

Global EMC Inc. Labs

EMC & RF Test Report

As per
RSS 210 Issue 7:2007
&
FCC Part 15 Subpart C:2010
Unlicensed Intentional Radiators
on the

Wireless Audio Transceiver Module – WTX1011



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Testing produced for



See Appendix A for full customer & EUT details.



Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	

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Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	

Report Scope

This report addresses the EMC verification testing and test results of the Wireless Audio Transceiver Module – WTX1011, herein referred to as EUT (Equipment Under Test) performed at Global EMC Labs.

The EUT was tested for compliance against the following standards:

RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010

Test procedures, results, justifications, and engineering considerations, if any, follow later in this report.

The results contained in this report relate only to the item(s) tested.

This report does not imply product endorsement by A2LA or any other accreditation agency, any government, or Global EMC Inc.


Opinions/interpretations expressed in this report, if any, are outside the scope of Global EMC Inc accreditation. Any opinions expressed do not necessarily reflect the opinions of Global EMC Inc, unless otherwise stated.

Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	

Summary


The results contained in this report relate only to the item(s) tested.

EUT FCC Certification #, FCC ID:	WUO-WTX1011
EUT Industry Canada Certification #, IC:	7985A-WTX1011
EUT Passed all tests performed.	Yes (see test results summary)
Tests conducted by	Raymond Lee Au

Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	

Test Results Summary

Standard/Method	Description	Class/Limit	Result
FCC 15.203	Antenna Requirement	Unique	Pass See Justification
FCC 15.205 RSS 210 (Table 1)	Restricted Bands for intentional operation	QuasiPeak Average	Pass
FCC 15.207	Power line conducted emissions	QuasiPeak Average	Pass
FCC 15.209 RSS-210 (Table 2)	Spurious Radiated emissions	QuasiPeak Average	Pass
FCC 15.247(a)2 RSS-210 A8.2(a)	6 dB Bandwidth	> 500 kHz	Pass
FCC 15.247(b)2 RSS-210 A8.4(4)	Max output power	< 1 Watt	Pass
FCC 15.247(b)(4) RSS-210 A8.4(5)	Antenna Gain	< 6 dBi	Pass See Justifications
FCC 15.247(d) RSS-210 A8.5	Antenna conducted spurious	< 20 dBc	Pass
FCC 15.247(e) RSS-210 A8.2(b)	Spectral Density	< 8 dBm (3 kHz BW)	Pass
FCC 15.247(i) IC Safety code 6	Maximum Permissible Exposure	< 2.4 mW	Pass See justification and calculations
Overall Result			PASS

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All tests were performed by Raymond Lee Au.

If the product as tested or otherwise complies with the specification, the EUT is deemed to comply with the requirement and is deemed a 'PASS' grade. If not 'FAIL' grade will be issued. Note that 'PASS' / 'FAIL' grade is independent of any measurement uncertainties. A 'PASS' / 'FAIL' grade within measurement uncertainty is marked with a '*'.

Justifications, Descriptions, or Deviations

The following justifications for tests not performed or deviations from the above listed specifications apply:


For the Antenna requirement specified in FCC 15.203 (RSS 210 section 5.5), this device uses a SMT chip antenna.

For the Restricted Bands of operation, the EUT is designed to only operate between 2.405 GHz and 2.477 GHz

For the power line conducted emissions requirements, the EUT is DC powered, and this test does not apply, however representative power line conducted emissions using a test bed host are presented in this report.

For the Antenna gain, this antenna has (significantly) less than 6 dBi.

For maximum permissible exposure, this device operates at less than 2.4mW and is allowable for portable & mobile configurations. No testing is required, however worst case calculated exposure compliance follows later in this report.

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Applicable Standards, Specifications and Methods

ANSI C63.4:2003	- Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI C63.10:2009	- American national standard for testing unlicensed wireless devices
CFR 47 FCC 15	- Code of Federal Regulations – Radio Frequency Devices
CISPR 22:1997	- Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement
ICES-003:2004	- Digital Apparatus - Spectrum Management and Telecommunications Policy Interference-Causing Equipment Standard
ISO 17025:2005	- General Requirements for the competence of testing and calibration laboratories
RSS 210:2007	- Issue 7: Spectrum Management and Telecommunications Policy. Radio Standards Specification Low Power Licence-Exempt Radiocommunication Devices

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Sample calculation(s)

Margin = limit – (received signal + antenna factor + cable loss – pre-amp gain)

Margin = 50.5dBuV/m – (50dBuV + 10dB + 2.5dB – 20dB)

Margin = 8.5 dB

Document Revision Status

Revision 1 - December 23, 2010

Client	Sonavox Audio Solution	
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Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	

Definitions and Acronyms

The following definitions and acronyms are applicable in this report.
See also ANSI C63.14.

AE – Auxillary Equipment.

BW – Bandwidth. Unless otherwise stated, this refers to the 6 dB bandwidth.

EMC – Electro-Magnetic Compatibility

EMI – Electro-Magnetic Immunity

EUT – Equipment Under Test

ITE – Information Technology Equipment with a primary function(s) of entry, storage, display, retrieval, transmission, processing, switching, or control, of data.

LISN – Line impedance stabilization network

NCR – No Calibration Required

RF – Radio Frequency

Client	Sonavox Audio Solution	
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Testing Facility

Testing for EMC on the EUT was carried out at Global EMC labs in Toronto, Ontario, Canada. The testing lab consists of a 3m semi-anechoic chamber calibrated to be able to allow measurements on an EUT with a maximum width or length of up to 2m and height up to 3m. The chamber is equipped with a turn table that is capable of testing devices up to 3300lb in weight. This facility is capable of testing products that are rated for 120 Vac and 240Vac single phase, or 208 Vac 3 phase input. DC capability is also available. The chamber is equipped with an antenna mast that controls polarization and height from the control room adjoining the shielded chamber. Radiated emissions measurements are performed using a Bilog, and Horn antenna where applicable. Conducted emissions, unless otherwise stated, are performed using a LISN.

Calibrations and Accreditations

The measurement site used is registered with Federal Communications Commission (FCC) and Industry Canada (IC). This site is calibrated for Normalized Site Attenuation (NSA) using test procedures outlined in ANSI C63.4 “Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz”. The semi-anechoic chamber is lined with ferrite tiles and absorption cones to minimize any undesired reflections. All measuring equipment is calibrated on an annual or bi-annual basis as listed for each respective test.

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Testing Environmental Conditions and Dates

Following were the environmental conditions in the facility during time of testing –

Date	Test	Init.	Temperature (°C)	Humidity (%)	Pressure (kPa)
Dec. 7 – 16, 2010	All	RA	20-25°C	30-45%	100 -103kPa

Client	Sonavox Audio Solution	
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Detailed Test Results Section

Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	

Power Line Conducted Emissions

Purpose

The purpose of this test is to ensure that the RF energy unintentionally emitted from the EUT's power line does not exceed the limits listed below as defined in the applicable test standard, as measured from a LISN. This helps protect lower frequency radio services such as AM radio, shortwave radio, amateur radio operators, maritime radio, CB radio, and so on, from unwanted interference.

Limits & Method

The limits are as defined in 47 CFR FCC Part 15 Section 15.207


Method is as defined in ANSI C64:2003

Average Limits		QuasiPeak Limits	
150 kHz – 500 kHz	56 to 46 dBuV	150 kHz – 500 kHz	66 to 56 dBuV
500 kHz – 5 MHz	46 dBuV	500 kHz – 5 MHz	56 dBuV
5 MHz – 30 MHz	50 dBuV	500 kHz – 30 MHz	60 dBuV

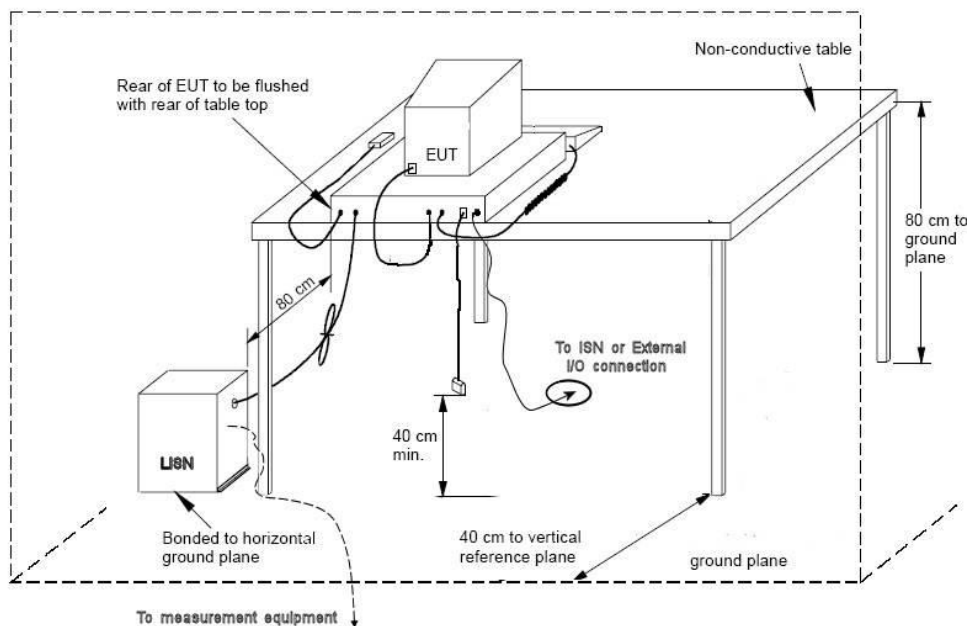
The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

Note: If the Peak or Quasi Peak detector measurements do not exceed the Average limits, then the EUT is deemed to have passed the requirements.

Both limits are applicable, and each is specified as being measured with a 9 kHz measurement bandwidth.

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Typical Setup Diagram



Note: The vertical reference plane is optional as per ANSI C63.4 section 5.2.2


Client	Sonavox Audio Solution	
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Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	

Measurement Uncertainty

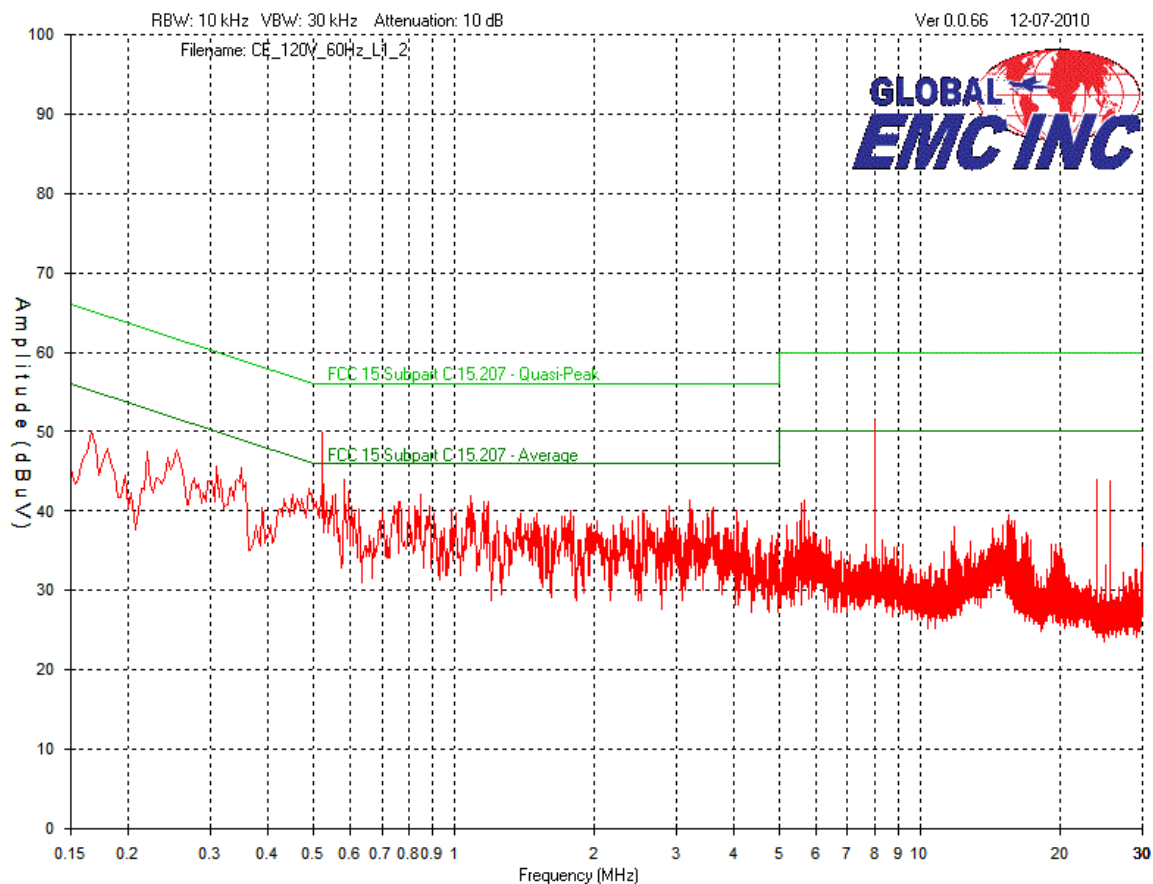
The expanded measurement uncertainty is calculated in accordance with CISPR 16-4-2 and is ± 3.6 dB with a 'k=2' coverage factor and a 95% confidence level.


Preliminary Graphs

Note the graphs shown below are for graphical illustration only. For final measurements with the appropriate detector where applicable, please refer to the table. The graph shown below is a peak measurement graph, measured with a resolution bandwidth greater than or equal to the final required detector. These graphs are performed as a worst case measurement to enable the detection of frequencies of concern and for considerable time savings.

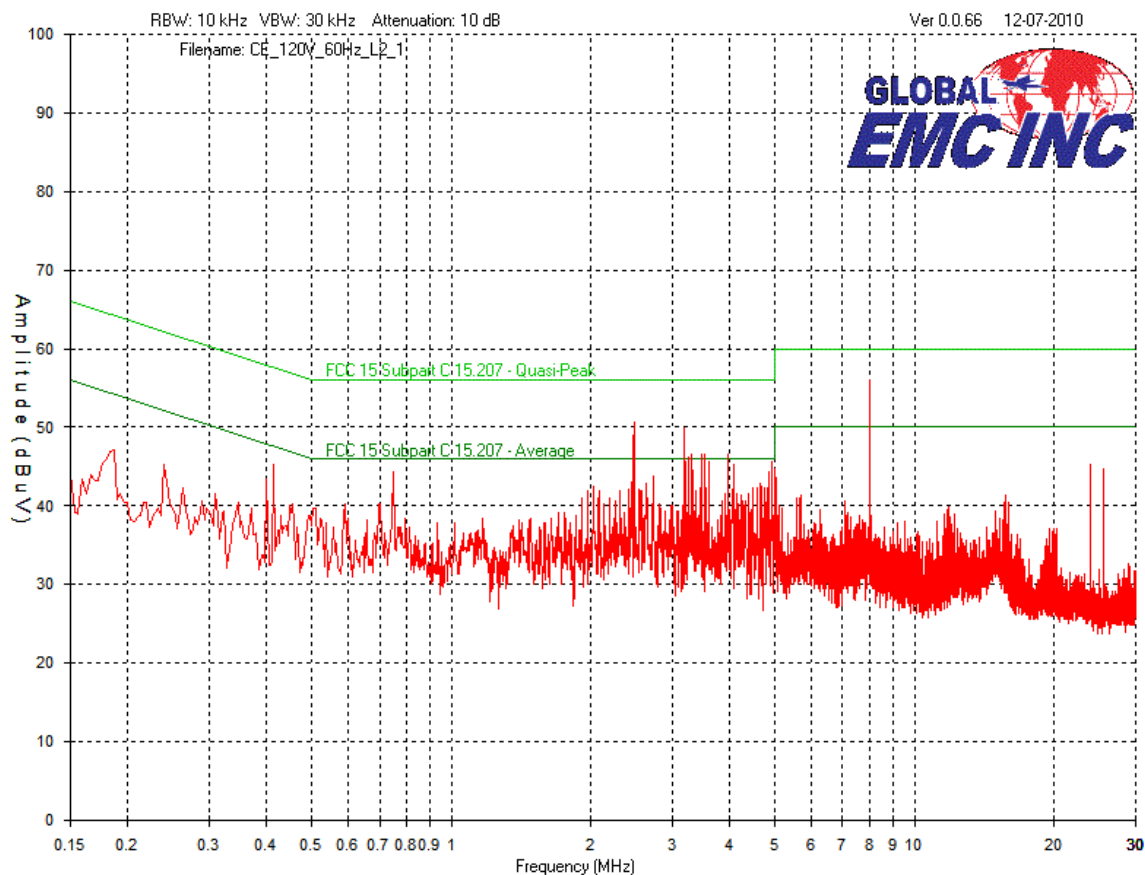
Client	Sonavox Audio Solution	
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Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	


Phase
120V, 60Hz



Client	Sonavox Audio Solution	
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Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	

Neutral
120V, 60Hz



Client	Sonavox Audio Solution	
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Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	

Final Measurements


Average Measurements:

Line 1 – Phase: 120V, 60Hz

Frequency (MHz)	Raw Reading (dBuV)	Atten Factor (dB)	Cable Factor	LISN Factor (dB)	Level (dBuV)	Limit (dB)	Margin (dB)	Pass/Fail
8.00	39.3	10	0.2	0.2	49.7	50	0.3	Pass
1.06	14.2	10	0.1	0.2	24.5	46	21.5	Pass
0.517	16.5	10	0.1	0.2	26.8	46	19.2	Pass
0.590	19.3	10	0.1	0.2	29.6	46	16.4	Pass
0.850	13.4	10	0.1	0.2	23.7	46	22.3	Pass
0.247	16.5	10	0.1	0.7	27.3	51.9	24.6	Pass

Line 2 – Neutral: 120V, 60Hz

Frequency (MHz)	Raw Reading (dBuV)	Atten Factor (dB)	Cable Factor	LISN Factor (dB)	Level (dBuV)	Limit (dB)	Margin (dB)	Pass/Fail
8.00	39.2	10	0.2	0.2	49.6	50	0.4	Pass
2.47	12.1	10	0.1	0.2	22.4	46	23.6	Pass
3.18	12.5	10	0.1	0.2	22.8	46	23.2	Pass
2.47	12.3	10	0.1	0.2	22.6	46	23.4	Pass
3.95	13.5	10	0.2	0.2	23.9	46	22.1	Pass
3.54	14.8	10	0.1	0.2	25.1	46	20.9	Pass

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Quasi-peak readings


Line 1 – Phase: 120V, 60Hz

Frequency (MHz)	Raw Reading (dBuV)	Atten Factor (dB)	Cable Factor	LISN Factor (dB)	Level (dBuV)	Limit (dB)	Margin (dB)	Pass/Fail
8.00	46.1	10	0.2	0.2	56.5	60	3.5	Pass
1.06	24.2	10	0.1	0.2	34.5	56	21.5	Pass
0.517	29.1	10	0.1	0.2	39.4	56	16.6	Pass
0.590	25.7	10	0.1	0.2	36	56	20	Pass
0.850	24	10	0.1	0.2	34.3	56	21.7	Pass
0.247	33.7	10	0.1	0.7	44.5	61.9	17.4	Pass

Line 2 – Neutral: 120V, 60Hz

Frequency (MHz)	Raw Reading (dBuV)	Atten Factor (dB)	Cable Factor	LISN Factor (dB)	Level (dBuV)	Limit (dB)	Margin (dB)	Pass/Fail
8.00	46.1	10	0.2	0.2	56.5	60	3.5	Pass
2.47	23.1	10	0.1	0.2	33.4	56	22.6	Pass
3.18	31.5	10	0.1	0.2	41.8	56	14.2	Pass
2.47	23.4	10	0.1	0.2	33.7	56	22.3	Pass
3.95	22	10	0.2	0.2	32.4	56	23.6	Pass
3.54	29.5	10	0.1	0.2	39.8	56	16.2	Pass

Note: See ‘Appendix B – EUT & Test Setup Photographs’ for photos showing the test set-up for the highest line conducted emission

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Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
IFR Spectrum Analyzer	AN940	IFR	12/29/2009	12/29/2011	GEMC 6350
BiLog Antenna	3142-C	ETS	2009-02-12	2011-02-12	GEMC 8
LISN	FCC-LISN-50/250-16-2-01	FCC	2009-02-11	2011-02-11	GEMC 65
RF Cable 7m	LMR-400-7M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 28
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
Attenuator 10 dB	FP-50-10	Trilithic	NCR	NCR	GEMC 42

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B_Rev1"

Client	Sonavox Audio Solution	
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Radiated Emissions

Purpose

The purpose of this test is to ensure that the RF energy unintentionally emitted from the EUT does not exceed the limits listed below as defined in the applicable test standard, as measured from a receiving antenna. This helps protect broadcast radio services such as television, FM radio, pagers, cellular telephones, emergency services, and so on, from unwanted interference.

Limit(s) and Method

The method is as defined in ANSI C63.4:2003.

The limits are as defined in FCC Part 15, Section 15.209:

30 MHz – 88 MHz, 100 uV/m (40.0 dBuV/m¹) at 3 m

88 MHz – 216 MHz, 150 uV/m (43.5 dBuV/m¹) at 3 m


216 MHz – 960 MHz, 200 uV/m (46.4 dBuV/m¹) at 3 m

Above 960 MHz, 500 uV/m (54.0 dBuV/m¹) at 3 m

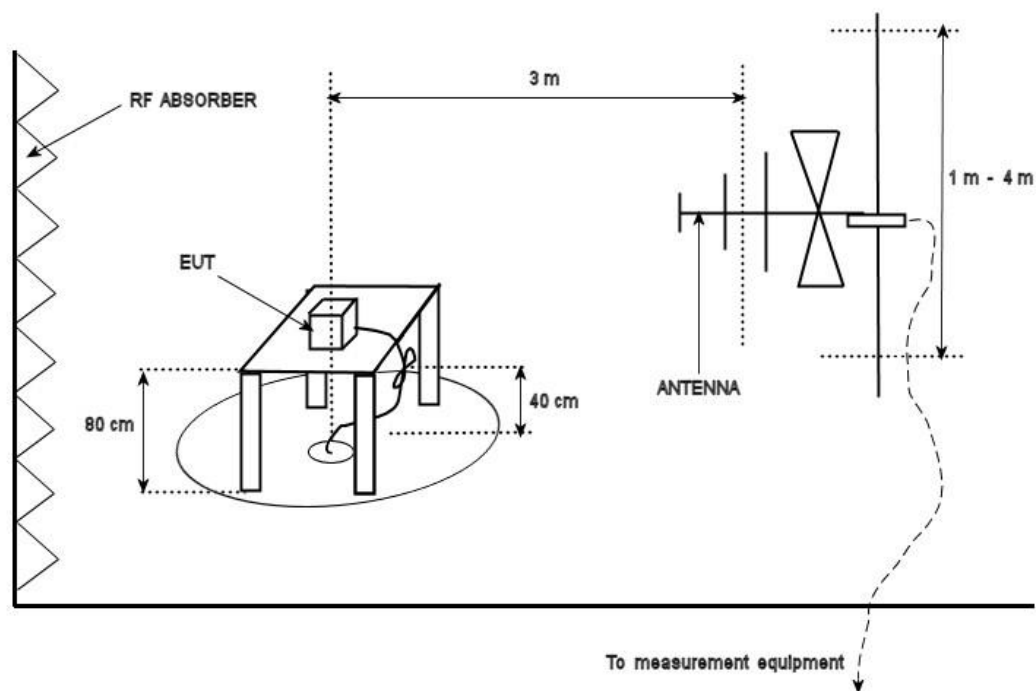
Above 1000 MHz², 500 uV/m (54 dBuV/m) at 3m

¹Limit is with 120 kHz measurement bandwidth and a using a Quasi Peak detector.

²Limit is with 1 MHz measurement bandwidth and using an Average detector

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Typical Radiated Emissions Setup



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Measurement Uncertainty

The expanded measurement uncertainty is calculated in accordance with CISPR 16-4-2 and is +/-4.4 dB with a 'k=2' coverage factor and a 95% confidence level.


Preliminary Graphs

Note the graphs shown below are for graphical illustration only. For final measurements with the appropriate detector, please refer to the final measurement table where applicable. The graph shown below is a maximized peak measurement graph, measured with a resolution bandwidth greater than the final required detector and over a full 0-360° rotation. This peaking process is done as a worst case measurement. This process enables the detection of frequencies of concern for final measurement, and provides considerable time savings.

In accordance with FCC Part 15, Subpart A, Section 15.33, the device was scanned to the 10th harmonic (a minimum of a 25 GHz).

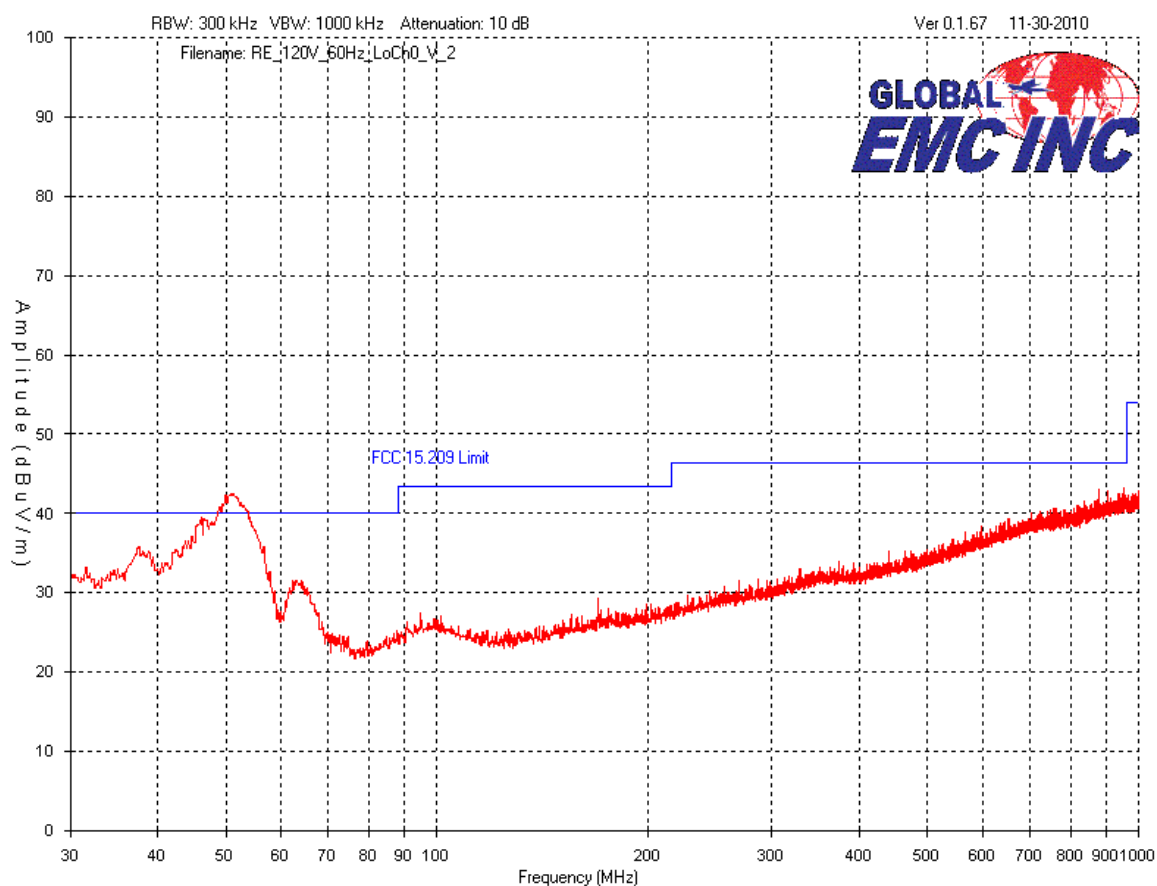
The graphs shown represent low channel as representative, however low, middle, and high channel were scanned.


Devices scanned above 10 GHz were scanned at 1 meter test distance, and in accordance with FCC Part 15, Subpart A, Section 15.31, an extrapolation factor of 20 dB/decade was used. For example for 1 meter measurements, an extrapolation factor 9.5 dB from 20 Log (1m / 3m) is applied.

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Vertical – Peak Emissions Graph

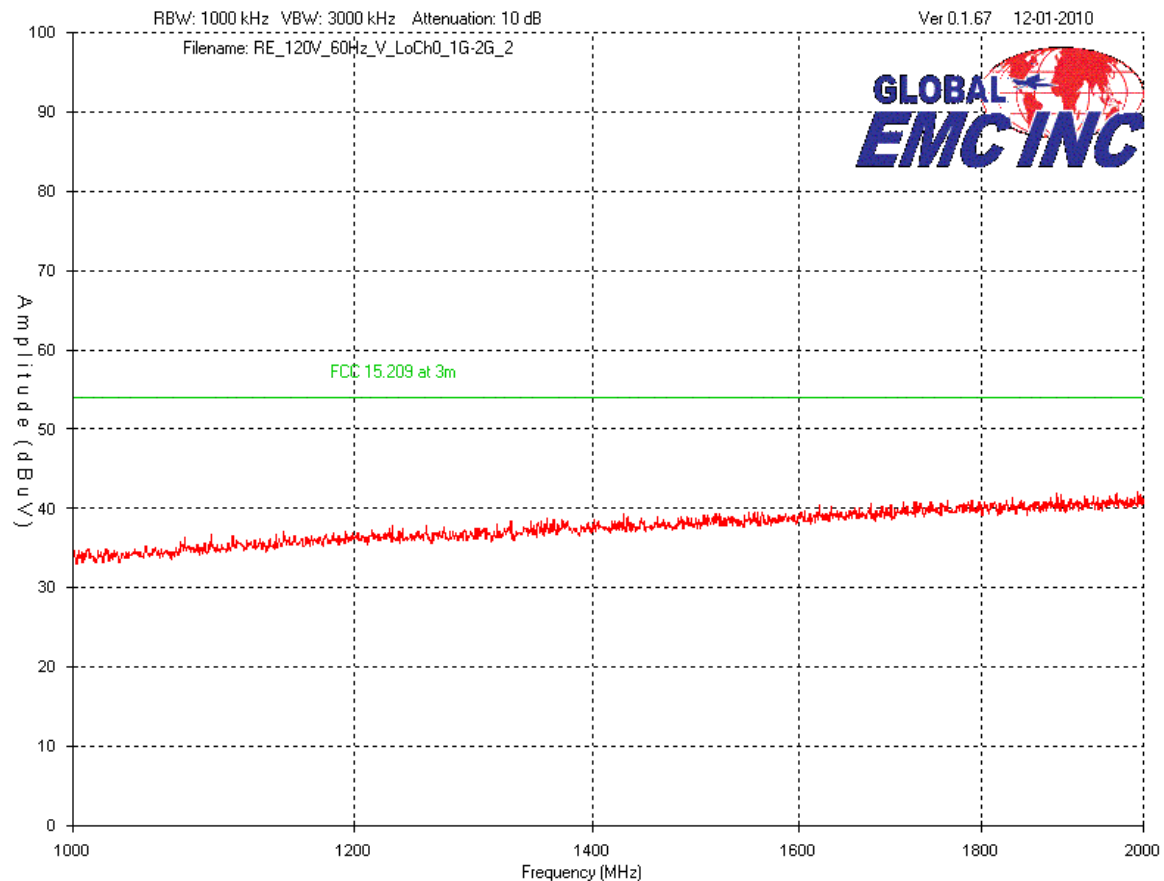
30M to 1 GHz




Client	Sonavox Audio Solution	
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Vertical – Peak Emissions Graph

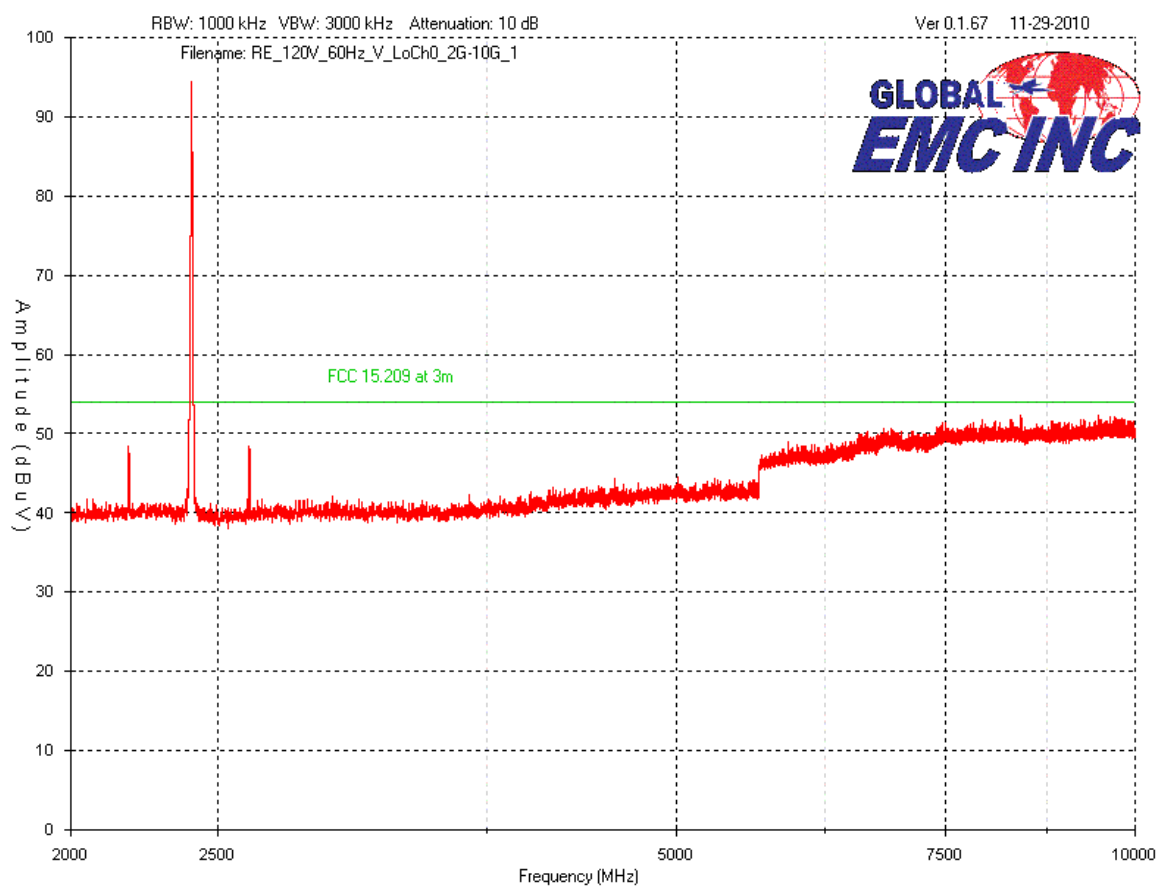
1GHz to 2 GHz




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Vertical – Peak Emissions Graph

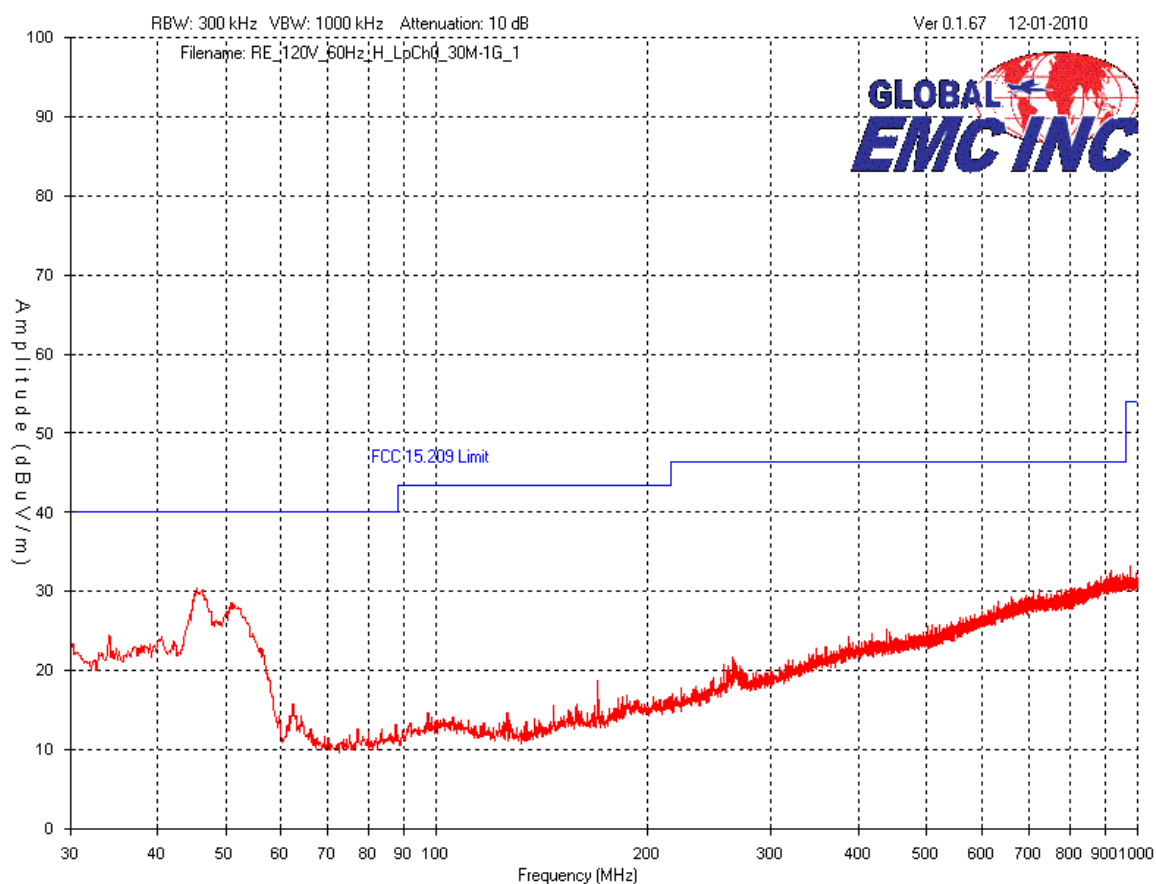
2 GHz to 10 GHz




Client	Sonavox Audio Solution	
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Horizontal – Peak Emissions Graph

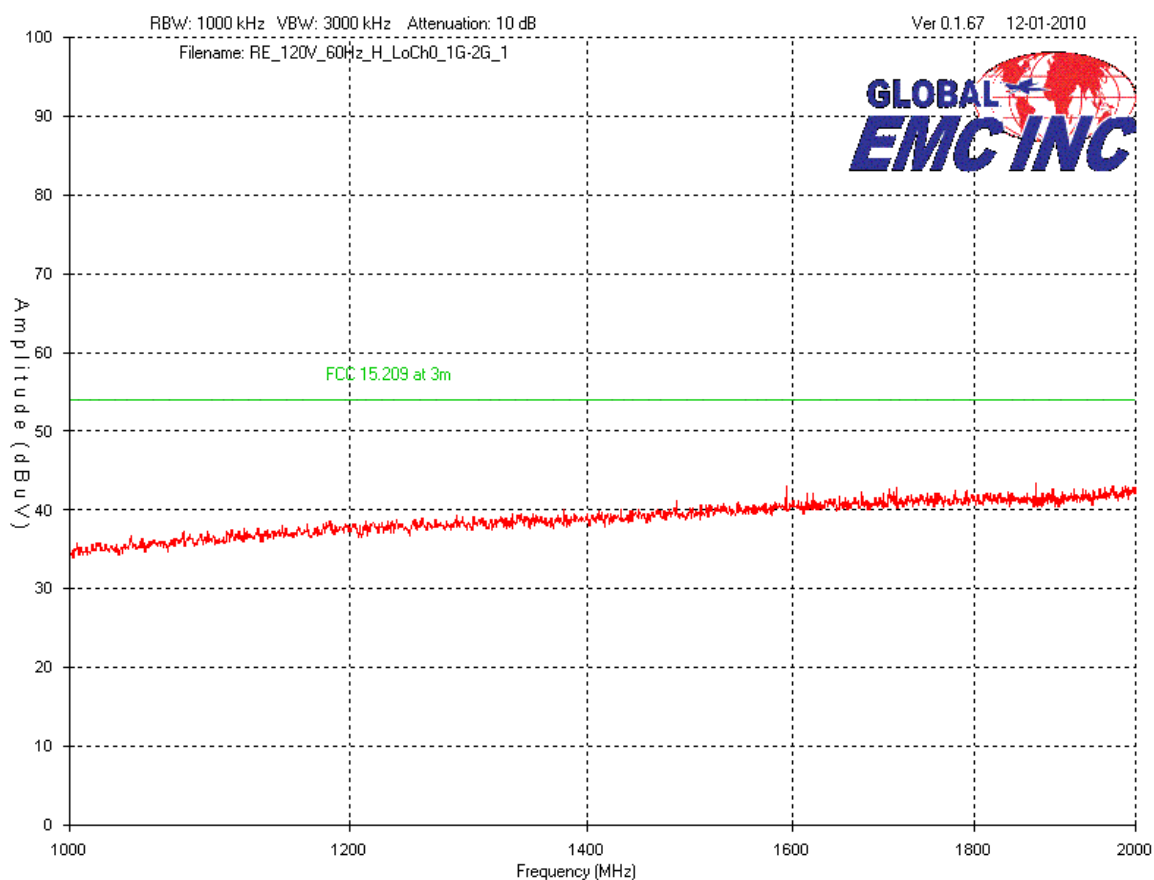
30M to 1 GHz




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Horizontal – Peak Emissions Graph

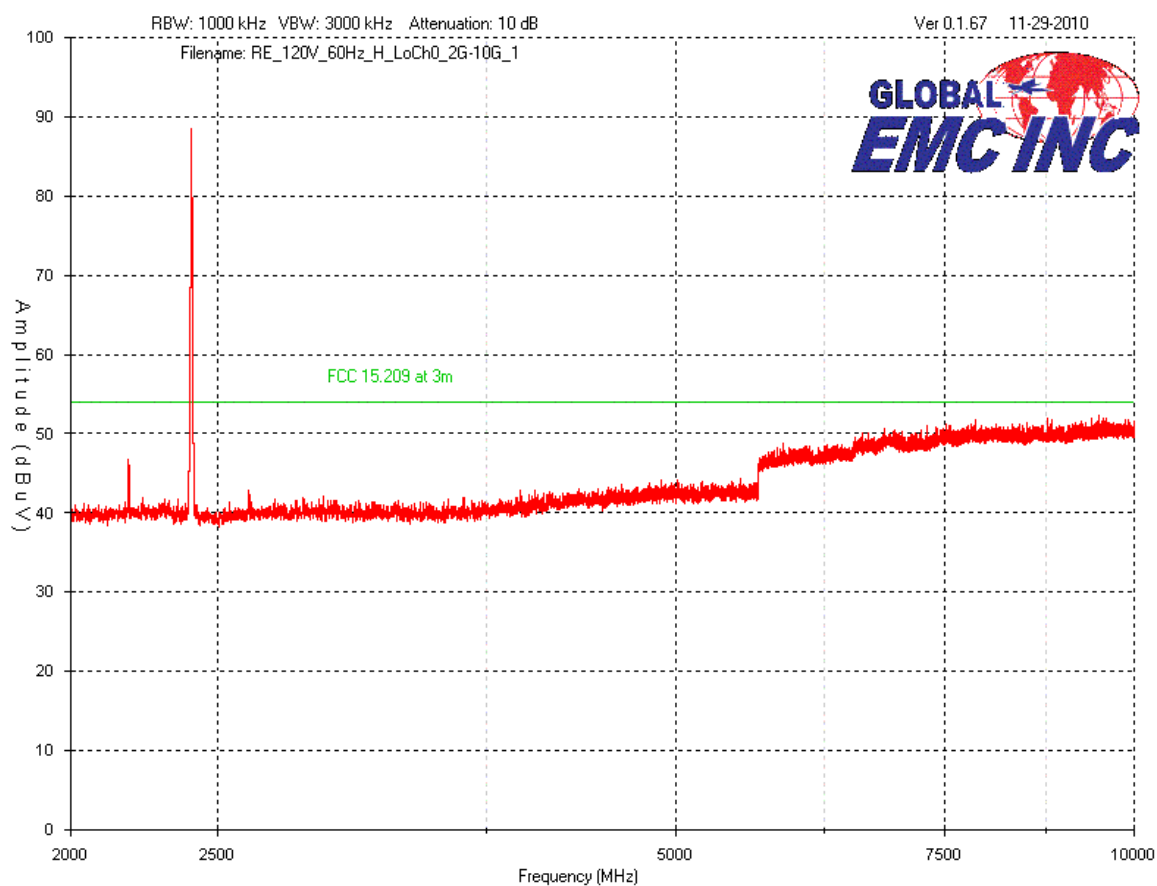
1GHz to 2 GHz




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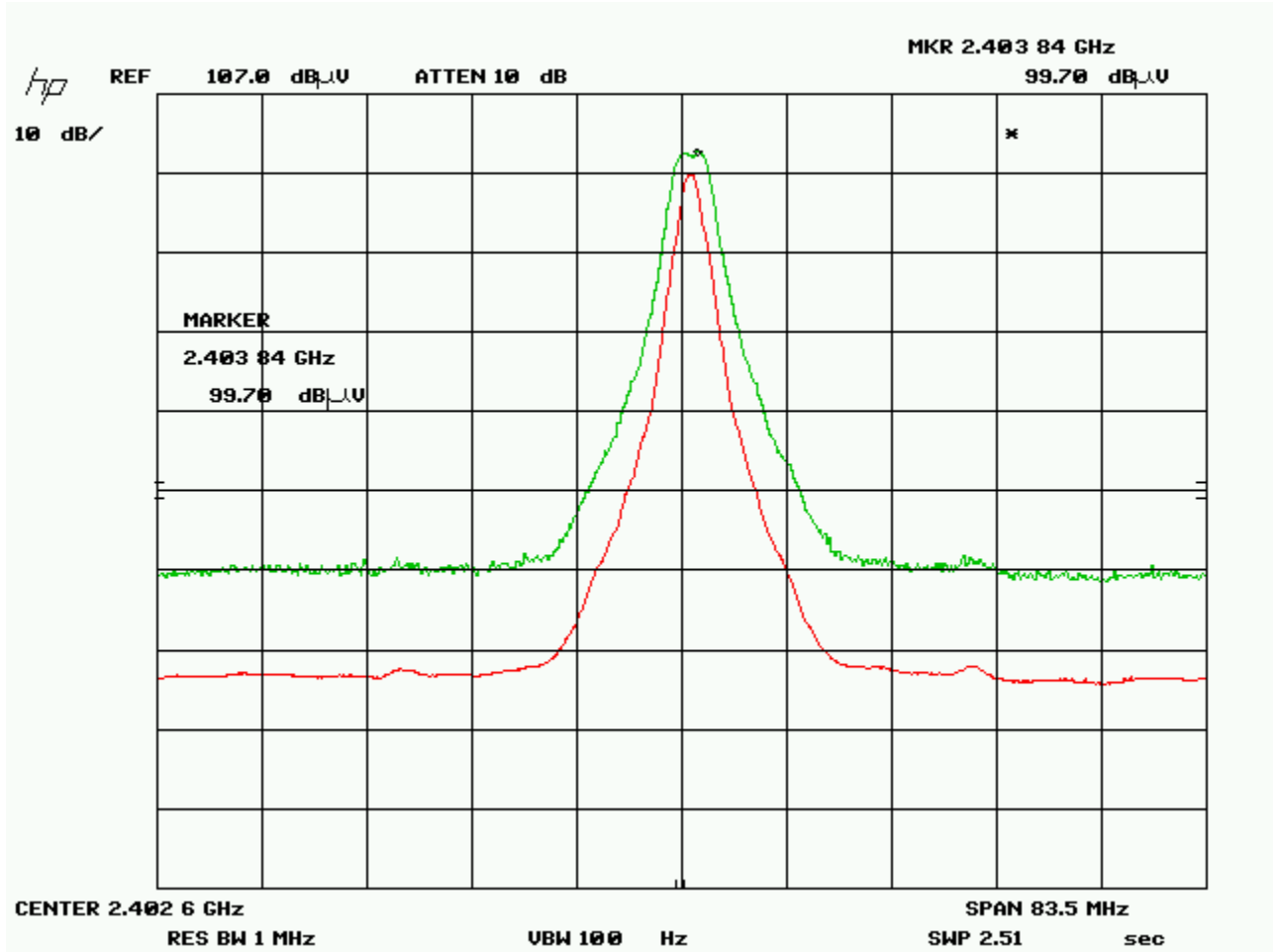
Horizontal – Peak Emissions Graph


2 GHz to 10 GHz



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2405 MHz (raw)



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Final Measurements

For information purposes, the worst case fundamental was measured to be 96.3 dBuV/m at 3 meters.

Quasi-Peak Emissions 30MHz to 1GHz.


Quasi Peak Emissions Table – Vertical

Frequency (MHz)	Raw Reading (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Preamplifier (dB)	Level (dBuV/m)	Limit (dB)	Margin (dB)	Pass/Fail
50.8	34.8	8.3	0.4	-18.5	25	40	15	Pass
953.0	36.7	22.7	1.4	-17.6	43.2	46.4	3.2	Pass
63.3	42.9	6.82	0.4	-18.5	31.6	40	8.4	Pass
37.7	41.9	12.1	0.3	-18.5	35.8	40	4.2	Pass
94.8	36.1	9.4	0.5	-18.5	27.5	43.5	16.0	Pass
890.0	35.4	22.4	1.3	-17.7	41.4	46.4	5.0	Pass

Quasi Peak Emissions Table – Horizontal

Frequency (MHz)	Raw Reading (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Preamplifier (dB)	Level (dBuV/m)	Limit (dB)	Margin (dB)	Pass/Fail
45.5	51.5	10.7	0.3	-32	30.5	40	9.5	Pass
973.9	38	23.8	1.5	-30.1	33.2	54	20.8	Pass
51.0	50.9	9.3	0.4	-32	28.6	40	11.4	Pass
257.8	39.2	12.6	0.6	-31.6	20.8	46.4	25.6	Pass
34.2	40.2	15.9	0.3	-32	24.4	40	15.6	Pass
169.8	41.1	9	0.5	-31.8	18.8	43.5	24.7	Pass

Note the emissions shown in the table above were determined to be emanating from the host power supply and the host board.

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Emissions above 1 GHz

Test Frequency (MHz)	Detection mode (Q-Peak)	Antenna polarity (Horz/Vert)	Raw signal dB(μV)	Antenna factor dB	Cable loss dB + Preselector	Attenuator dB	Pre-Amp Gain dB	Received signal dB(μV/m)	Emission limit dB(μV/m)	Margin dB(μV)	Result
Low Channel											
2403	Peak	Horz	94.8	30.6	2.2	0.0	36.2	91.4	---	---	PASS
2403	Avg	Horz	92.6	30.6	2.2	0.0	36.2	89.2	---	---	PASS
2403	Peak	Vert	99.7	30.6	2.2	0.0	36.2	96.3	---	---	PASS
2403	Avg	Vert	96.8	30.6	2.2	0.0	36.2	93.4	---	---	PASS
2390	Peak	Horz	45.2	30.6	2.2	0.0	36.2	41.8	74.0	32.2	PASS
2390	Avg	Horz	34.2	30.6	2.2	0.0	36.2	30.8	54.0	23.2	PASS
2390	Peak	Vert	46.9	30.6	2.2	0.0	36.2	43.5	74.0	30.5	PASS
2390	Avg	Vert	34.9	30.6	2.2	0.0	36.2	31.5	54.0	22.5	PASS
2400	Peak	Horz	56.9	30.6	2.2	0.0	36.2	53.5	74.0	20.5	PASS
2400	Avg	Horz	46.7	30.6	2.2	0.0	36.2	43.3	54.0	10.7	PASS
2400	Peak	Vert	61.3	30.6	2.2	0.0	36.2	57.9	74.0	16.1	PASS
2400	Avg	Vert	51.2	30.6	2.2	0.0	36.2	47.8	54.0	6.2	PASS
4806	Peak	Horz	27.9	33.7	2.9	0.0	35.7	28.8	74.0	45.2	PASS
4806	Avg	Horz	23.1	33.7	2.9	0.0	35.7	24.0	54.0	30.0	PASS
4806	Peak	Vert	30.5	33.7	2.9	0.0	35.7	31.4	74.0	42.6	PASS
4806	Avg	Vert	26.1	33.7	2.9	0.0	35.7	27.0	54.0	27.0	PASS
7209	Peak	Vert	28.7	37.9	4.3	0.0	35.9	35.0	74.0	39.0	PASS
7209	Avg	Vert	24.6	37.9	4.3	0.0	35.9	30.9	54.0	23.1	PASS
7209	Peak	Horz	27.2	37.9	4.3	0.0	35.9	33.5	74.0	40.5	PASS
7209	Avg	Horz	22.1	37.9	4.3	0.0	35.9	28.4	54.0	25.6	PASS
Mid channel											
2442	Peak	Horz	93.9	30.6	2.2	0.0	36.2	90.5	---	---	PASS
2442	Avg	Horz	91.4	30.6	2.2	0.0	36.2	88.0	---	---	PASS
2442	Peak	Vert	98.3	30.6	2.2	0.0	36.2	94.9	---	---	PASS
2442	Avg	Vert	95.9	30.6	2.2	0.0	36.2	92.5	---	---	PASS
4884	Peak	Horz	34.8	33.7	2.9	0.0	35.7	35.7	74.0	38.3	PASS
4884	Avg	Horz	32.7	33.7	2.9	0.0	35.7	33.6	54.0	20.4	PASS
4884	Peak	Vert	38.7	33.7	2.9	0.0	35.7	39.6	74.0	34.4	PASS
4884	Avg	Vert	35.1	33.7	2.9	0.0	35.7	36.0	54.0	18.0	PASS
7326	Peak	Vert	27.4	37.9	4.3	0.0	35.9	33.7	74.0	40.3	PASS
7326	Avg	Vert	16.2	37.9	4.3	0.0	35.9	22.5	54.0	31.5	PASS
7326	Peak	Horz	26.8	37.9	4.3	0.0	35.9	33.1	74.0	40.9	PASS
7326	Avg	Horz	15.8	37.9	4.3	0.0	35.9	22.1	54.0	31.9	PASS
High channel											
2480	Peak	Horz	92.5	30.6	2.2	0.0	36.2	89.1	---	---	PASS
2480	Avg	Horz	90.2	30.6	2.2	0.0	36.2	86.8	---	---	PASS

Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	

2480	Peak	Vert	97.1	30.6	2.2	0.0	36.2	93.7	---	---	PASS
2480	Avg	Vert	94.7	30.6	2.2	0.0	36.2	91.3			PASS
2483.5	Peak	Horz	58.9	30.6	2.2	0.0	36.2	55.5	74.0	18.5	PASS
2483.5	Avg	Horz	46.9	30.6	2.2	0.0	36.2	43.5	54.0	10.5	PASS
2483.5	Peak	Vert	64.2	30.6	2.2	0.0	36.2	60.8	74.0	13.2	PASS
2483.5	Avg	Vert	51.4	30.6	2.2	0.0	36.2	48.0	54.0	6.0	PASS
4960	Peak	Horz	38.5	33.7	2.9	0.0	35.7	39.4	74.0	34.6	PASS
4960	Avg	Horz	35.9	33.7	2.9	0.0	35.7	36.8	54.0	17.2	PASS
4960	Peak	Vert	41.0	33.7	2.9	0.0	35.7	41.9	74.0	32.1	PASS
4960	Avg	Vert	38.2	33.7	2.9	0.0	35.7	39.1	54.0	14.9	PASS
7440	Peak	Vert	29.7	37.9	4.3	0.0	35.9	36.0	74.0	38.0	PASS
7440	Avg	Vert	17.1	37.9	4.3	0.0	35.9	23.4	54.0	30.6	PASS
7440	Peak	Horz	28.9	37.9	4.3	0.0	35.9	35.2	74.0	38.8	PASS
7440	Avg	Horz	17.1	37.9	4.3	0.0	35.9	23.4	54.0	30.6	PASS

No emissions were detected above 10 GHz.

Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
IFR Spectrum Analyzer	AN940	IFR	12/29/2009	12/29/2011	GEMC 6350
BiLog Antenna	3142-C	ETS	2009-02-12	2011-02-12	GEMC 8
Attenuator 3 dB	FP-50-3	Trilithic	NCR	NCR	GEMC 40
Chase Preamp 9kHz - 2 GHz	CPA9231A	Chase	8/25/2010	8/25/2012	GEMC 6403
Q-Par 1.5-18 GHz Horn	6878/24	Q-par	8/25/2010	8/25/2012	GEMC 65
1-26G pre-amp	HP 8449B	HP	8/25/2010	8/25/2012	GEMC 68
RF Cable 7m	LMR-400-7M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 28
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
RF Cable 0.5M	LMR-400-0.5M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 31

This report module is based on GEMC template "FCC - 15.209 - Radiated Emissions_Rev1.doc"

Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	

6dB Bandwidth of Digitally Modulated Systems

Purpose

The purpose of this test is to ensure that the bandwidth occupied exceeds a stated minimum. This helps ensure the utilization of the frequency allocation is sufficiently wide. This also helps prevent corruption of data by ensuring adequate data separation to distinguish the reception of the intended information.

Limits

The Limit is as specified in FCC Part 15 and RSS 210.

Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.


Results

The EUT passed. The 6 dB BW measured was 1.46 MHz, well more than the 500 kHz requirement.

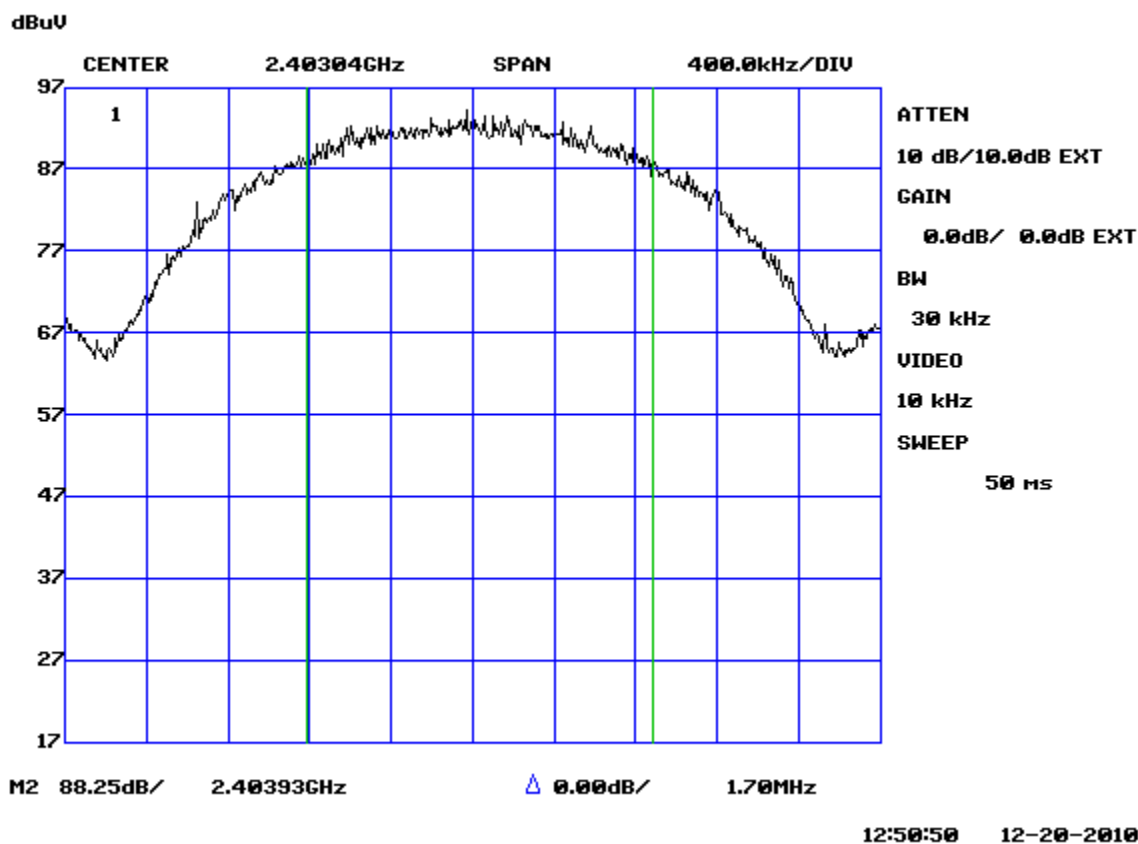
Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	


Graph(s)

The graphs shown below shows the channel spacing during the operation of the device. This is measured by a max hold on the spectrum analyzer and the highest resolution bandwidth that is sufficiently low to exhibit the 6 dB bandwidth of a channel during operation of the EUT. This measurement is a peak measurement. Max hold is performed for a duration of not less than 1 minute.

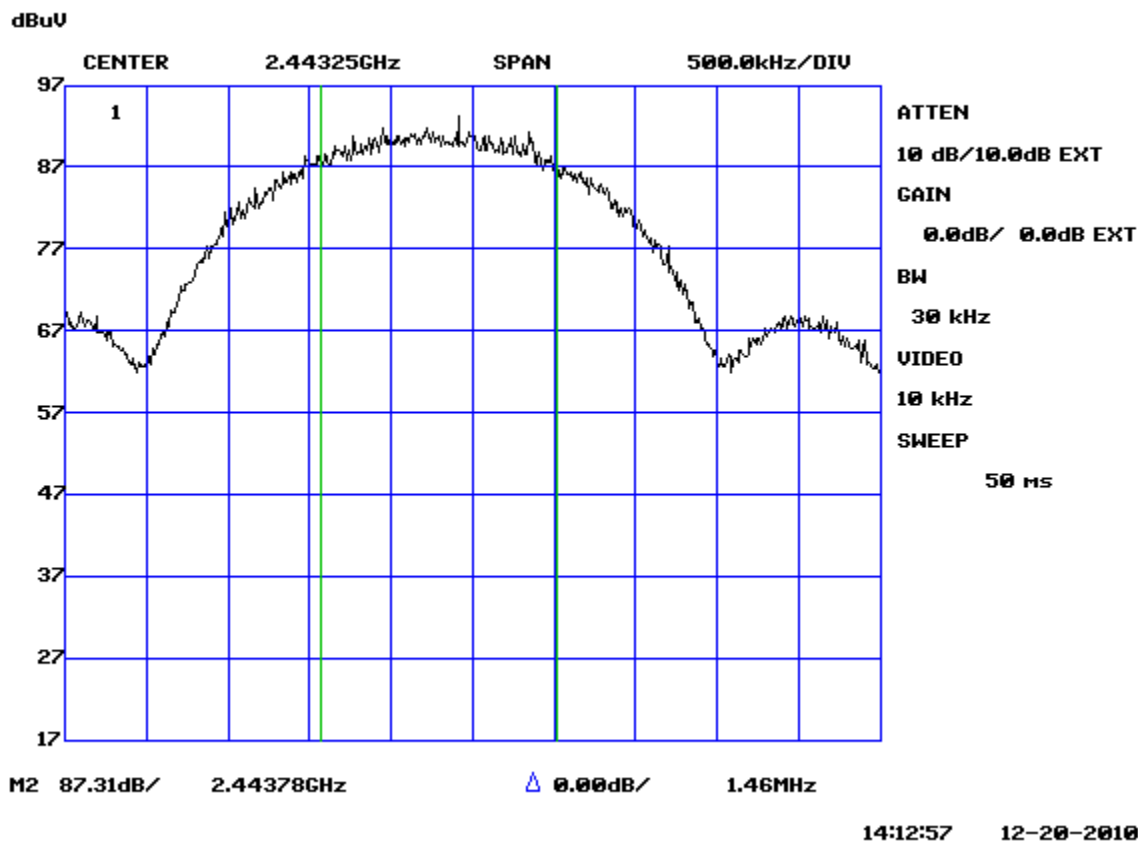
Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	


Low Channel



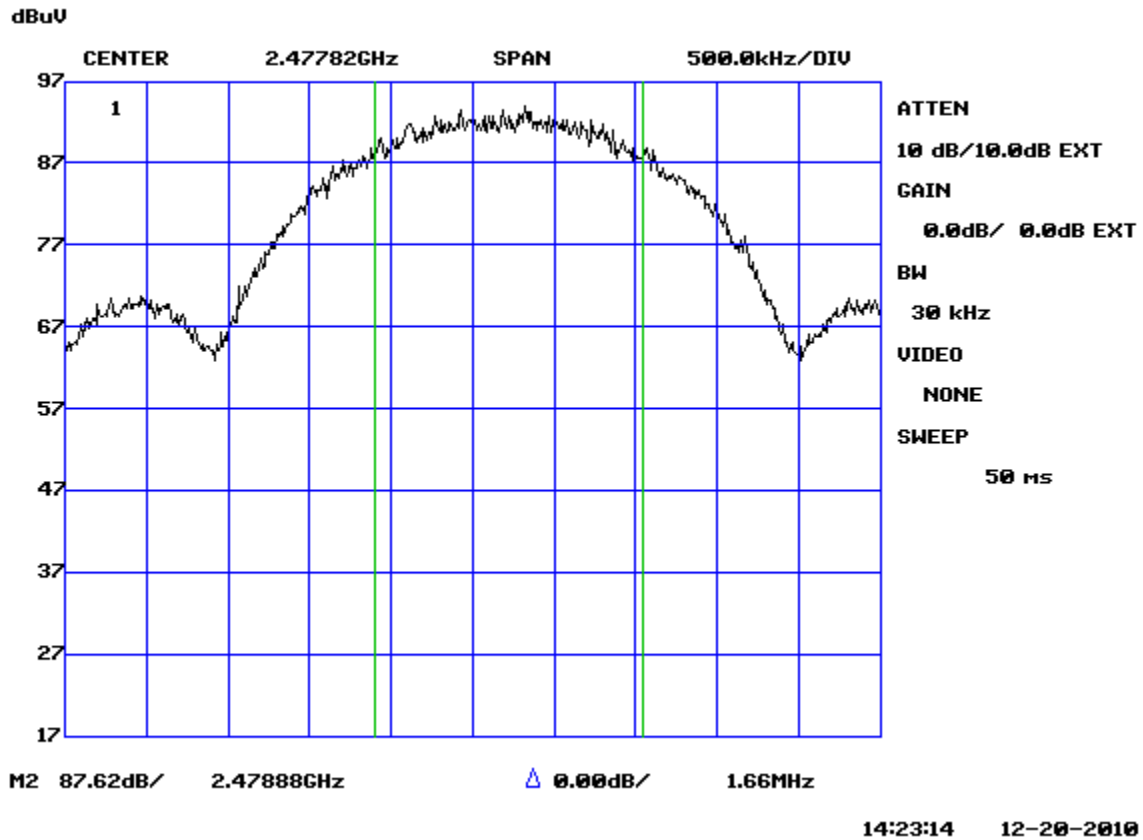
Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	


Mid Channel

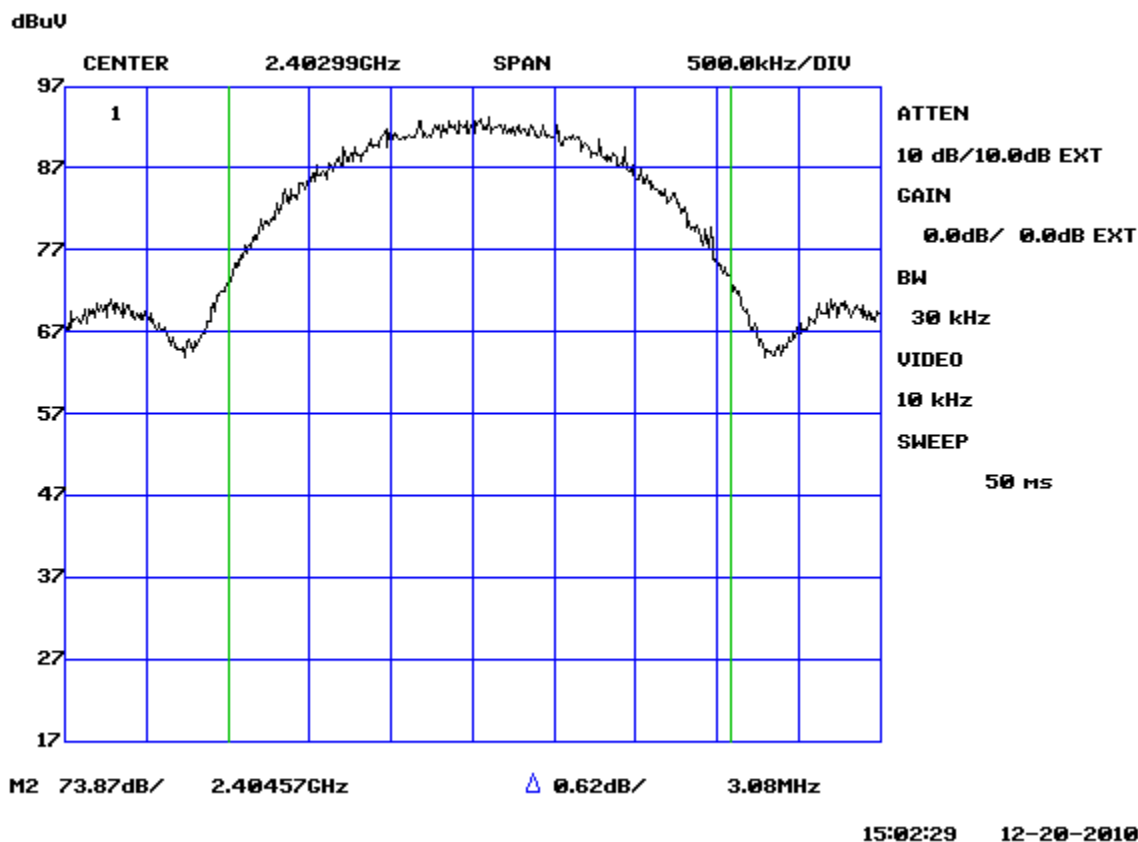


Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	

High Channel




Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	



Note 1: 20 dB bandwidth shown above.

Note 2: See ‘Appendix B – EUT & Test Setup Photographs’ for photos showing the test set-up.

Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
IFR Spectrum Analyzer	AN940	IFR	12/29/2009	12/29/2011	GEMC 6350
Attenuator 10 dB	FP-50-10	Trilithic	NCR	NCR	GEMC 42
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
Power Attenuator 20 dB	25-A-FFN-20	Bird / Hutton	NCR	NCR	GEMC 49

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B_Rev1"

Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	

Maximum Peak Envelope Conducted Power

Purpose

The purpose of this test is to ensure that the maximum power conducted to the radiating element does not exceed the limits specified. This ensures that if the end-user replaces the antenna, that the maximum power does not exceed an amount which may create an excessive power level.


Limits

The limits are defined in FCC Part 15.247(b) and RSS 210.

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands, the peak limit is 1 watt.

Results

The EUT passed. The peak power measured was 5dBm (3.2mW).

Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	

Table(s)

The tables shown below shows the peak power output of the device during the antenna conducted measurement during transmit operation of the EUT. Note there was 10 dB of external attenuation taken during this measurement.


Transmitter

Channel	Frequency (GHz)	Received (dBm)	Ext Atten (dB)	Output Power (dBm)
0	2403	-5.0	10	5.0
8	2443	-5.9	10	4.1
15	2478	-5.9	10	4.1

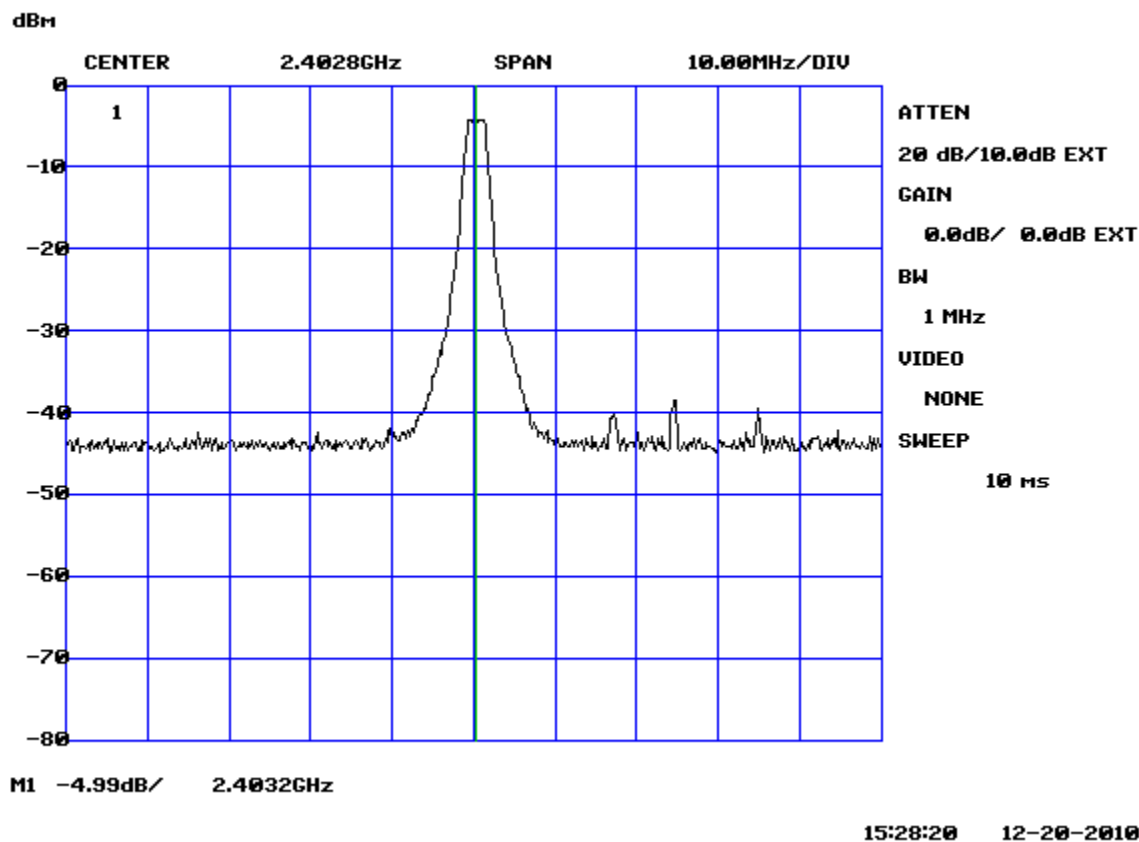
The calculated value is:


-5 dBm + 10 dB (attenuator)

= 5 dBm = 3.2 mW

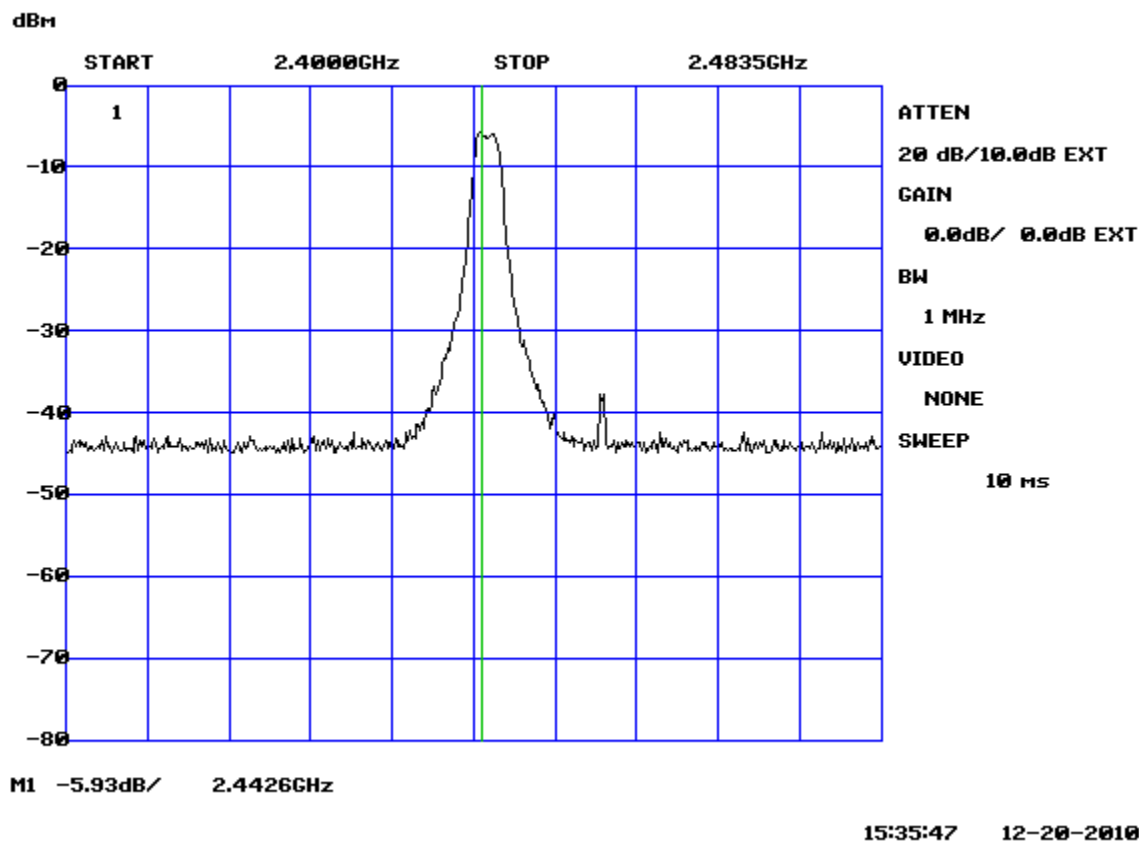
Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	


Transceiver (low channel)



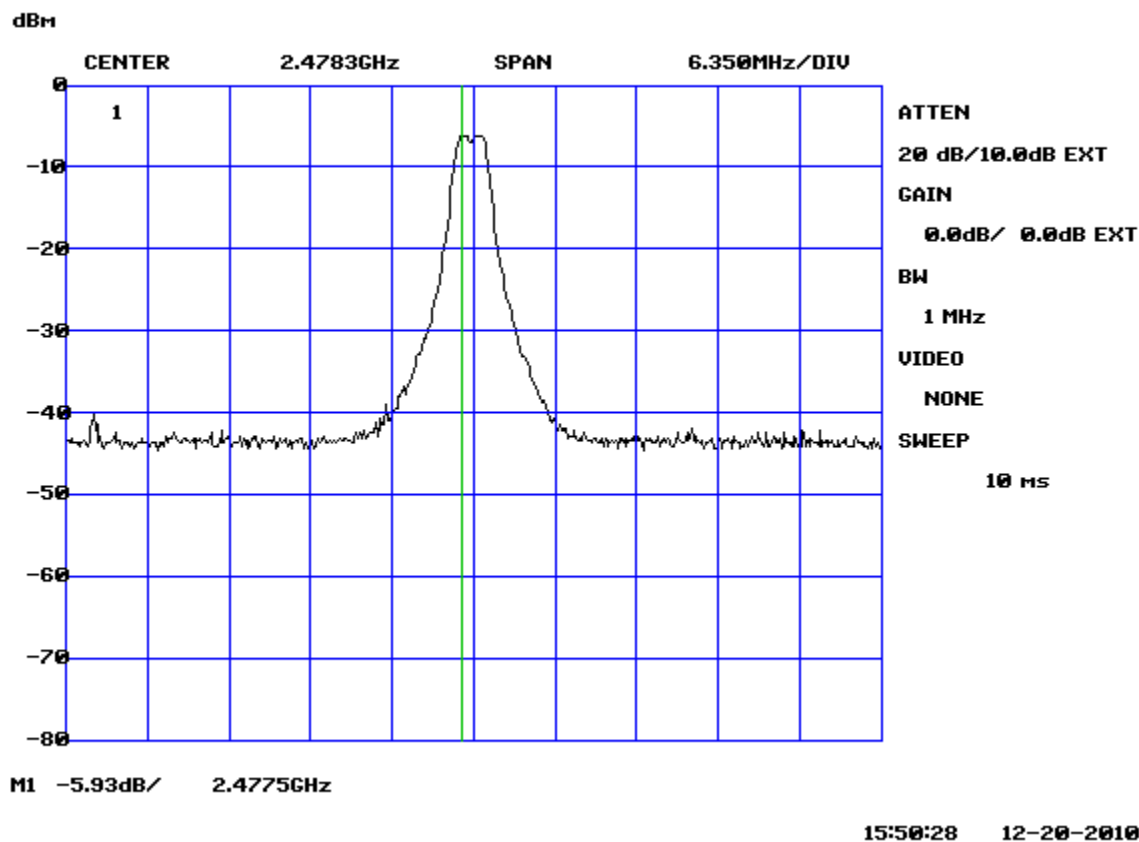
Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	

Transmitter (Mid channel)



Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	

Transmitter (High Channel)




Note: See ‘Appendix B – EUT & Test Setup Photographs’ for photos showing the test set-up.

Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
IFR Spectrum Analyzer	AN940	IFR	12/29/2009	12/29/2011	GEMC 6350
BiLog Antenna	3142-C	ETS	2009-02-12	2011-02-12	GEMC 8
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
Power Attenuator 20 dB	25-A-FFN-20	Bird / Hutton	NCR	NCR	GEMC 49

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B_Rev1"

Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	

Spurious Conducted Emissions

Purpose


The purpose of this test is to ensure that the maximum power conducted to the radiating element at frequencies outside of the authorized spectrum does not exceed the limits specified. This ensures that the only the intended signal is delivered to the radiating element.

Limits

The limits are defined in 15.247(d). In any 100 kHz band, the peak spurious harmonics emissions must be at least 20 dB below the fundamental. Spurious Conducted emissions are to be evaluated up to the 10th harmonic. This -20 dBc requirement also applies at the ‘band edge’ or 2.4 GHz and 2.4835 GHz.

Results

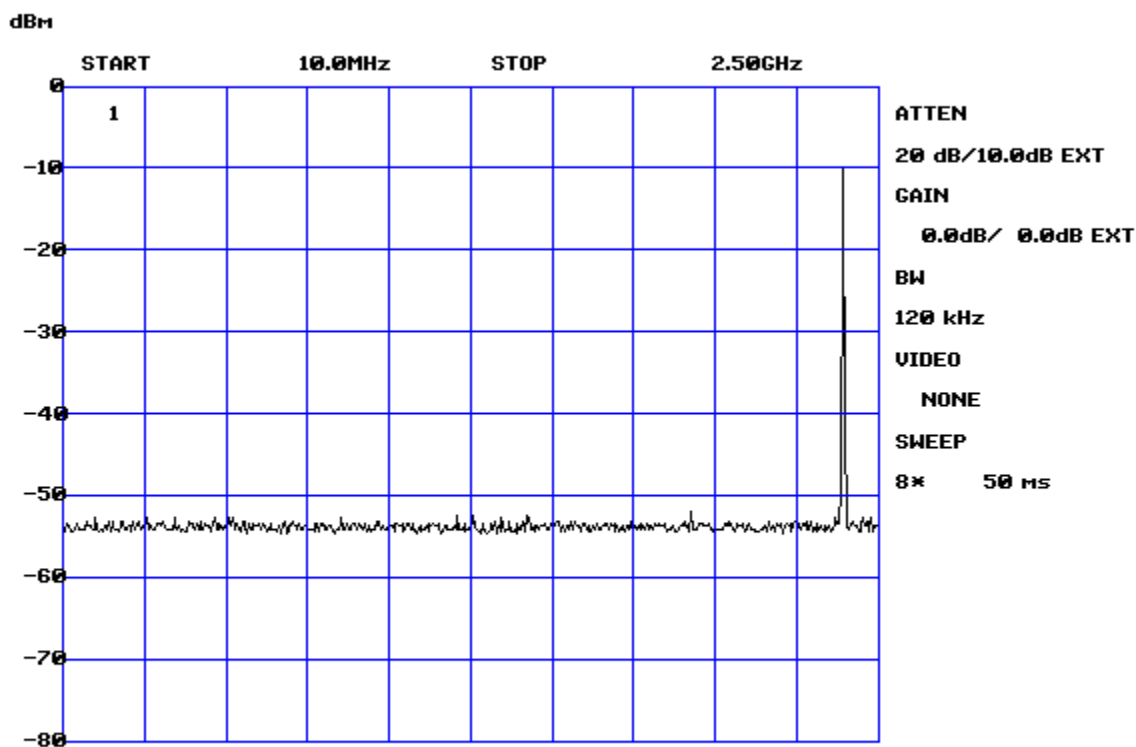
The EUT passes. Low, middle and high band was measured. The worst case is presented as a graph for the spectrum. The -20 dBc requirement is shown for the lower band edge at 2.4 GHz in the low band for transmitter as representative. The -20 dBc requirement is also shown for the higher band edge at 2.4835 GHz in the high band for transmitter as representative.

Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	


Graph(s)

The graphs shown below shows the peak power output of the device during the antenna conducted measurement during transmit operation of the EUT. Note there was 10 dB of external attenuation taken during this measurement.

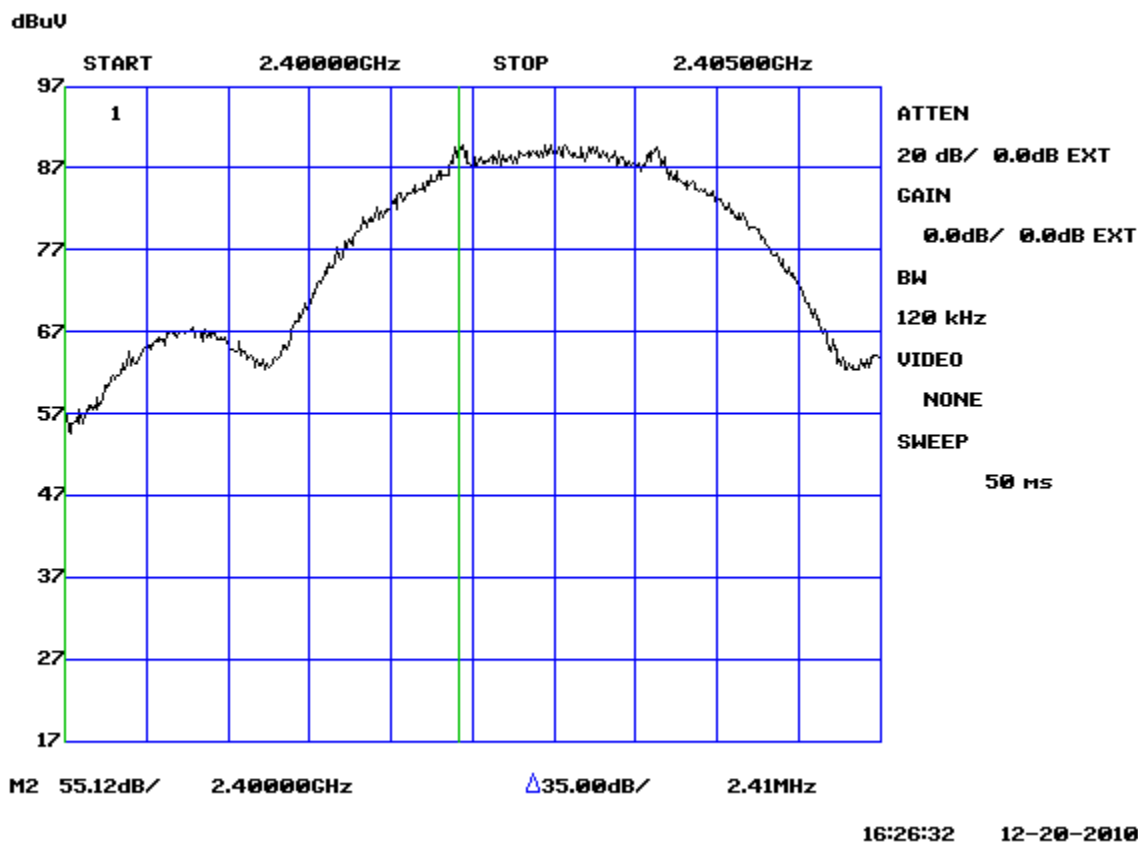
Frequencies below fundamental




16:07:24 12-20-2010

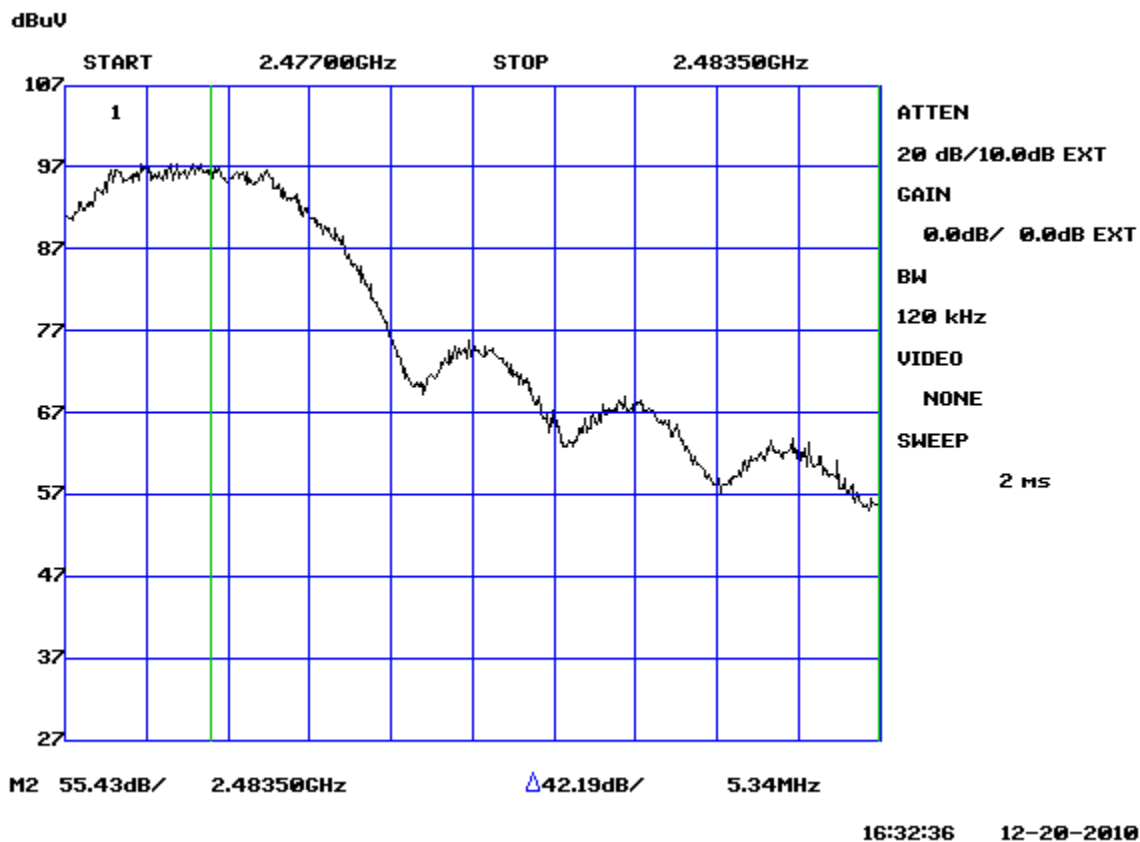
Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	


Low Channel, Lower Band Edge



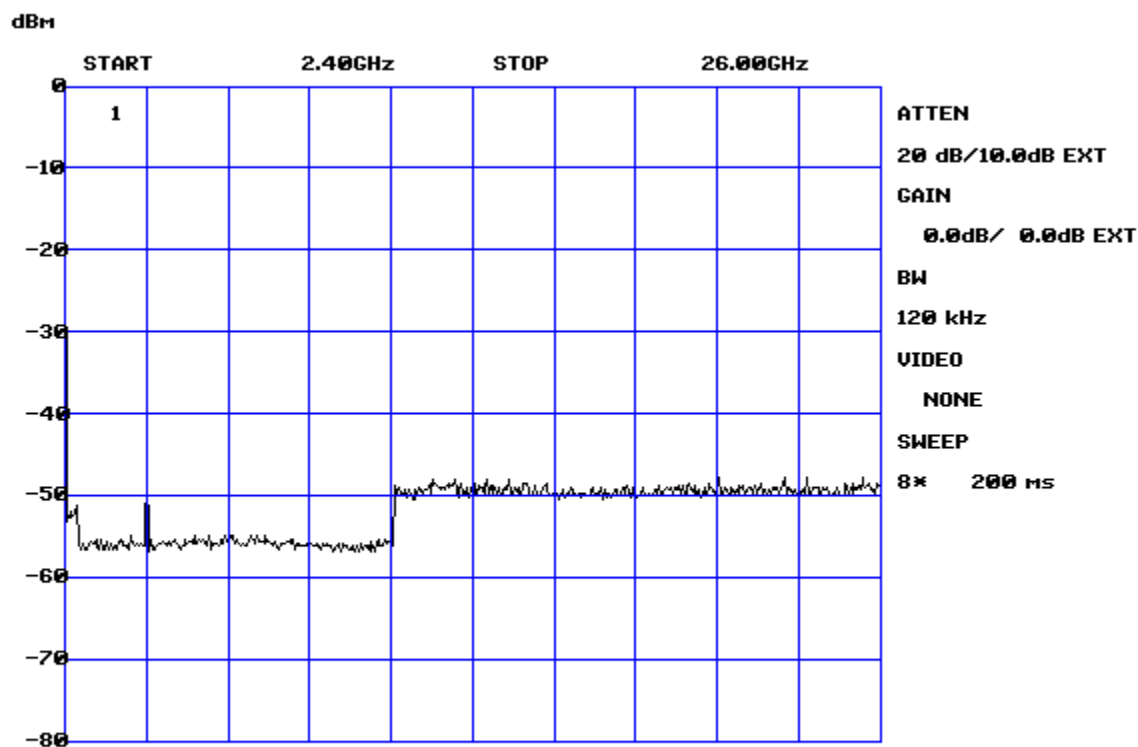
Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	

High Channel, Upper Band Edge




Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	

Frequencies above Fundamental (2rd to 10th Harmonics)



16:12:53 12-20-2010


Note: See 'Appendix B – EUT & Test Setup Photographs' for photos showing the test set-up.

Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Attenuator 1 dB	FP-50-1	Trilithic	NCR	NCR	GEMC 38
Attenuator 3 dB	FP-50-3	Trilithic	NCR	NCR	GEMC 40
Attenuator 6 dB	FP-50-6	Trilithic	NCR	NCR	GEMC 41
Attenuator 10 dB	FP-50-10	Trilithic	NCR	NCR	GEMC 42
Attenuator 20 dB	FP-50-20	Trilithic	NCR	NCR	GEMC 43
IFR Spectrum Analyzer	AN940	IFR	12/29/2009	12/29/2011	GEMC 6350
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
Power Attenuator 20 dB	25-A-FFN-20	Bird / Hutton	NCR	NCR	GEMC 49

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B_Rev1"

Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	

Power Spectral Density

Purpose

The purpose of this test is to ensure that the maximum power spectral density to the radiating element does not exceed the limits specified. This ensures that the modulation is significantly wide enough, or low enough in power that it will allow for co-operation of other wireless devices operating within this frequency allocation.

Limits

The limits are defined in 15.247(e).


For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

Results

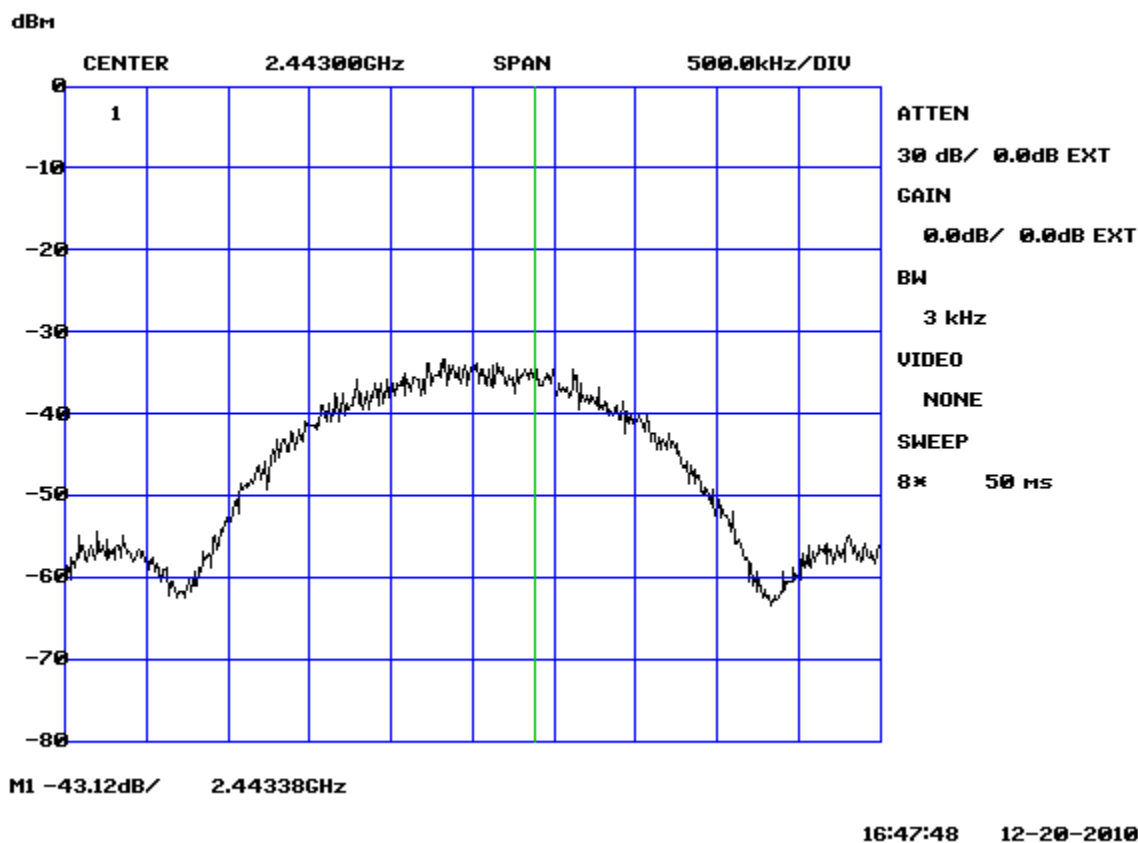
The EUT passed. Note that the worst case peak power output is 5.0 dBm, therefore this meets this requirement with significant margin when measured with a significantly wider bandwidth.

Graph(s)

The graphs shown below show the power spectral density of the device during the conducted measurement operation of the EUT. Low, middle, and high channel was investigated in each mode. Middle is shown as representative. Peak readings shown were taken with a 3 kHz Resolution using the radiated method and are raw readings as shown.

Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	

Mid channel



Note: See ‘Appendix B – EUT & Test Setup Photographs’ for photos showing the test set-up.

Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
IFR Spectrum Analyzer	AN940	IFR	12/29/2009	12/29/2011	GEMC 6350
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
Power Attenuator 20 dB	25-A-FFN-20	Bird / Hutton	NCR	NCR	GEMC 49

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B_Rev1"

Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	

Maximum Permissible Exposure

Purpose

The purpose of this test is to ensure that the RF energy intentionally transmitted, in terms of power density emitted from the EUT at a stated operating distance does not exceed the limits listed below as defined in the applicable test standard, as calculated based upon readings obtained during testing. This helps protect human exposure to excessive RF fields.

Limit(s) and Method

The limits, as defined in FCC 15.247(i), and FCC 1.1310 Table 1 (B) limits for general public exposure was applied. The limit for the frequency range of 1.5 GHz to 100 GHz was applied. This is a limit of 1.0 mW/cm^2 . The distance used for calculations was 1cm, as this is the minimum distance an operator will be from the EUT during normal operation, however limitations apply as this is less than 2.4 mW.

Note: This device does not exceed the $60 / f$ (GHz) in mW limit as per FCC KDB 447498 2(a)(i), so it is allowable to be used in portable exposure conditions with no restrictions on host platforms

Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	

Results

The EUT passed the requirements. The worst case calculated power density was 0.08 mW/cm², this is significantly under the 1.0 mW/cm² requirement.

Calculations

Method 1 (conducted power)

$$P_d = (P_t * G) / (4 * \pi * R^2)$$

Where $P_t = 3.2$ mW as per Peak power conducted output

Where $G = 0$ dBi, or numerically 1

Where $R = 1$ cm

$$P_d = (3.2 \text{ mW} * 1) / (4 * \pi * 1 \text{ cm}^2)$$

$$P_d = 3.2 \text{ mW} / 12.5 \text{ cm}^2$$

$$P_d = 0.26 \text{ mW/cm}^2$$

Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	


Appendix A – EUT Summary

For further details for filing purposes, refer to filing package.


General EUT Description

Manufacturer	Sonavox Audio Solution
EUT Name	Wireless Audio Transceiver Module – WTX1011
FCCID	WUO-WTX1011
IC #	7985A-WTX1011
Approximate Size (LxWxH)	5cm x 5cm x 2 cm
Equipment Category (Commercial / Residential / Medical)	Portable / mobile
Minimum Separation distance from operator	Possibly body worn
Types and lengths of all I/O cables	None.

Note the EUT is considered to have been received the date of the commencement of the first test, unless otherwise stated. For a close-up picture of the EUT, see ‘Appendix B – EUT & Test Setup Photographs’.

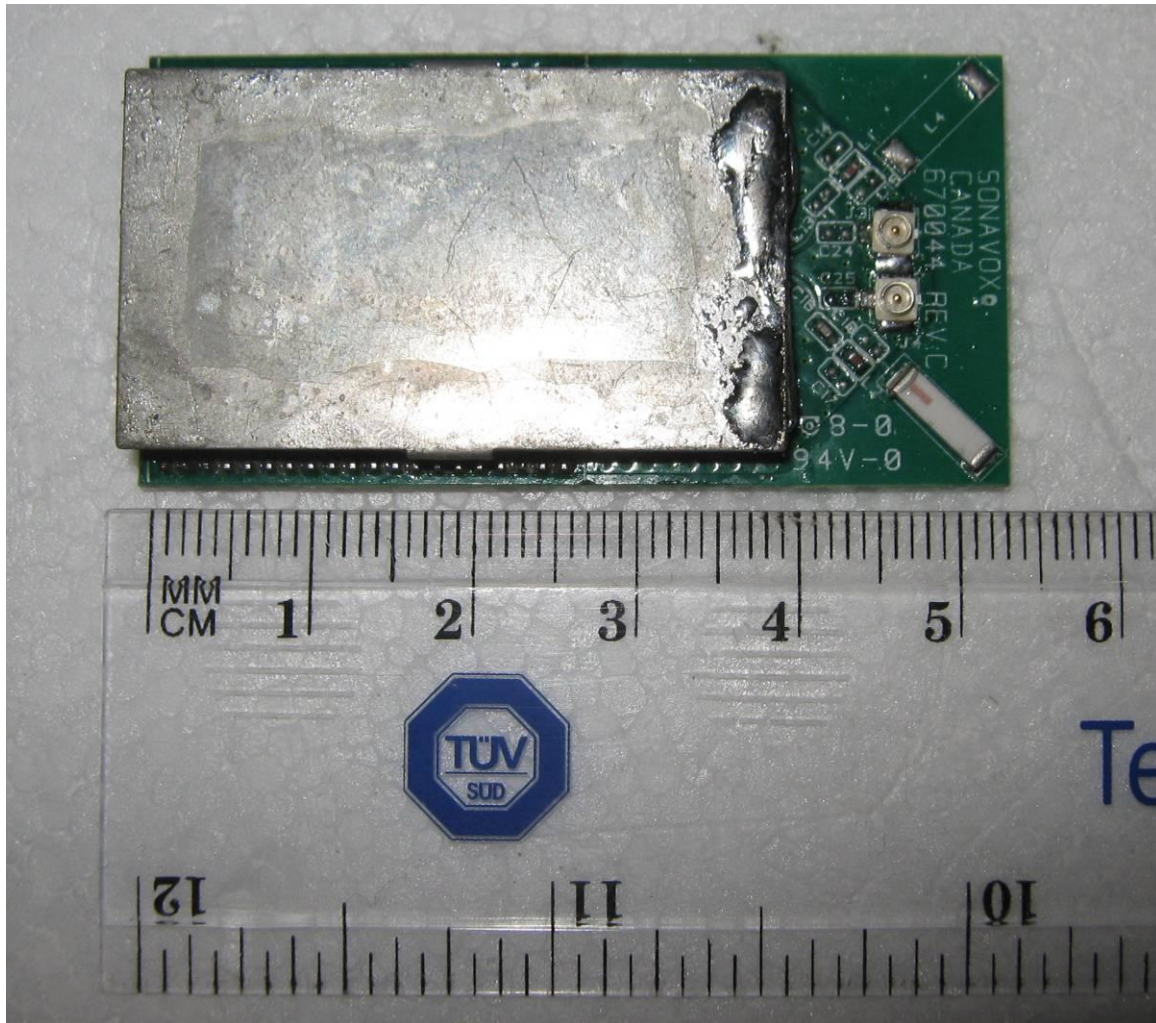
Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	


Appendix B – EUT and Test Setup Photographs

Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	

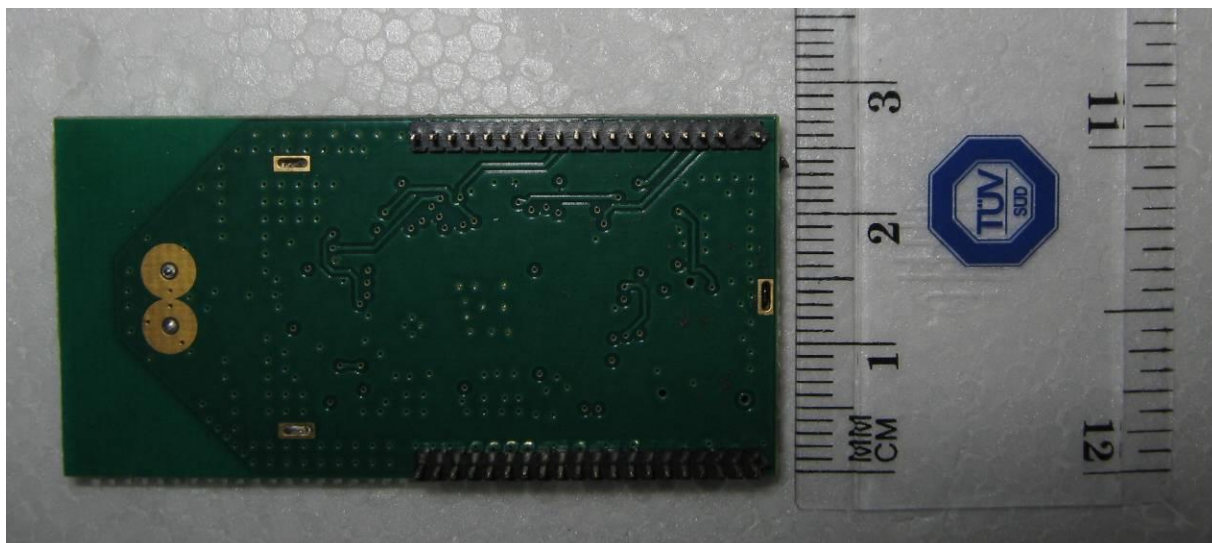
Note: These photos are for information purposes only. Also refer to PDF files that are separate from this test report.

EUT – External view, side 1



Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	


EUT – External view, side 2



Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	


Power Line Conducted Emissions



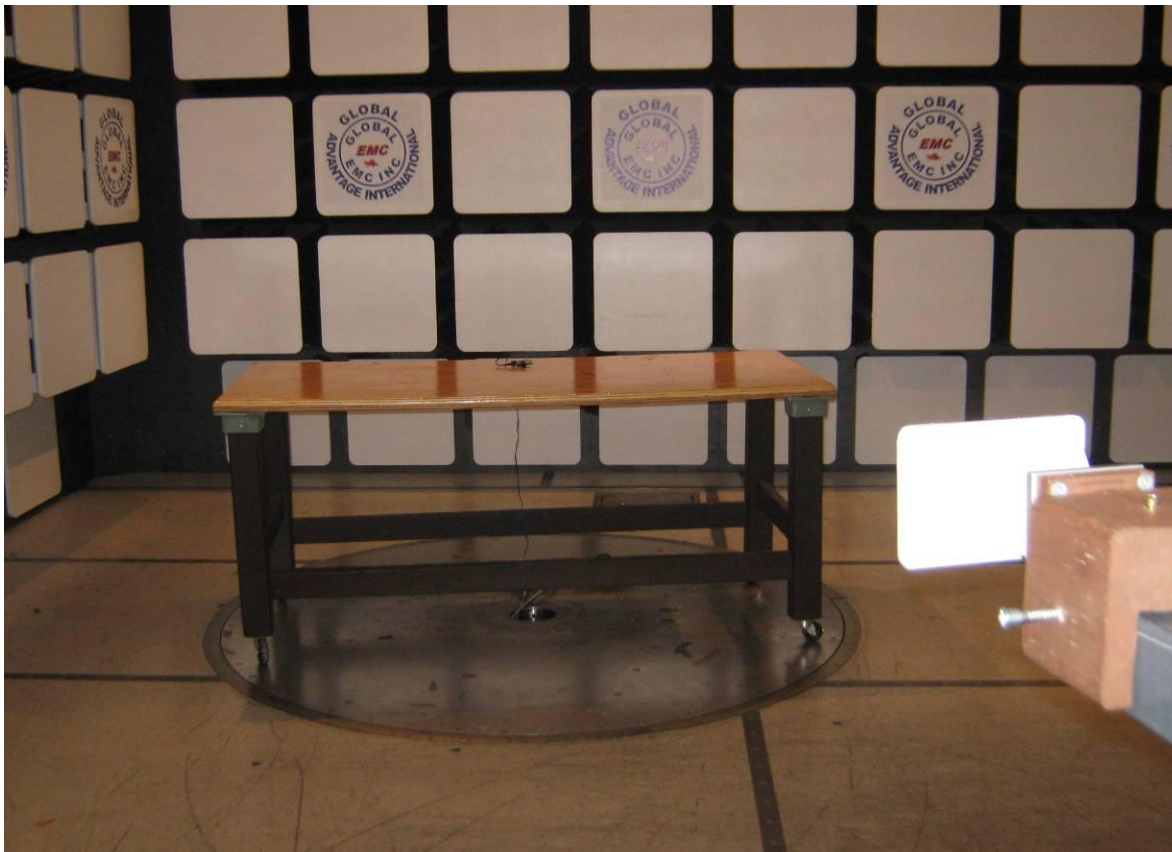
Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	


Radiated Emissions

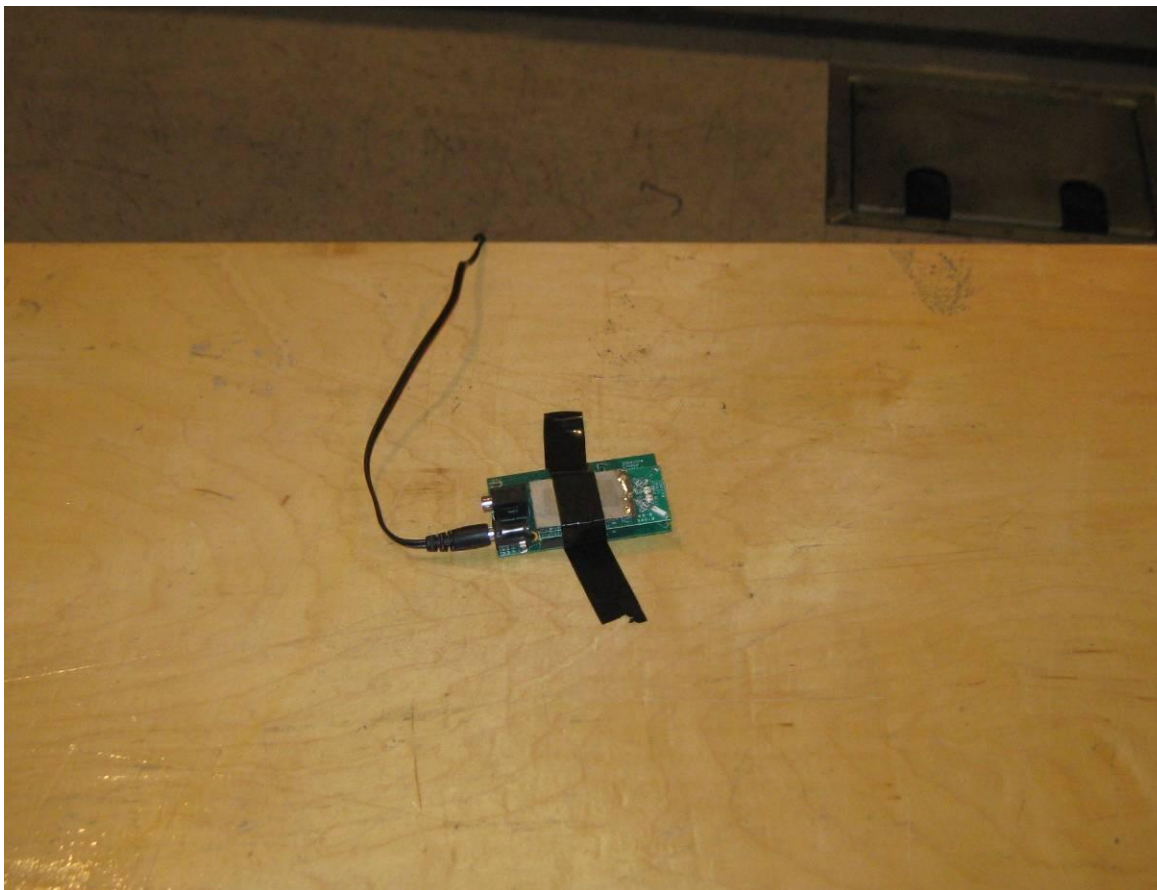


Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	


Radiated Emissions 2



Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	



Radiated Emissions – Close Up (worst case EUT configuration)

Client	Sonavox Audio Solution	
Product	Wireless Audio Transceiver Module – WTX1011	
Standard(s)	RSS 210 Issue 7:2007 / FCC Part 15 Subpart C 15:2010	

Antenna Conducted Measurements

