



849 NW State Road 45
Newberry, FL 32669 USA
Phone: 888.472.2424 or 352.472.5500
Fax: 352.472.2030
Email: info@timcoengr.com
Website: www.timcoengr.com

FCC PART 15.237
Auditory Assistance Device
Low Power Unlicensed Intentional Radiator
TEST REPORT

Applicant	Williams Sound Corporation
Address	10321 West 70th Street Eden Prairie, MN 55344 USA
FCC ID	CNMT32
Model Number	T32
Product Description	Audio Assistance Device
Date Sample Received	September 28, 2006
Date Tested	October 5, 2006
Tested By	Nam Nguyen
Approved By	Mario de Aranzeta
Report Number	2755AUT6TestRepot
Test Results	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL

**THE ATTACHED REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL
WITHOUT THE WRITTEN APPROVAL OF TIMCO ENGINEERING, INC.**



Certificate # 0955-01

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STATEMENT OF COMPLIANCE



Certificate #0955-01

This equipment has been tested in accordance with the standards identified in the referenced test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report and demonstrate that the equipment does comply with the appropriate standards.

I attest that the necessary measurements were made by me or under my supervision, at TIMCO ENGINEERING, INC. located at 849 N.W. State Road 45, Newberry, Florida 32669 USA.

Authorized by: Mario de Aranzeta

Signature: <on file>

Function: Engineer

Date: October 12, 2006

Tested by: Nam Nguyen

Signature: on file

Date: October 5, 2006

REPORT SUMMARY

Purpose of Report	To demonstrate the DUT in compliance with FCC CFR 47 Part 15.237 requirements for auditory assistance device.
Disclaimer	The test results relate only to the items tested.
Applicable Standards	FCC CFR 47, Pt 15.237, ANSI C63.4-2003
Related Report	Digital portion is in compliance with Pt15.109, Pt 15.107 requirements in 2755BUT6TestReport

TEST ENVIRONMENT

Test Facility	Timco Engineering Inc 849 NW State Road 45 Newberry, FL 32669 USA
Laboratory Condition	Temperature: 26°C, Humidity: 50%

TEST SYSTEM SETUP

Certified System	The EUT was tested with the microphone and/or accessories provided by the applicant, which includes a S/N: 086 microphone and a microphone simulator.
Modification to DUT	No modification was made to ensure the DUT in compliance with regulatory requirements
Test Exercise	The DUT was placed in continuous transmit mode of operation
Cable	N/A
Supporting Equipment	The device is a stand-alone device operated by installed manufacturer software specified in operation manual.

DUT DESCRIPTION

Manufacturer	Williams Sound Corporation		
DUT	Auditory Assistance Device		
FCC ID	CNMT32		
Model Number	T32		
Serial Number	N/A		
Trade Name	Hearing Helper		
Operating Frequency	72.1 ~ 75.9 MHz		
No. of Channels	Selectable 16 channels, internal rotary switch		
Max. Output Power	N/A		
Modulation	Wideband FM		
Mic Connector	3.5 mm mono phone jack		
DUT Power Source	Battery Operated Exclusively		
Test Item	<input type="checkbox"/> Prototype	<input checked="" type="checkbox"/> Pre-Production	<input type="checkbox"/> Production
Type of Equipment	<input type="checkbox"/> Fixed	<input type="checkbox"/> Mobile	<input checked="" type="checkbox"/> Portable
Antenna Specification	Integral with 39" microphone cord		

EMC EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
3/10-Meter OATS	TEI	N/A	N/A	Listed 3/27/04	3/26/07
3-Meter OATS	TEI	N/A	N/A	Listed 1/11/06	1/10/09
Antenna: Biconnical	Eaton	94455-1	1057	CAL 12/12/05	12/12/07
Antenna: Biconnical	Electro-Metrics	BIA-25	1171	CAL 4/29/05	4/29/07
Analyzer Blue Tower Quasi-Peak Adapter	HP	85650A	2811A01279	CAL 4/13/05	4/13/07
Analyzer Blue Tower RF Preselector	HP	85685A	2926A00983	CAL 9/5/05	9/5/07
Analyzer Blue Tower Spectrum Analyzer	HP	8568B	2928A04729 2848A18049	CAL 4/13/05	4/13/07
LISN	Electro-Metrics	ANS-25/2	2604	CAL 8/27/06	8/27/08
LISN	Electro-Metrics	EM-7820	2682	CAL 4/28/05	4/28/07
Antenna: Log-Periodic	Eaton	96005	1243	CAL 12/14/05	12/14/07

TEST PROCEDURES

Power Line Conducted Interference

The procedure used was ANSI STANDARD C63.4-2003 using a 50uH LISN. The spectrum was scanned from .15 to 30 MHz. The bandwidth of the spectrum analyzer was 10 kHz with an appropriate sweep speed.

Radiation Interference

The test procedure used was ANSI STANDARD C63.4-2003 using an Agilent spectrum analyzer with a pre-selector. In the frequency range 10 kHz to 30 MHz the RBW was 10 kHz and from 30-1000 MHz the RBW of the spectrum analyzer was 100 kHz with an appropriate sweep speed. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The resolution bandwidth was 100 kHz and the video bandwidth was 300 kHz.

Modulation Characteristics

Audio Frequency Response - The audio frequency response was measured in accordance with TIA/EIA Specification 603. The audio signal was fed into a dummy microphone circuit and into the microphone connector. The input required to produce 30 percent modulation level was measured.

Audio input versus modulation

The audio input level needed for a particular percentage of modulation was measured in accordance with TIA/EIA Specification 603.

Occupied Bandwidth

The test procedure used was ANSI STANDARD C63.4-2003.

Radiated Spurious Emissions Into Adjacent Restricted Band

An in band field strength measurement of the fundamental Emission using the RBW and detector function required by C63.4-2003 and FCC Rules. The procedure was repeated with an average detector and a plot made. The calculated field strength in the adjacent restricted band is presented in the following pages.

Formula Of Conversion Factors: The Field Strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dBuV) to the antenna correction factor supplied by the antenna manufacturer. The antenna correction factors are stated in terms of dB. The gain of the Pre-selector was accounted for in the Spectrum Analyzer Meter Reading.

Example:

Freq (MHz)	Meter Reading	+ ACF	+CL	= FS
33	20 dBuV	+ 10.36 dB/m	+0.40 dB	=30.76 dBuV/m @ 3m

ANSI C63.4-2003 Section 8.2.1 Measurement Procedures: The DUT was placed on a non-conducting table 80 cm above the ground plane with the DUT located in the center of the table. With the antenna vertical a preliminary scan was done at 1 meters distance, the DUT was moved to a 3.0-meter distance and the antenna height varied and also placed in a horizontal position. The frequency was scanned from 9.0 kHz to 1.0 GHz. When an emission was found, the table was rotated to produce the maximum signal strength. The DUT was measured in three (3) orthogonal planes.

RADIATION INTERFERENCE

Rules Part No.: Pt 15.237 (c), Pt 15.35

Requirements: Carrier frequency shall not exceeds 98.0 dBuV/m at 3m. Out-of-band emissions, other than emissions in the restricted band shall not exceed 63.5 dBuV/m at 3m.

Test Data: Sample Calculation: FS: dBuV/m = MR(dBuV) + ACFdB.

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBuV	Ant. Polarity V/H	Coax Loss dB	Correction Factor dB/m	Field Strength dBuV/m	Margin dB
72.1	72.1	72.4	V	0.57	6.23	79.20	18.80
72.1	72.1	80.4	H	0.57	7.87	88.84	9.16
72.1	144.2	8.2	V	0.69	16.86	25.75	37.75
72.1	144.2	10.6	H	0.69	15.62	26.91	36.59
72.1	216.3	15.8	V	0.93	11.47	28.2	35.3
72.1	216.3	17.3	H	0.93	11.61	29.84	33.66
72.1	288.4	21.8	H	1.08	13.67	36.55	26.95
72.1	288.4	27.9	V	1.08	14.12	43.1	20.4
72.1	360.5	29.3	H	1.16	15.11	45.57	17.93
72.1	360.5	30.5	V	1.16	14.73	46.39	17.11
72.1	432.6	20.7	H	1.23	16.7	38.63	24.87
72.1	432.6	22.6	V	1.23	16.33	40.16	23.34
72.1	504.7	16.2	V	1.31	18.34	35.85	27.65
72.1	504.7	17.6	H	1.31	18.19	37.1	26.4
72.1	648.9	13.4	V	1.65	21.05	36.1	27.4
72.1	648.9	13.4	H	1.65	20.56	35.61	27.89
72.1	721.0	11.6	H	1.74	21.11	34.45	29.05
72.1	721.0	12.3	V	1.74	20.72	34.76	28.74

[Continued]

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBuV	Ant. Polarity V/H	Coax Loss dB	Correction Factor dB/m	Field Strength dBuV/m	Margin dB
74.7	74.7	72.6	V	0.58	7.01	80.19	17.81
74.7	74.7	81	H	0.58	7.09	88.67	9.33
74.7	149.4	9.7	H	0.7	16.05	26.45	37.05
74.7	149.4	10.3	V	0.7	17.18	28.18	35.32
74.7	224.1	19.3	V	0.95	11.36	31.61	31.89
74.7	224.1	25.6	H	0.95	11.54	38.09	25.41
74.7	298.8	26.8	H	1.1	14.05	41.95	21.55
74.7	298.8	29.9	V	1.1	14.29	45.29	18.21
74.7	373.5	30.7	H	1.17	15.31	47.18	16.32
74.7	373.5	31.9	V	1.17	15.34	48.41	15.09
74.7	448.2	18.8	V	1.25	17.93	37.98	25.52
74.7	448.2	22.9	H	1.25	17.57	41.72	21.78
74.7	522.9	17.8	V	1.37	18.03	37.2	26.3
74.7	522.9	17.9	H	1.37	18.3	37.57	25.93
74.7	597.6	14.9	V	1.59	18.65	35.14	28.36
74.7	597.6	16.3	H	1.59	19.28	37.17	26.33
74.7	672.3	13.8	H	1.67	20.65	36.12	27.38
74.7	672.3	15.1	V	1.67	20.42	37.19	26.31
74.7	747.0	8.8	H	1.79	21.44	32.03	31.47
74.7	747.0	10.2	V	1.79	20.9	32.89	30.61

[Continued]

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBuV	Ant. Polarity V/H	Coax Loss dB	Correction Factor dB/m	Field Strength dBuV/m	Margin dB
75.9	75.9	70.9	V	0.59	7.41	78.90	19.10
75.9	75.9	80.1	H	0.59	6.93	87.62	10.38
75.9	151.8	10.1	V	0.71	17.24	28.05	35.45
75.9	151.8	14.6	H	0.71	16.17	31.48	32.02
75.9	227.7	21.9	V	0.96	11.32	34.18	29.32
75.9	227.7	28.7	H	0.96	11.58	41.24	22.26
75.9	303.6	27.7	V	1.1	14.59	43.39	20.11
75.9	303.6	30.7	H	1.1	14.32	46.12	17.38
75.9	379.5	31.5	V	1.18	15.58	48.26	15.24
75.9	379.5	32	H	1.18	15.49	48.67	14.83
75.9	455.4	22.1	V	1.26	17.55	40.91	22.59
75.9	455.4	26.2	H	1.26	17.32	44.78	18.72
75.9	531.3	19.4	V	1.39	18.1	38.89	24.61
75.9	531.3	20.3	H	1.39	18.31	40.00	23.50
75.9	683.1	13.4	V	1.68	20.53	35.61	27.89
75.9	683.1	15.2	H	1.68	20.83	37.71	25.79
75.9	759.0	12.1	V	1.82	20.81	34.73	28.77

MODULATION CHARACTERISTICS

Rule Parts No.: Pt 2.1047 (a) & (b)

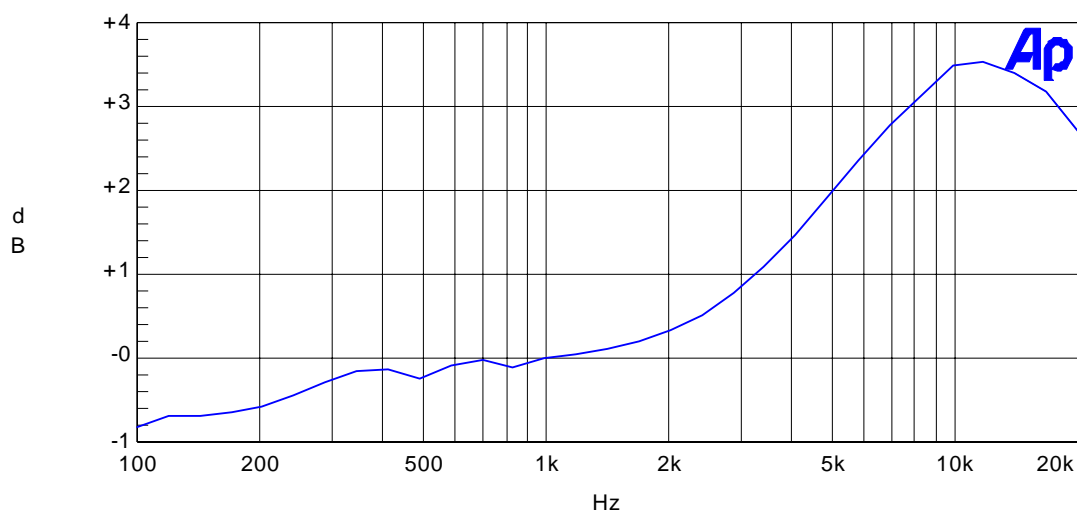
Requirements: A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 – 20,000Hz shall be submitted.

Audio input versus modulation cannot exceed 100%.

Test Data: The curve(s) is/are shown below.

Plot - Audio Frequency Response

Audio Frequency Response Plot

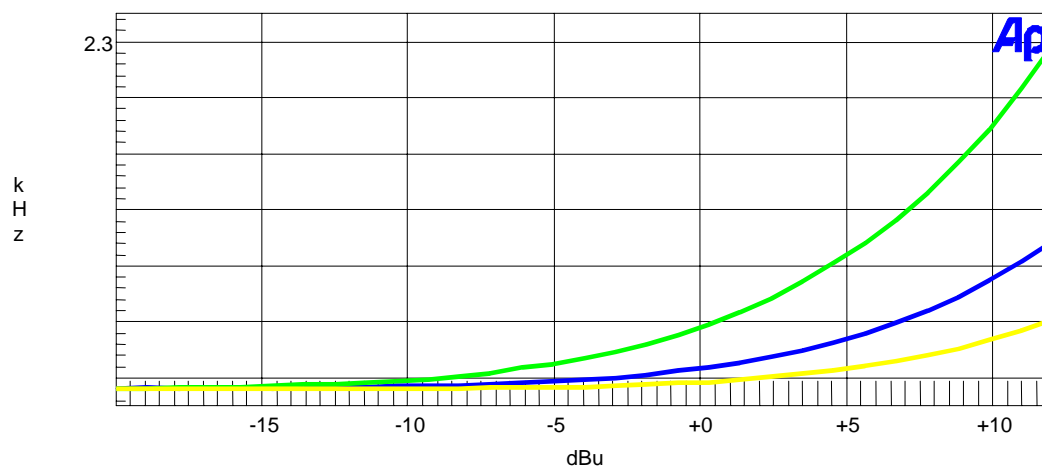


Color	Line Style	Thick	Data	Axis
Blue	Solid	1	Anlr.Level A!Normalize	Left

MaxFreq.at1

Plot – Audio input vs. Modulation

Modulation Limiting Plots:
15.0 KHz (Green), 2.5 KHz (Blue), and 300 Hz (Yellow)



OCCUPIED BANDWIDTH

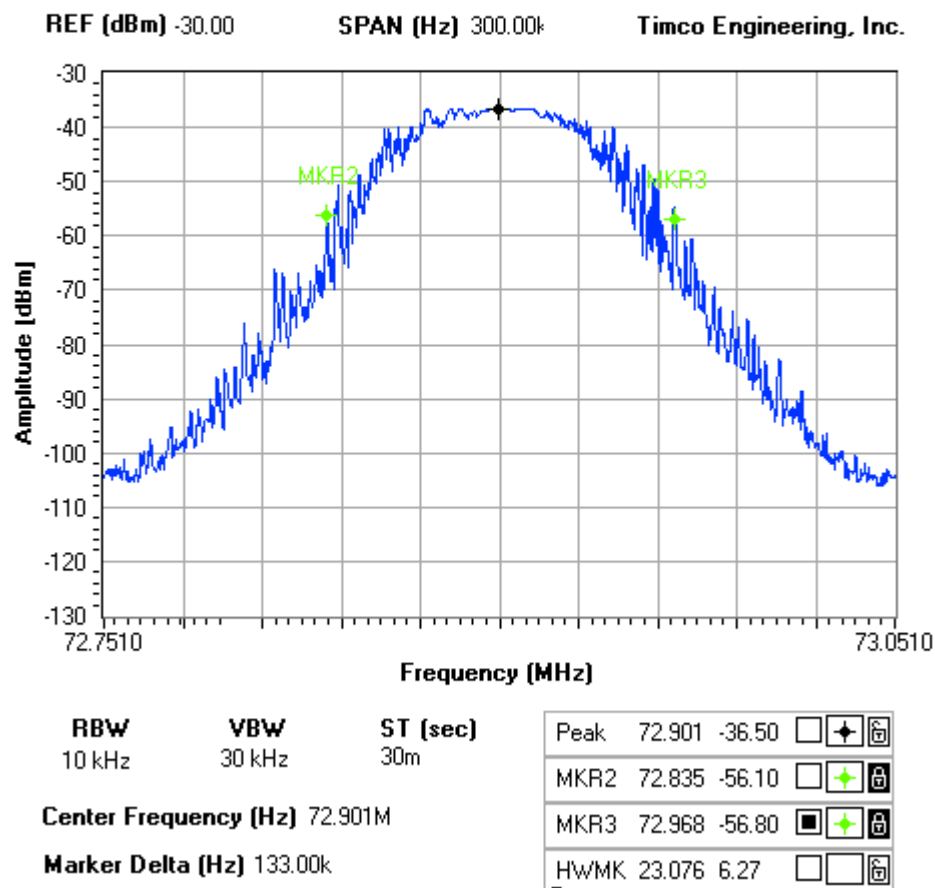
Rules Part No.: FCC Part 15.237 (b)

Requirements: Emissions from the intentional radiator shall be confined within a band 200 kHz wide centered on the operating frequency. The 200 kHz band shall lie wholly within the above specified frequency ranges.

Test Data:

NOTES:

Williams Sound Corporation - FCC ID: CNMT32
OCCUPIED BANDWIDTH PLOT



Note: the 20 dB bandwidth was found to be 133 kHz.

RADIATED SPURIOUS EMISSIONS INTO ADJACENT RESTRICTED BAND

Rule Parts No.: Pt 15.237 (b) and (c), Pt 15.205

Requirements: The emissions that fall in the restricted bands must be less than or equal to the limits shown in Part 15.209 and described in Part 15.35 (b). For the frequencies shown in the table below, the emissions in the restricted bands must be equal to or less than 100 uV/m (40 dBuV/m). The Emissions outside the restricted band must be 63.5dBuV/m or below.

MHz	MHz	MHz	GHz
0.090 – 0.110	16.42 – 16.423	399.9 – 410	4.5 – 5.15
¹ 0.495 – 0.505	16.69475 – 16.69525	608 – 614	5.35 – 5.46
2.1735 – 2.1905	16.80425 – 16.80475	960 – 1240	7.25 – 7.75
4.125 – 4.128	25.5 – 25.67	1300 – 1427	8.025 – 8.5
4.17725 – 4.17775	37.5 – 38.25	1435 – 1626.5	9.0 – 9.2
4.20725 – 4.20775	73 – 74.6	1645.5 – 1646.5	9.3 – 9.5
6.215 – 6.218	74.8 – 75.2	1660 – 1710	10.6 – 12.7
6.26775 – 6.26825	108 – 121.94	1718.8 – 1722.2	13.25 – 13.4
6.31175 – 6.31225	123 – 138	2200 – 2300	14.47 – 14.5
8.291 – 8.294	149.9 – 150.05	2310 – 2390	15.35 – 16.2
8.362 – 8.366	156.52475 – 156.52525	2483.5 – 2500	17.7 – 21.4
8.37625 – 8.38675	156.7 – 156.9	2655 – 2900	22.01 – 23.12
8.41425 – 8.41475	162.0125 – 167.17	3260 – 3267	23.6 – 24.0
12.29 – 12.293	167.75 – 173.2	3332 – 3339	31.2 – 31.8
12.51975 – 15.52025	240 – 285	3345.8 – 3358	36.43 – 36.5
12.57675 – 12.57725	322 – 335.4	3600 – 4400	(2)
13.36 – 13.41			

¹ Until February 1, 1999, this restricted band shall be 0.490 – 0.510 MHz

² Above 38.6

Test Data: The plot is presented in the following pages. Data was collected in the following table. The EUT was fed by the 11.5 KHz signal (audio frequency response) at the microphone input.

The following plots show that the 200 kHz bandwidth for each fundamental frequency lie wholly within the allowed frequency ranges of operation.

The marker(s) on each plot indicate a band-edge frequency. Frequency scale: 4 divisions correspond to a 200 kHz bandwidth.

Fundamental Frequency (MHz)	Field Strength Level of Fund. (dBuV/m)	Freq of Max. Band-edges Emission (MHz)	Delta Marker (dB) *	Cal. Max. Out of Band Emission Level (dBuV/m) **	Limit (dBuV/m)	Margin (dB)
72.1	88.84	71.998	56.5	32.34	63.5	31.16
72.9	90.61	73.004	52.1	38.51	40.0	1.49
74.7	88.67	74.595	56.1	32.57	40.0	7.43
74.7	88.67	74.807	56.3	32.37	40.0	7.63
75.3	87.76	75.199	50.8	36.96	40.0	3.04
75.9	87.62	76.004	50.1	37.52	63.5	25.98

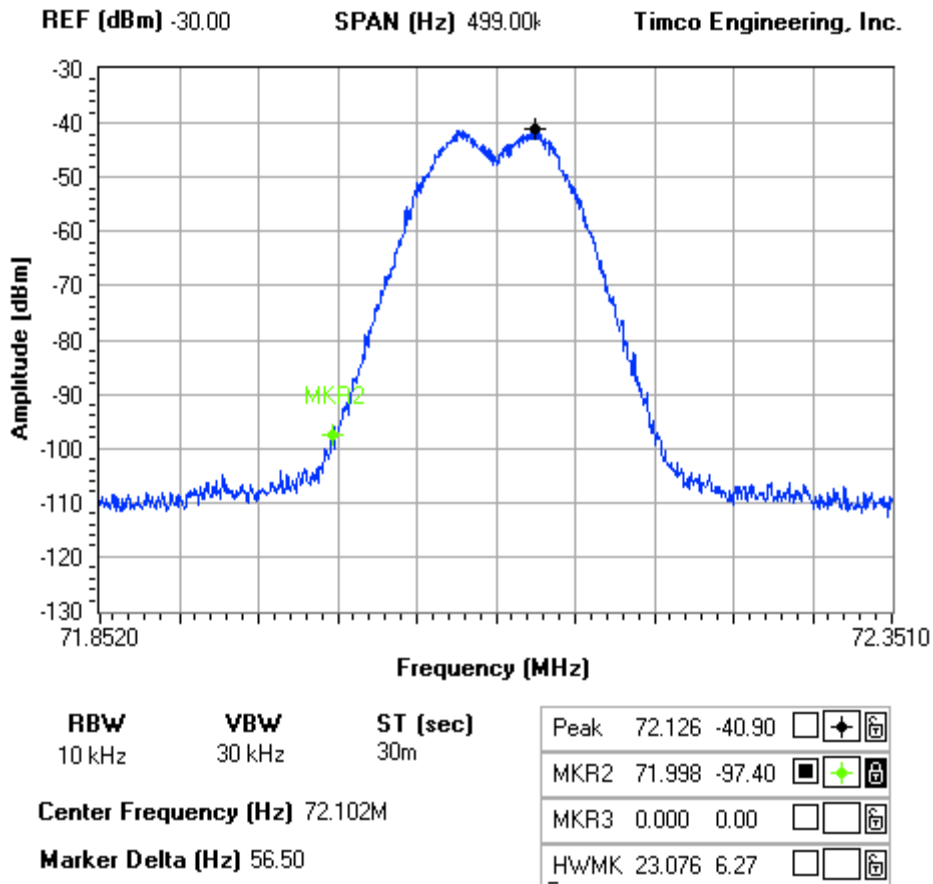
* According to step 2 of Marker-Delta Method DA 00-705 (following plots included).

** According to step 3 of Marker-Delta Method:

Calculated Emission Level = Field Strength Level - Delta Marker Level

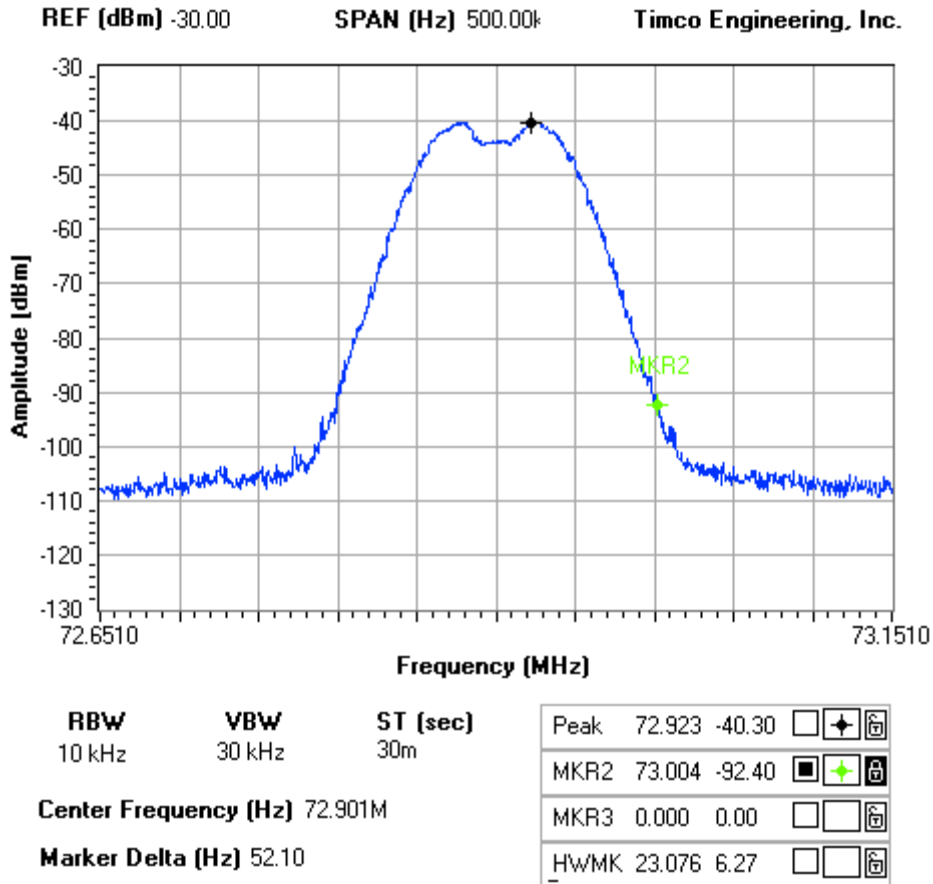
NOTES:

Williams Sound Corporation - FCC ID: CNMT32
 ADJACENT RESTRICTED BAND PLOT -



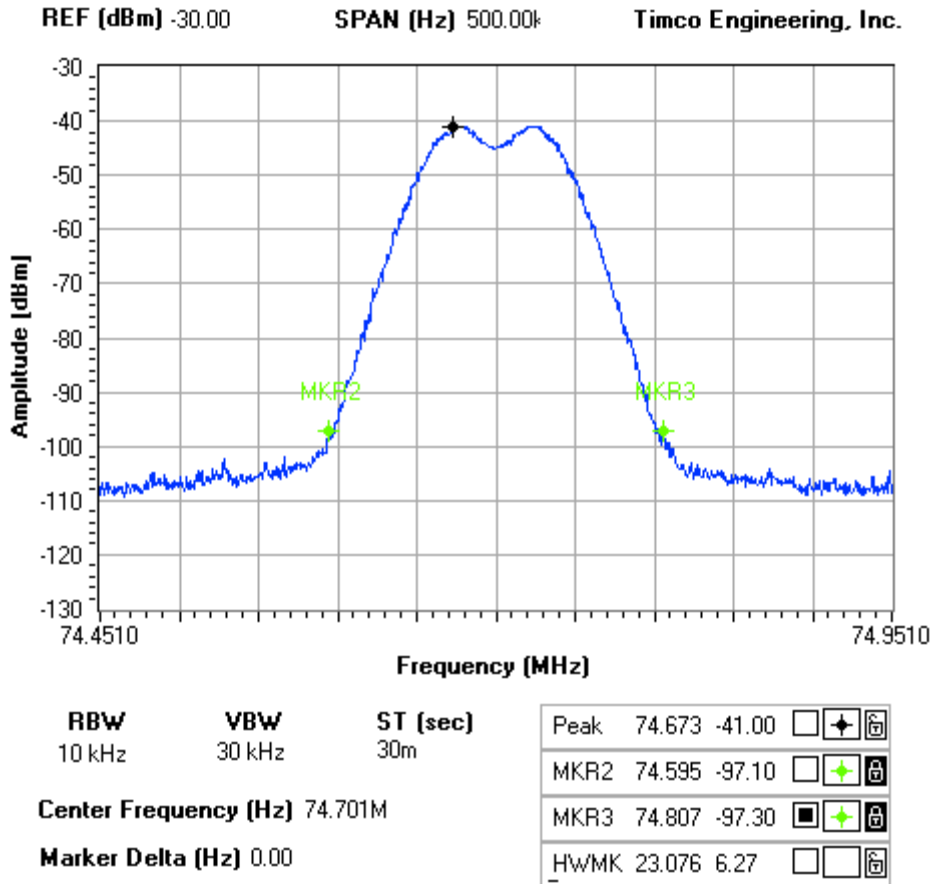
NOTES:

Williams Sound Corporation - FCC ID: CNMT32
 ADJACENT RESTRICTED BAND PLOT -



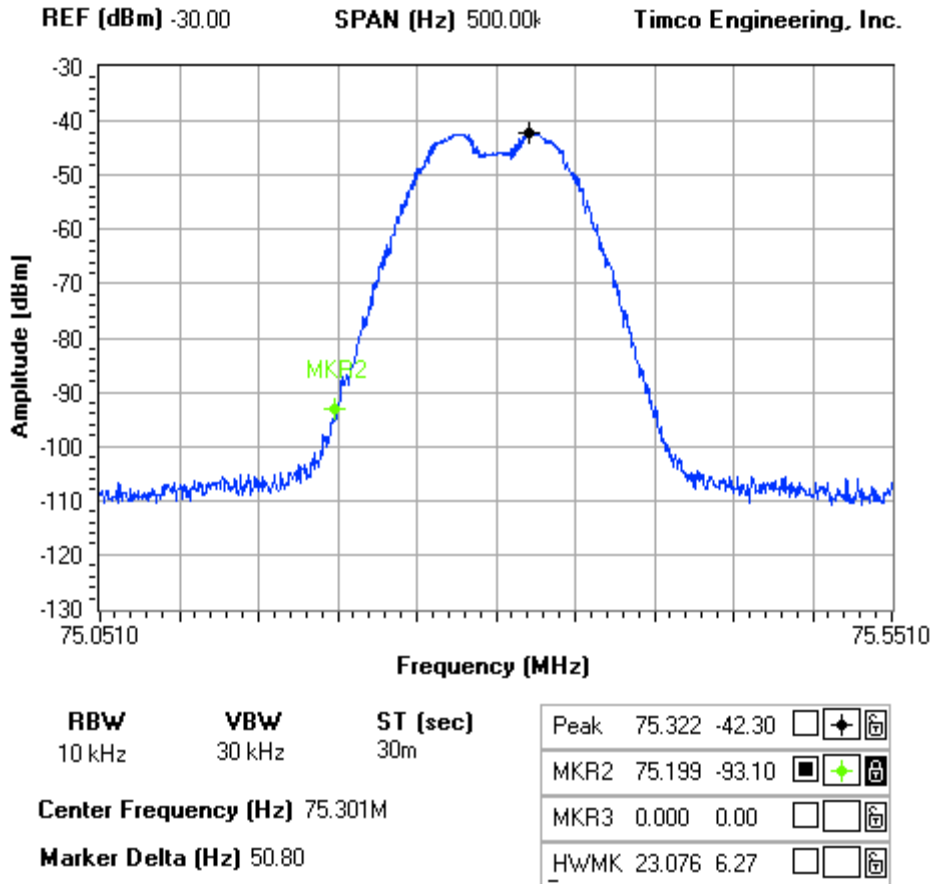
NOTES:

Williams Sound Corporation - FCC ID: CNMT32
 ADJACENT RESTRICTED BAND PLOT -



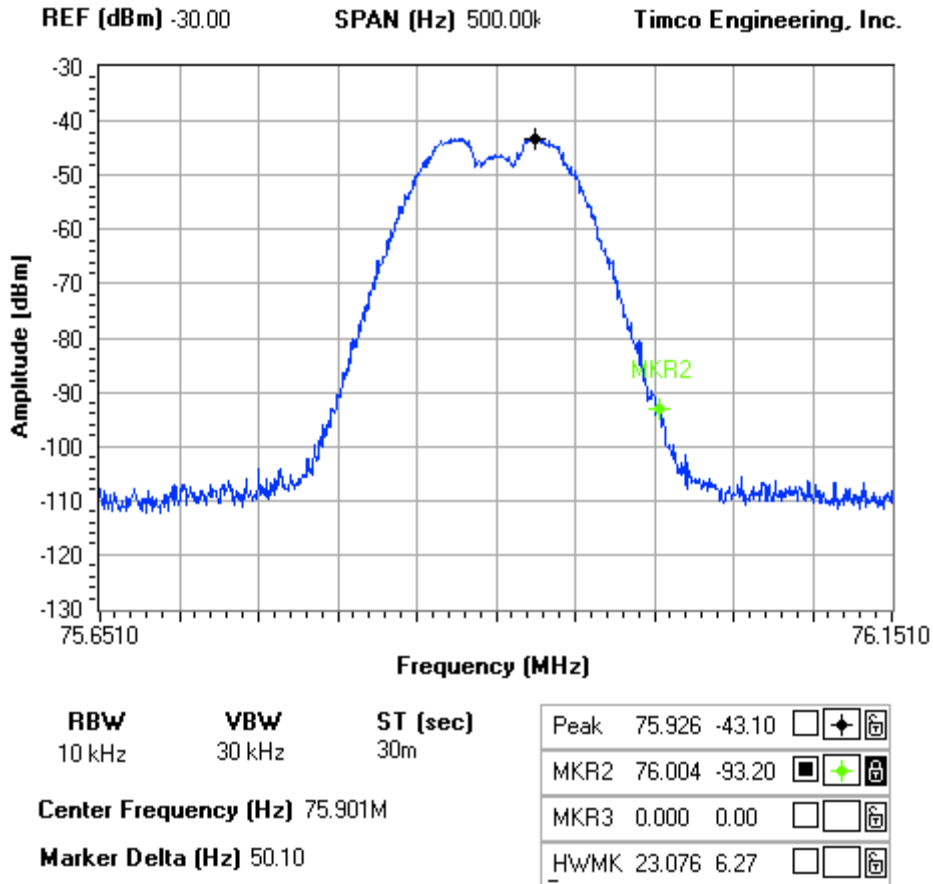
NOTES:

Williams Sound Corporation - FCC ID: CNMT32
 ADJACENT RESTRICTED BAND PLOT -



NOTES:

Williams Sound Corporation - FCC ID: CNMT32
 ADJACENT RESTRICTED BAND PLOT -



POWER LINE CONDUCTED INTERFERENCE

Rules Part No.: Part 15.207 Class B

Requirements:

Frequency (MHz)	Quasi Peak Limits (dBuV)	Average Limits (dBuV)
0.15 – 0.5	66 – 56	56 – 46
0.5 – 5.0	56	46
5.0 – 30	60	50

Test Data: Not applicable because the DUT is battery operated exclusively