50-R-24-BNC	LIY	3/21/2016	3/21/2017
LISN	Solar Electronics	9252-50-R-24-BNC	LIQ	11/3/2015	11/3/2016

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	2.4 dB	-2.4 dB

CONFIGURATIONS INVESTIGATED

WILM0013-9

MODES INVESTIGATED

Transmitting 74.7 MHz; modulated with 1000 Hz sine wave at 200mVRMS.

AC - POWERLINE CONDUCTED EMISSIONS

EUT:	T45NET-D	Work Order:	WILM0013
Serial Number:	3	Date:	06/02/2016
Customer:	Williams Sound, LLC	Temperature:	22.2°C
Attendees:	Lawrence Herrington, Kelly Williams	Relative Humidity:	43.7%
Customer Project:	None	Bar. Pressure:	1020 mb
Tested By:	Dustin Sparks	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	WILM0013-9

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2016	ANSI C63.10:2013

TEST PARAMETERS

Run #:	3	Line:	High Line	Add. Ext. Attenuation (dB):	0
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COMMENTS

ANT025 antenna

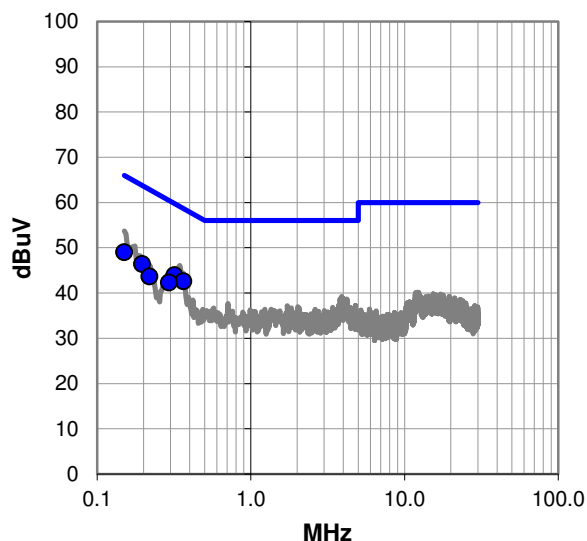
EUT OPERATING MODES

Transmitting 74.7 MHz; modulated with 1000 Hz sine wave at 200mVRMS.

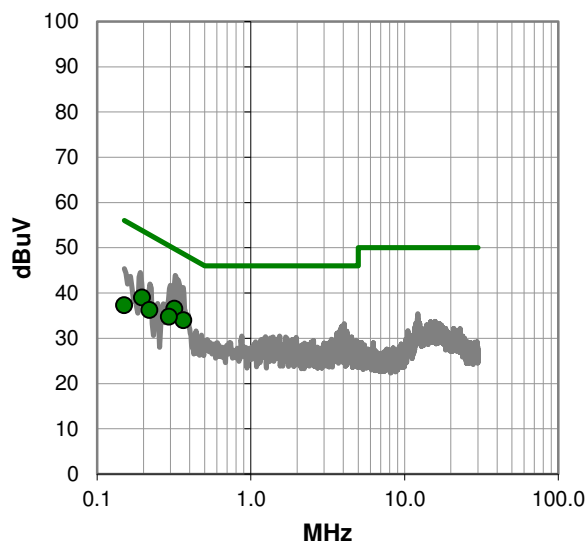
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



AC - POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #3

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.319	23.7	20.2	43.9	59.7	-15.8
0.364	22.4	20.2	42.6	58.6	-16.1
0.150	28.6	20.4	49.0	66.0	-17.0
0.196	26.1	20.3	46.4	63.8	-17.4
0.293	22.1	20.2	42.3	60.4	-18.1
0.219	23.4	20.3	43.7	62.9	-19.2

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.319	16.3	20.2	36.5	49.7	-13.2
0.364	13.8	20.2	34.0	48.6	-14.7
0.196	18.7	20.3	39.0	53.8	-14.8
0.293	14.5	20.2	34.7	50.4	-15.7
0.219	16.0	20.3	36.3	52.9	-16.6
0.150	16.9	20.4	37.3	56.0	-18.7

CONCLUSION

Pass



Tested By

AC - POWERLINE CONDUCTED EMISSIONS

EUT:	T45NET-D	Work Order:	WILM0013
Serial Number:	3	Date:	06/02/2016
Customer:	Williams Sound, LLC	Temperature:	22.2°C
Attendees:	Lawrence Herrington, Kelly Williams	Relative Humidity:	43.7%
Customer Project:	None	Bar. Pressure:	1020 mb
Tested By:	Dustin Sparks	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	WILM0013-9

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2016	ANSI C63.10:2013

TEST PARAMETERS

Run #:	4	Line:	Neutral	Add. Ext. Attenuation (dB):	0
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COMMENTS

ANT025 antenna

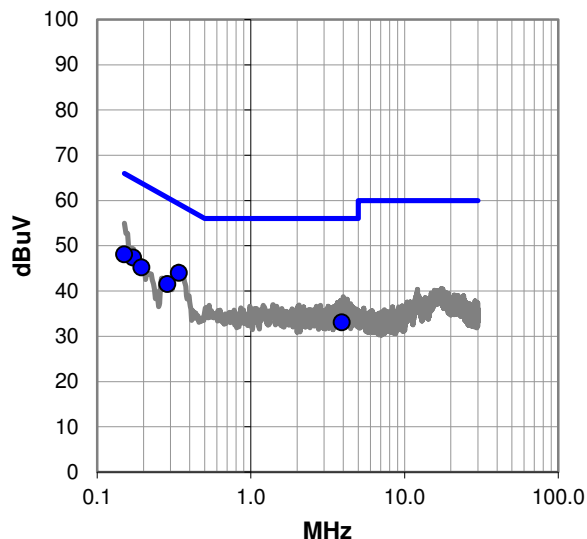
EUT OPERATING MODES

Transmitting 74.7 MHz; modulated with 1000 Hz sine wave at 200mVRMS.

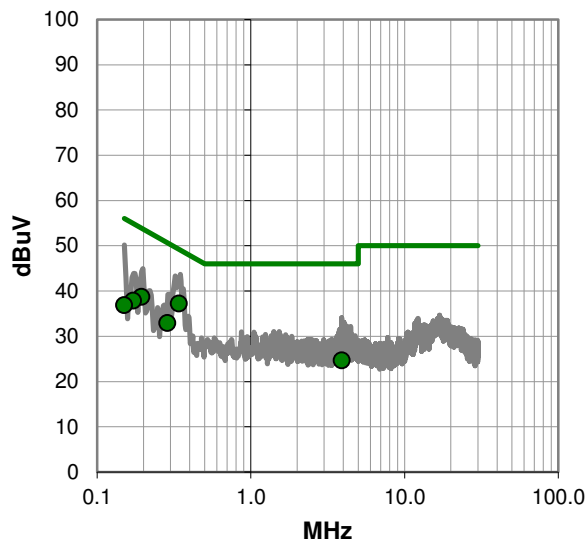
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



AC - POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #4

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.341	23.8	20.2	44.0	59.2	-15.2
0.171	27.0	20.4	47.4	64.9	-17.5
0.150	27.7	20.4	48.1	66.0	-17.9
0.195	24.9	20.3	45.2	63.8	-18.6
0.287	21.3	20.2	41.5	60.6	-19.1
3.908	12.8	20.3	33.1	56.0	-22.9

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.341	17.0	20.2	37.2	49.2	-12.0
0.195	18.4	20.3	38.7	53.8	-15.1
0.171	17.5	20.4	37.9	54.9	-17.0
0.287	12.7	20.2	32.9	50.6	-17.7
0.150	16.5	20.4	36.9	56.0	-19.1
3.908	4.4	20.3	24.7	46.0	-21.3

CONCLUSION

Pass



Tested By