

# Global EMC Inc. Labs

## EMC & RF Test Report

As per  
**RSS 210 Issue 8:2010**  
&  
**FCC Part 15 Subpart C:2012**  
**Unlicensed Intentional Radiators**  
on the

**Wireless Digital Audio Transceiver Module**



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Testing produced for



See Appendix A for full customer & EUT details.



LAB REGISTRATION #6844A-2



FCC REGISTRATION  
#612361



Testing Laboratory  
Certificate #2555.01

Client	<b>Octet Matrix Inc.</b>
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



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Client	<b>Octet Matrix Inc.</b>	
Product	Wireless Digital Audio Transceiver Module	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012	

## Report Scope

This report addresses the EMC verification testing and test results of the Wireless Digital Audio Transceiver Module, 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 8:2010 / FCC Part 15 Subpart C 15:2012

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	<b>Octet Matrix Inc.</b>
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## Summary

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

EUT FCC Certification #, FCC ID:	Q3D-WDAM1
EUT Industry Canada Certification #, IC:	10647A-WDAM1
EUT Passed all tests performed.	Yes (see test results summary)
Tests conducted by	Min Xie

Client	Octet Matrix Inc.	
Product	Wireless Digital Audio Transceiver Module	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012	

## Test Results Summary

Standard/Method	Description	Class/Limit	Result
FCC 15.203 RSS 210 Section 5.5	Antenna Requirement	Unique	Pass See Justification
FCC 15.205 RSS 210 Section 6.3 (Table 2)	Restricted Bands for intentional operation	None within chart	Pass See description
FCC 15.207 RSS 210 Section 6.6	Power line conducted emissions	QuasiPeak Average	Pass See Justification
FCC 15.209 RSS 210 Section 6.2.1 (Tables 3 & 7)	Radiated emissions	QuasiPeak Average	Pass
FCC 15.247(a)(1) RSS 210 6.2.2(o)	Channel Separation	> 25 kHz or 2/3 of 20 dB BW	Pass
FCC 15.247(a)(1)(i) RSS 210 6.2.2(o)	Number of channels	> 15	Pass
FCC 15.247(a)(1)(i) RSS 210 6.2.2(o)	Time of occupancy	< 400 mSec in 20 sec period	Pass
FCC 15.247(b) RSS 210 6.2.2(o)	Max output power	< 1 Watt / 125 mW	Pass
FCC 15.247(b)(4) RSS 210 6.2.2(o)	Antenna Gain	< 6 dBi	Pass See Justification
FCC 15.247(d) RSS 210 6.2.2(d)	Antenna conducted spurious	> 20 dBc	Pass
FCC 15.247(h)	FHSS Intelligence	No coordination	Pass See Justification
FCC 15.247(i) IC Safety code 6	Maximum Permissible Exposure	> 20 cm separation.	Pass See justification and calculations
<b>Overall Result</b>			<b>PASS</b>

All tests were performed by Min Xie.

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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 '\*'.

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### ***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 PCB antenna, and has no provisions for end-user replacement.

For the Restricted Bands of operation, the EUT is designed to only operate between 2.4 to 2.4835 GHz band.

For the Antenna gain, the stated gain according to the antenna manufacturer is less than 6 dBi.

For maximum permissible exposure, this device operates at less than 125 mW at 2.4 to 2.4835 GHz and is designed to operate greater than 20 cm (or greater) from personnel during normal operation. No testing is required, however worst case calculated exposure compliance follows later in this report.

For the scope of this test report the EUT was mounted in three orthogonal axes to maximize emissions. Worst case results are presented.

Below is an example of a hopping sequence of 20 channels from a palette of 49 channels. Each channel is chosen pseudo randomly from a list of unused channels and added to the list. The EUT hops sequentially from items 1 to 20. When the EUT detects interference on a channel, an unused channel is chosen from the unused channels list and replaces the interfered channel, at the same position, in the list. See operational description for further details.

1. 2403.585	2. 2422.017	3. 2443.521	4. 2465.025
5. 2406.657	6. 2428.161	7. 2449.665	8. 2468.097
9. 2411.265	10. 2431.233	11. 2452.737	12. 2471.169
13. 2412.801	14. 2437.377	15. 2455.809	16. 2475.777
17. 2418.945	18. 2440.449	19. 2461.953	20. 2477.313

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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

FCC Public Notice DA 00-705  
 Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems

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 210:2010      - Issue 8: 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 -    October 22, 2012  
                          Initial report release

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## Definitions and Acronyms

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

**AE** – Auxiallary Equipment.

**BW** – Bandwidth. Unless otherwise stated, this is 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

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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 3m semi-anechoic chamber is registered with Federal Communications Commission (FCC, 612361), Industry Canada (IC, 6844A-1) and VCCI (R-2621 and C-2864). This chamber was 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 chamber is lined with ferrite tiles and absorption cones to minimize any undesired reflections. The NSA data is kept on file at Global EMC. For radiated susceptibility testing, a 16 point field calibration has been performed on the chamber. The field uniformity data is kept on file at Global EMC. Global EMC Inc is accredited to ISO 17025 by A2LA with Testing Certificate #2555.01. The laboratories current scope of accreditation listing can be found as listed on the A2LA website. 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)
Oct 2 – 15, 2012	All	MX	21-25°C	36-45%	98 -102kPa

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## **Detailed Test Results Section**

Client	<b>Octet Matrix Inc.</b>
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## *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.

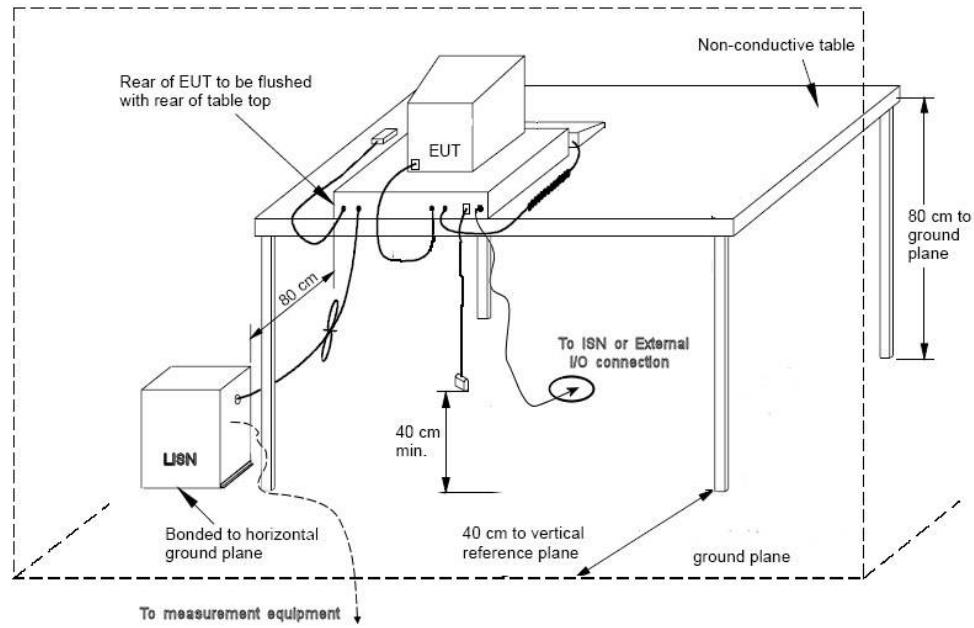
Note: If the Peak or Quasi Peak detector measurements do not exceed the Average limits, then the EUT is deemed to have passed the requirements.

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

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### Typical Setup Diagram



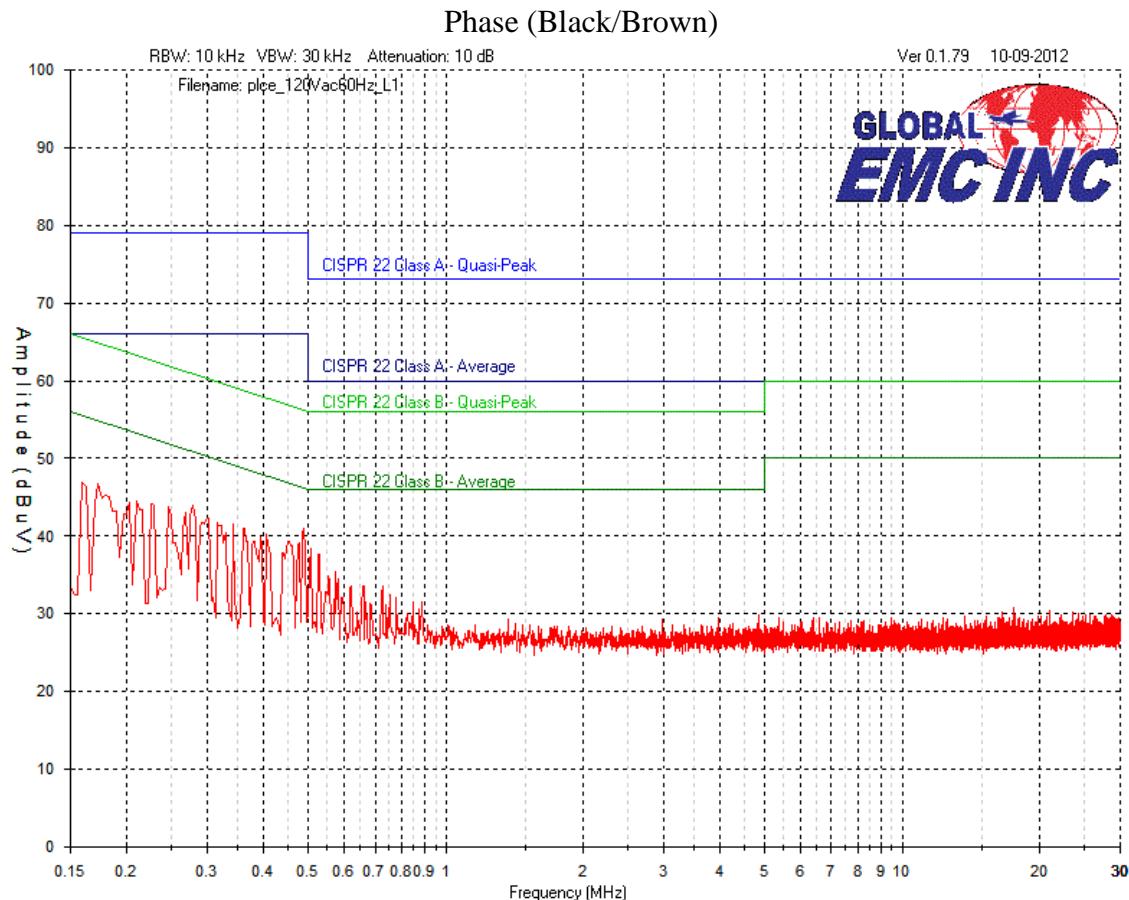
### Measurement Uncertainty

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.

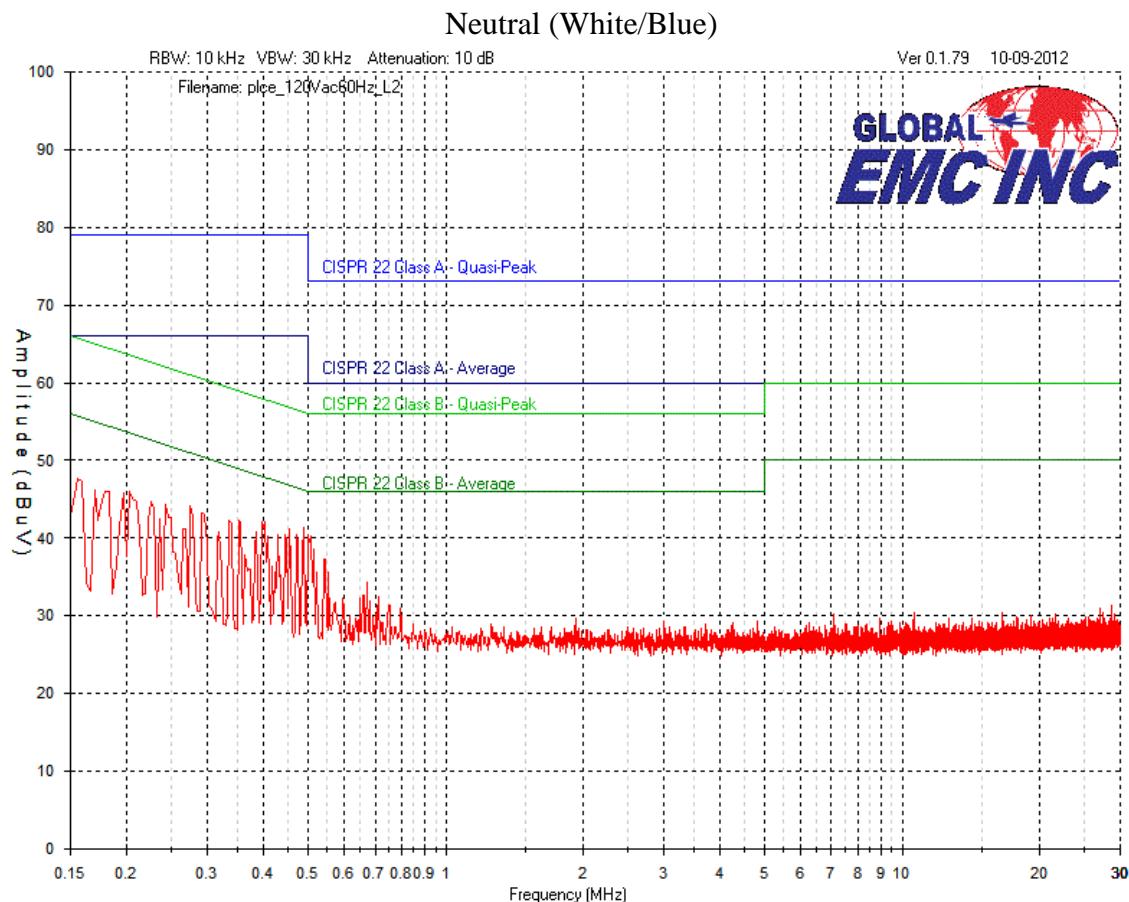
### Preliminary Graphs

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.

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Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



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## Final Measurements

Product Category		Class B						
Product		EA-60026-01						
Supply		120 VAC 60 Hz						
L1 (Line) – Peak emission with respect to Average limit								
Frequency (MHz)	Raw (dBuV)	Atten Factor (dB)	Cable Loss (dB)	LISN Factor (dB)	Level (dBuV)	Limit (dB)	Margin (dB)	Pass/Fail
0.4883	30.7	10	0.1	0.2	41	46.2	5.2	Pass
0.2794	33.2	10	0.1	0.6	43.9	50.8	6.9	Pass
0.4784	28.9	10	0.1	0.2	39.2	46.4	7.2	Pass
0.4054	30	10	0.1	0.2	40.3	47.7	7.4	Pass
0.4551	29	10	0.1	0.2	39.3	46.8	7.5	Pass
0.3424	31.1	10	0.1	0.4	41.6	49.1	7.5	Pass
L2 (Neutral) - Peak emission with respect to Average limit								
0.4883	31.1	10	0.1	0.2	41.4	46.2	4.8	Pass
0.4551	30.9	10	0.1	0.2	41.2	46.8	5.6	Pass
0.4983	30.1	10	0.1	0.2	40.4	46	5.6	Pass
0.3954	31.8	10	0.1	0.2	42.1	48	5.9	Pass
0.4717	30.2	10	0.1	0.2	40.5	46.5	6	Pass
0.4452	30.1	10	0.1	0.2	40.4	47	6.6	Pass

Notes:

No peak emissions exceeded average limits; therefore, the unit was deemed to meet power line conducted emission requirements base on peak emissions. The above table represents the peak emission reading with respect to the average limit.

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 #
Spectrum Analyzer	ESL 6	Rohde & Schwarz	Oct-06, 2011	Oct-06, 2013	GEMC 160
LISN	FCC-LISN-50/250-16-2-01	FCC	Feb 03, 2011	Feb 03, 2013	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"

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## *Transmitter Spurious 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:

0.009 MHz – 0.490 MHz, 2400/F(kHz) uV/m at 300 m<sup>1</sup>  
 0.490 MHz – 1.705 MHz, 24000/F(kHz) uV/m at 30 m<sup>1</sup>  
 1.705 MHz – 30 MHz, 30 uV/m at 30 m<sup>1</sup>  
 30 MHz – 88 MHz, 100 uV/m (40.0 dBuV/m<sup>1</sup>) at 3 m  
 88 MHz – 216 MHz, 150 uV/m (43.5 dBuV/m<sup>1</sup>) at 3 m  
 216 MHz – 960 MHz, 200 uV/m (46.0 dBuV/m<sup>1</sup>) at 3 m  
 Above 960 MHz, 500 uV/m (54.0 dBuV/m<sup>1</sup>) at 3 m  
 Above 1000 MHz, 500 uV/m (54 dBuV/m<sup>2</sup>) at 3m  
 Above 1000 MHz, 500 uV/m (74 dBuV/m<sup>3</sup>) at 3m

<sup>1</sup>Limit is with 120 kHz measurement bandwidth and a using a Quasi Peak detector.

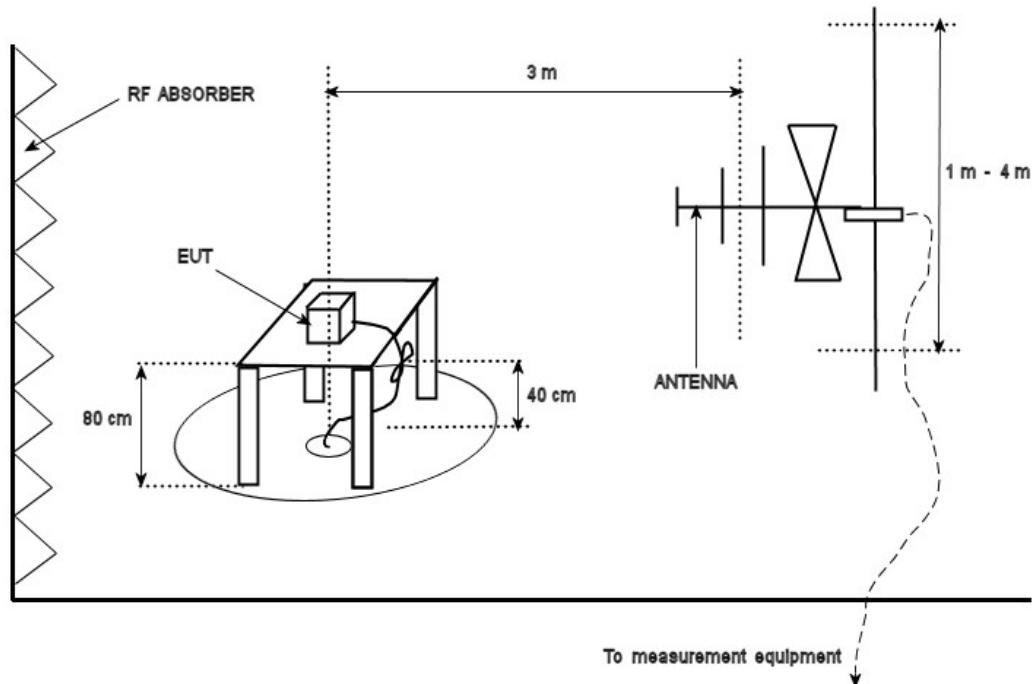
<sup>2</sup>Limit is with 1 MHz measurement bandwidth and using an Average detector

<sup>3</sup>Limit is with 1 MHz measurement bandwidth and using a Peak detector

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### Typical Radiated Emissions Setup



### 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 10<sup>th</sup> harmonic (a minimum of a 24.773 GHz); however no emissions were detected above 10 GHz.

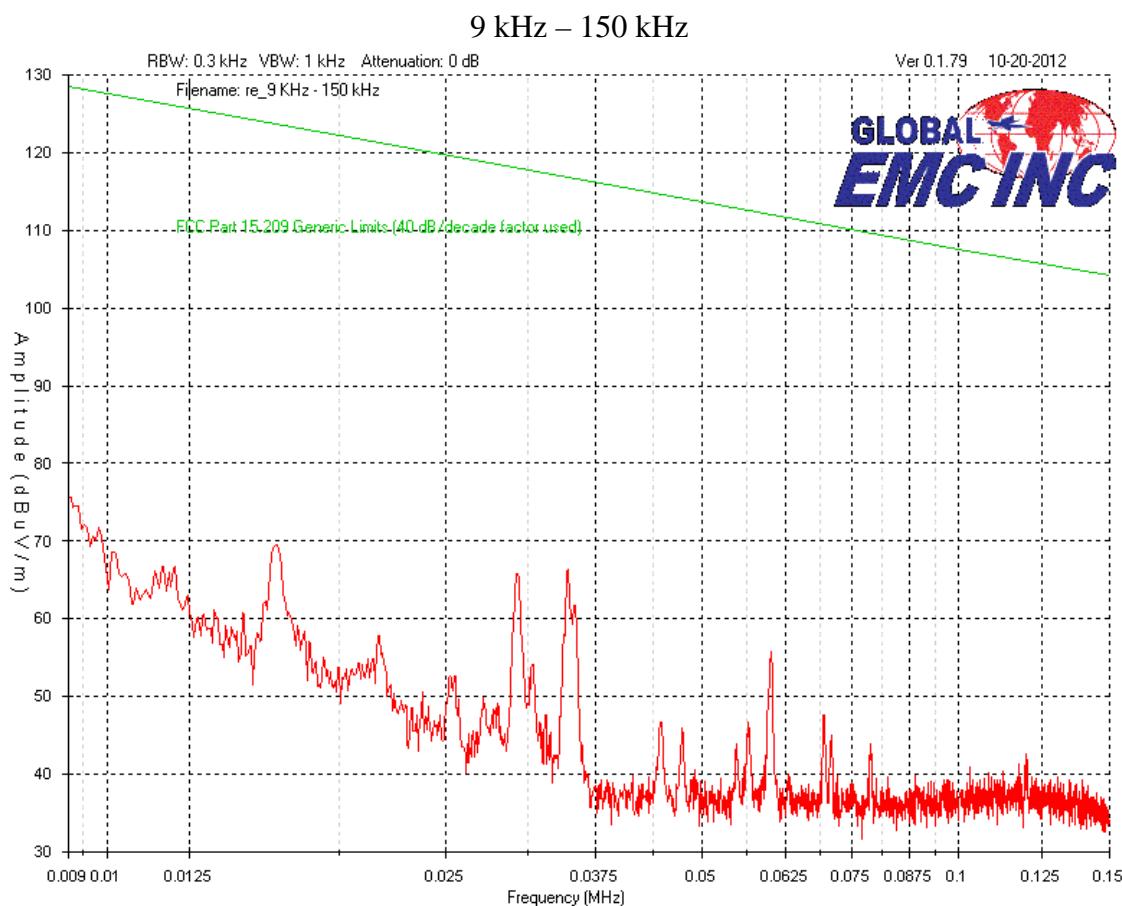
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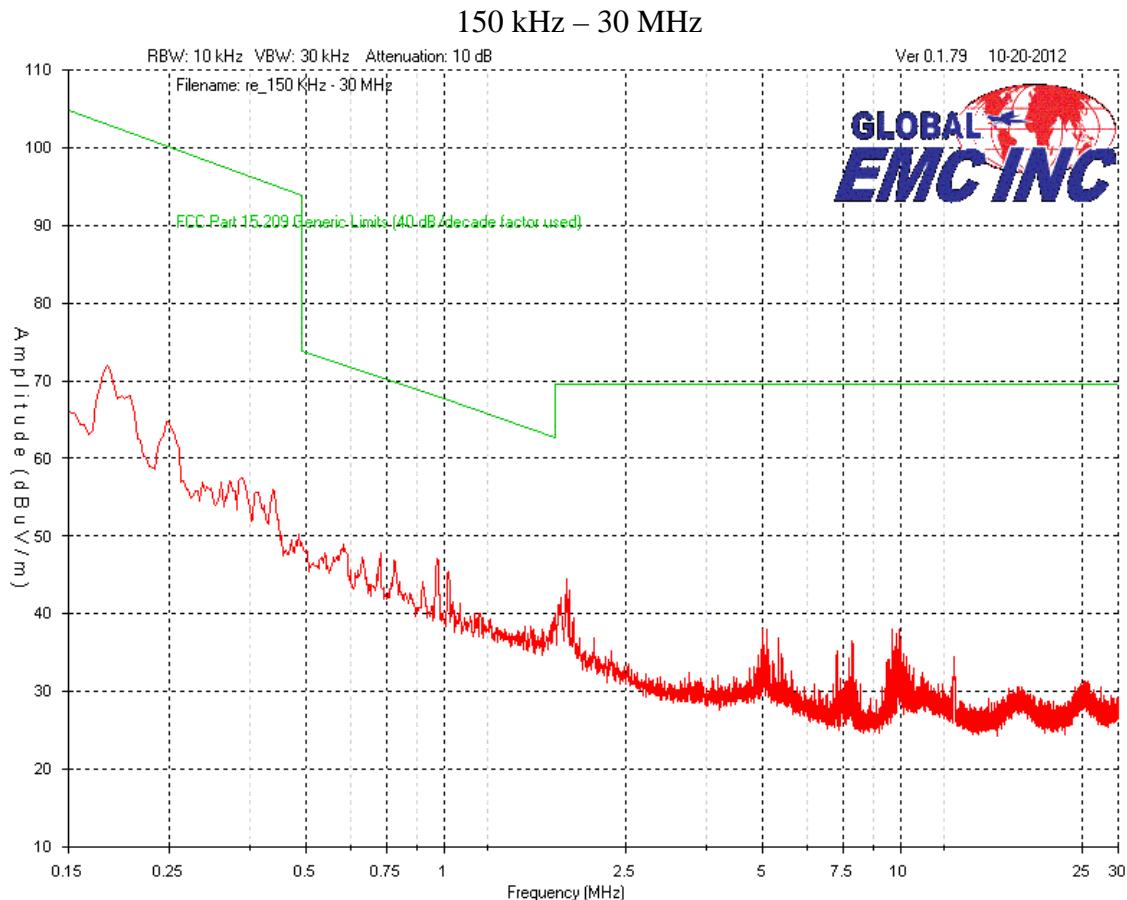
Devices scanned may be scanned at alternate test distances, and in accordance with FCC Part 15, Subpart A, Section 15.31, an extrapolation factor of 20 dB/decade was used above 30 MHz and 40 dB/decade below 30 MHz. For example for 1 meter measurements, an extrapolation factor 9.5 dB from 20 Log (1m / 3m) is applied.

Low, middle and high channels, each in three orthogonal axes, with frequency hopping stopped were checked, however the worst case graphs are presented where representative of all modes.

Band edge measure graphs were shown for illustrations purpose. See final measurement section for all measurements.



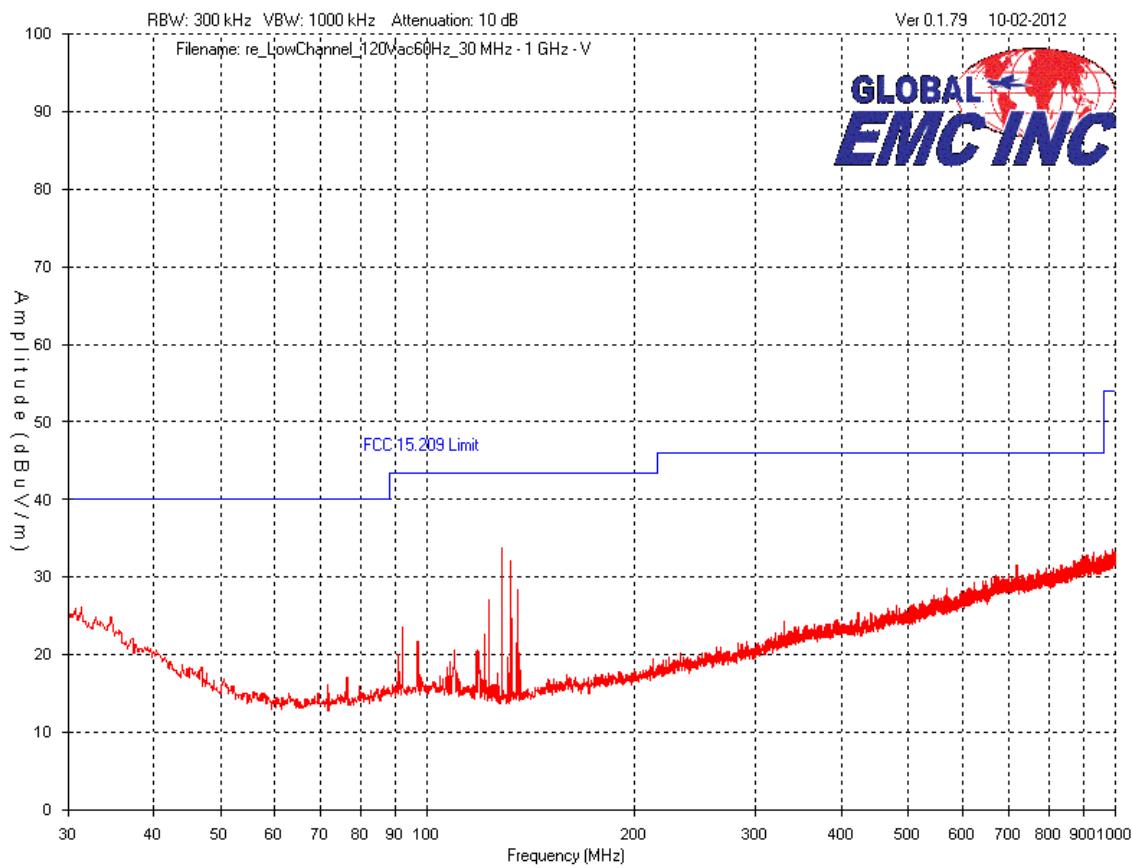
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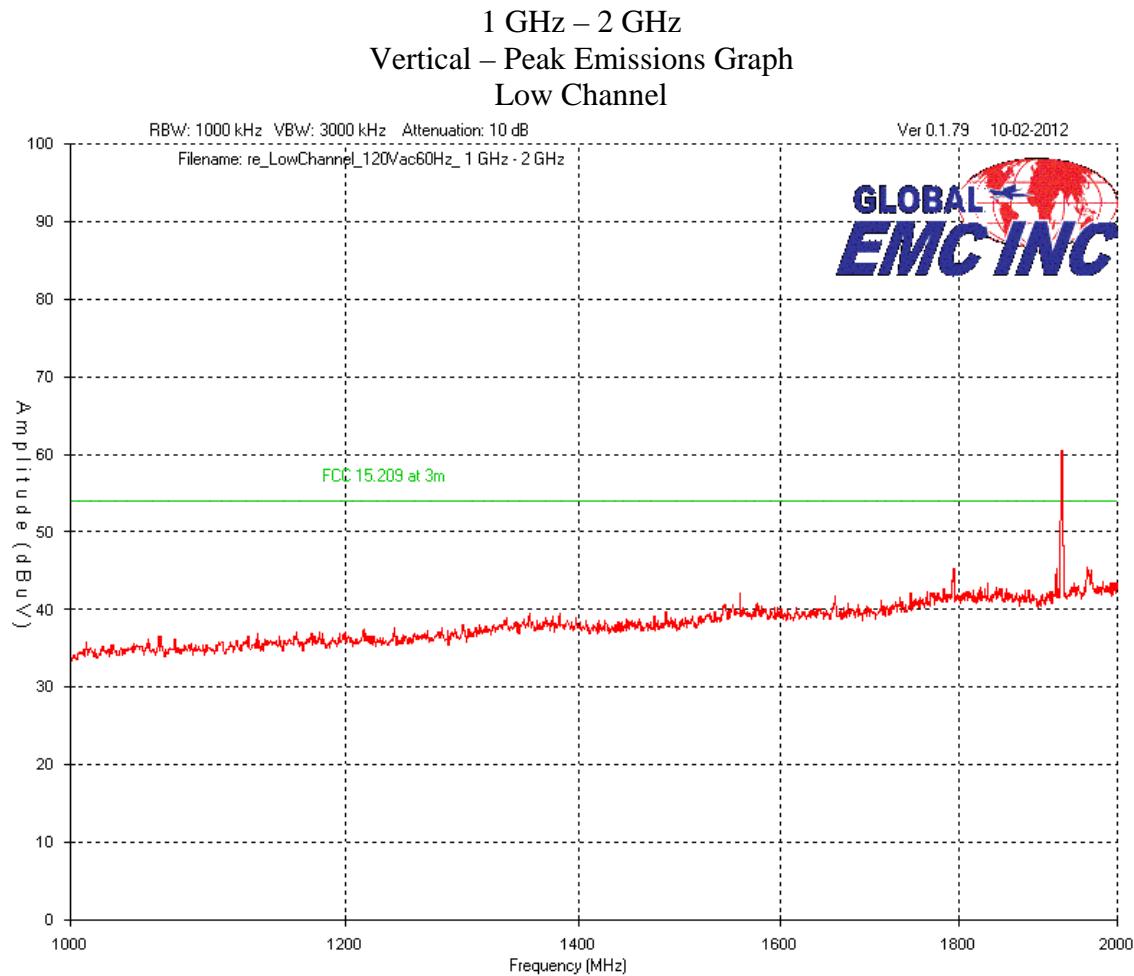
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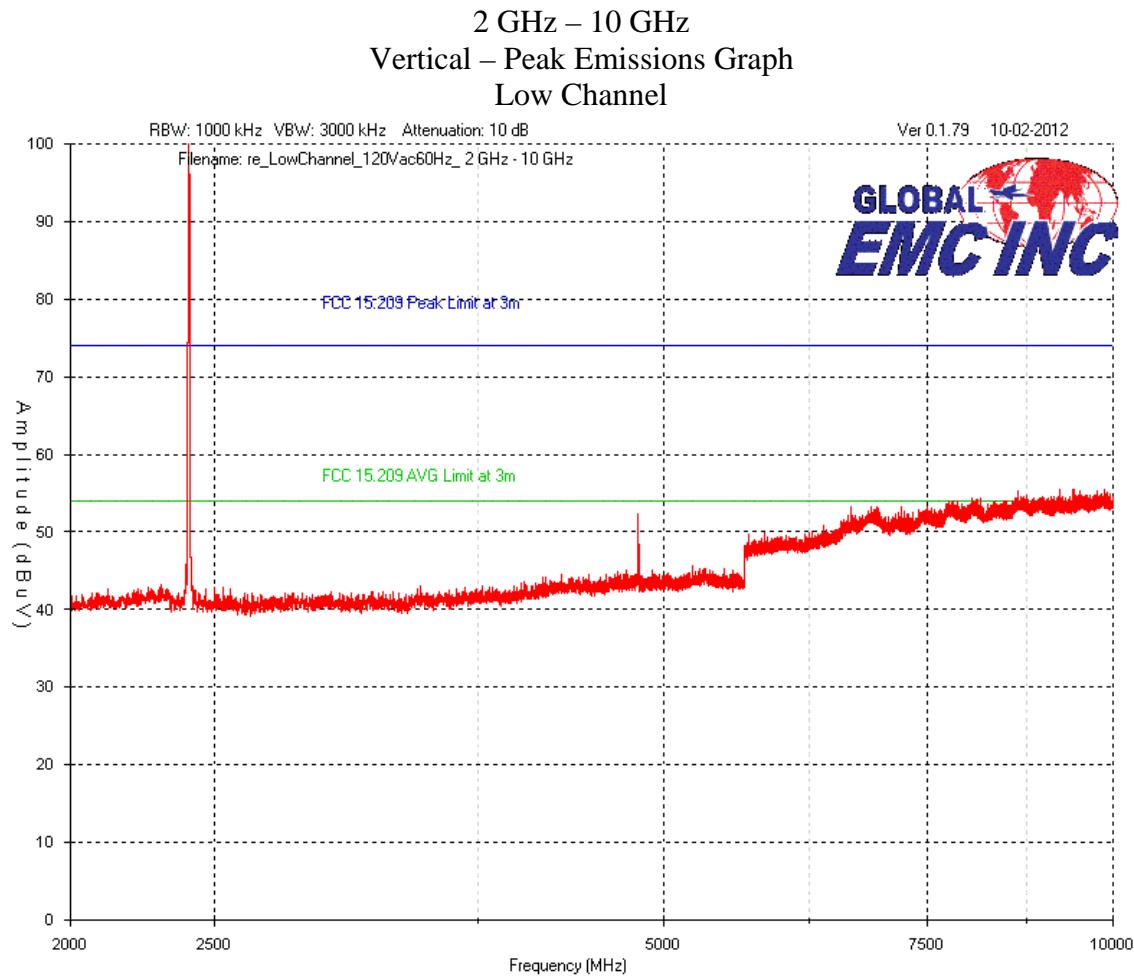
30 MHz – 1 GHz  
 Vertical – Peak Emissions Graph  
 Low Channel



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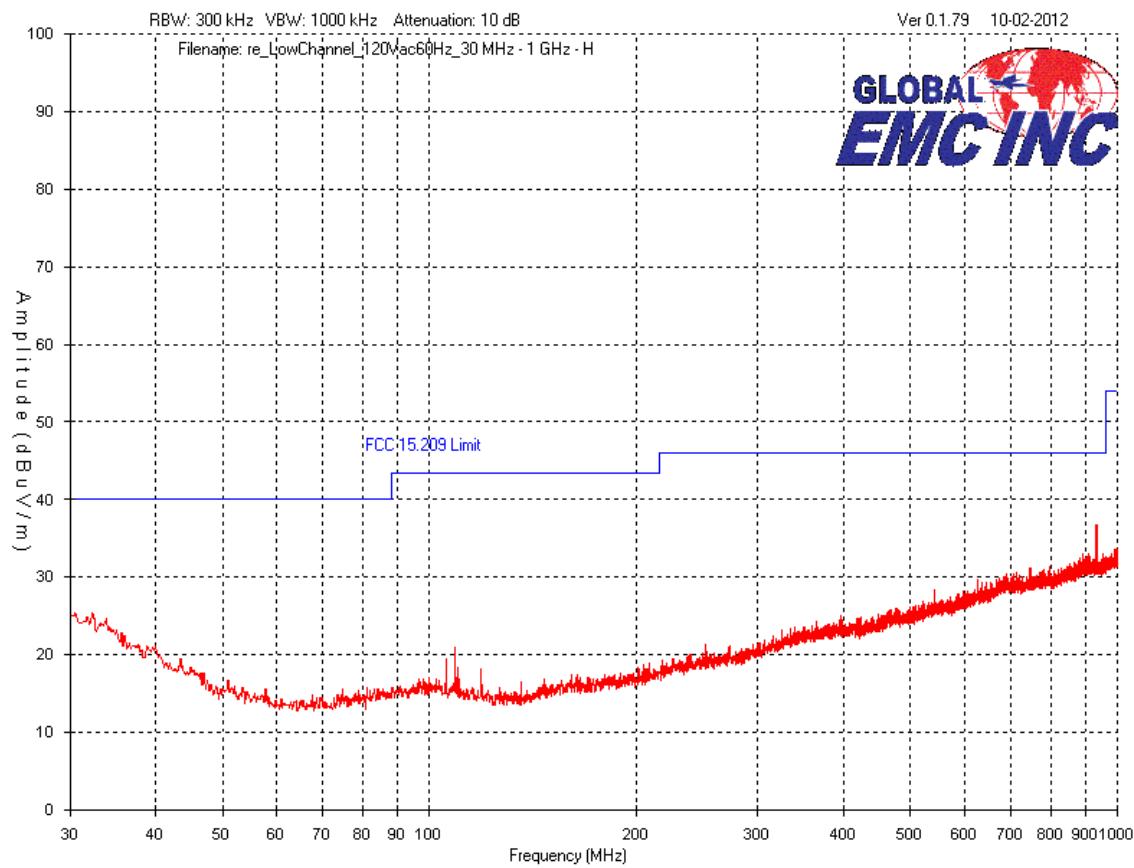
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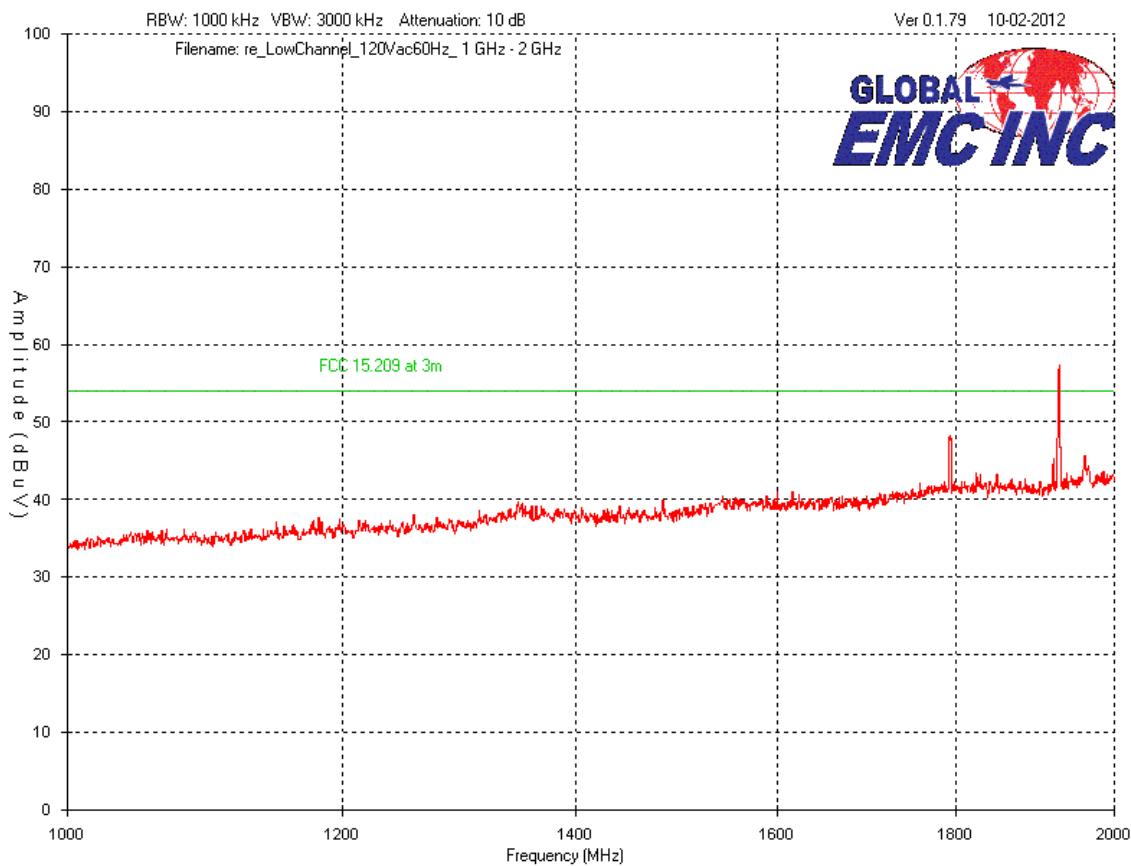
30 MHz – 1 GHz  
 Horizontal – Peak Emissions Graph  
 Low Channel



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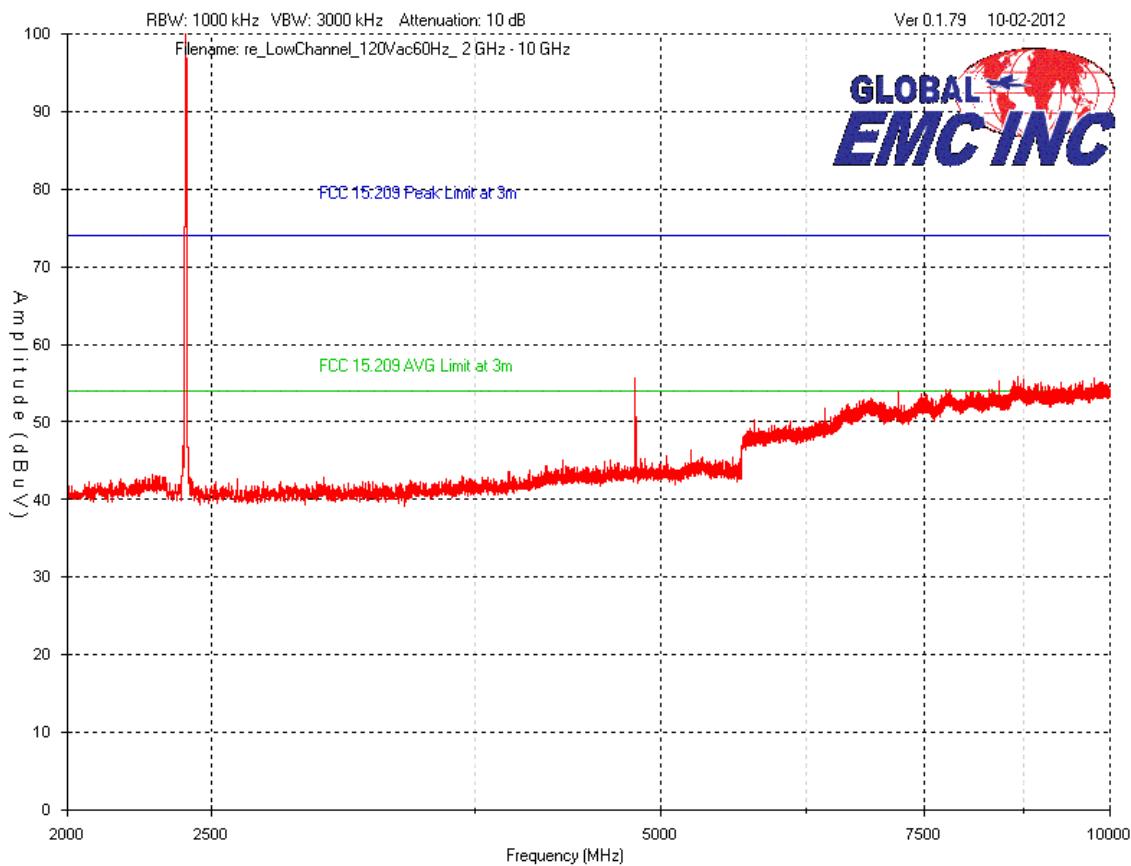
1 GHz – 2 GHz  
 Horizontal – Peak Emissions Graph  
 Low Channel



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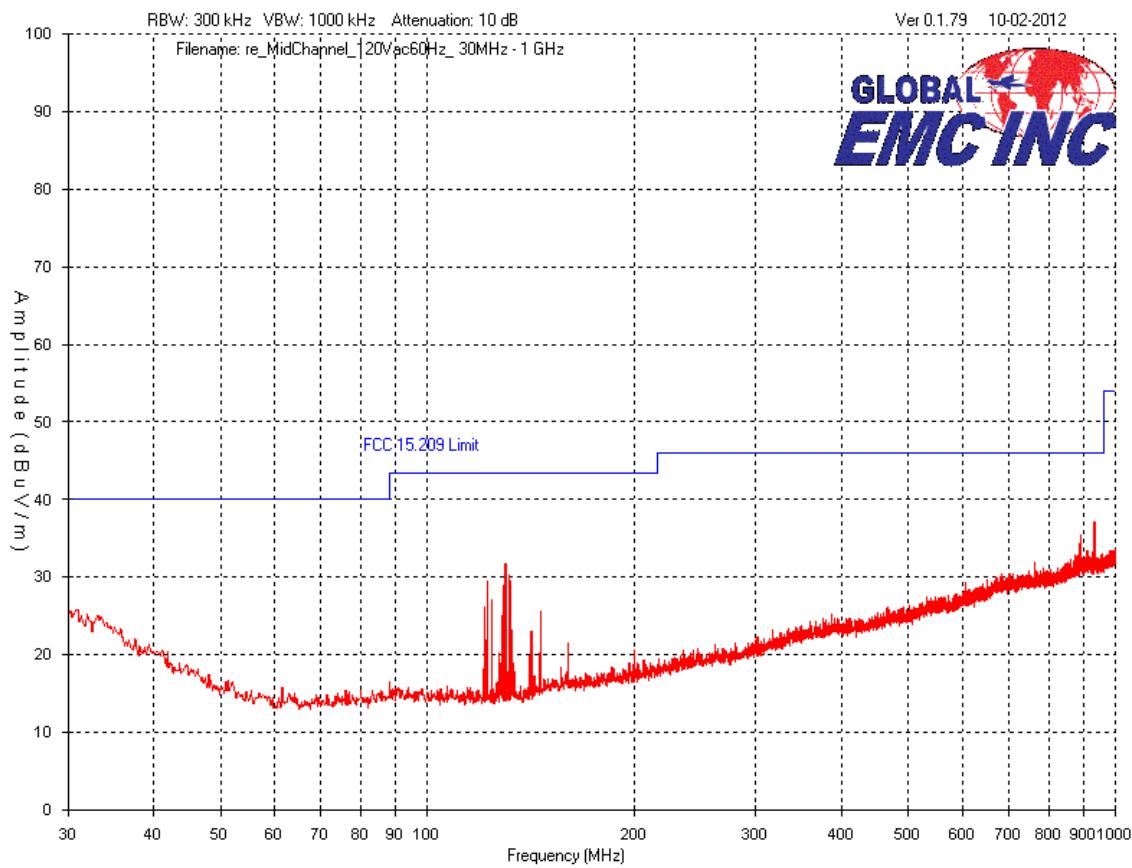
2 GHz – 10 GHz  
Horizontal – Peak Emissions Graph  
Low Channel



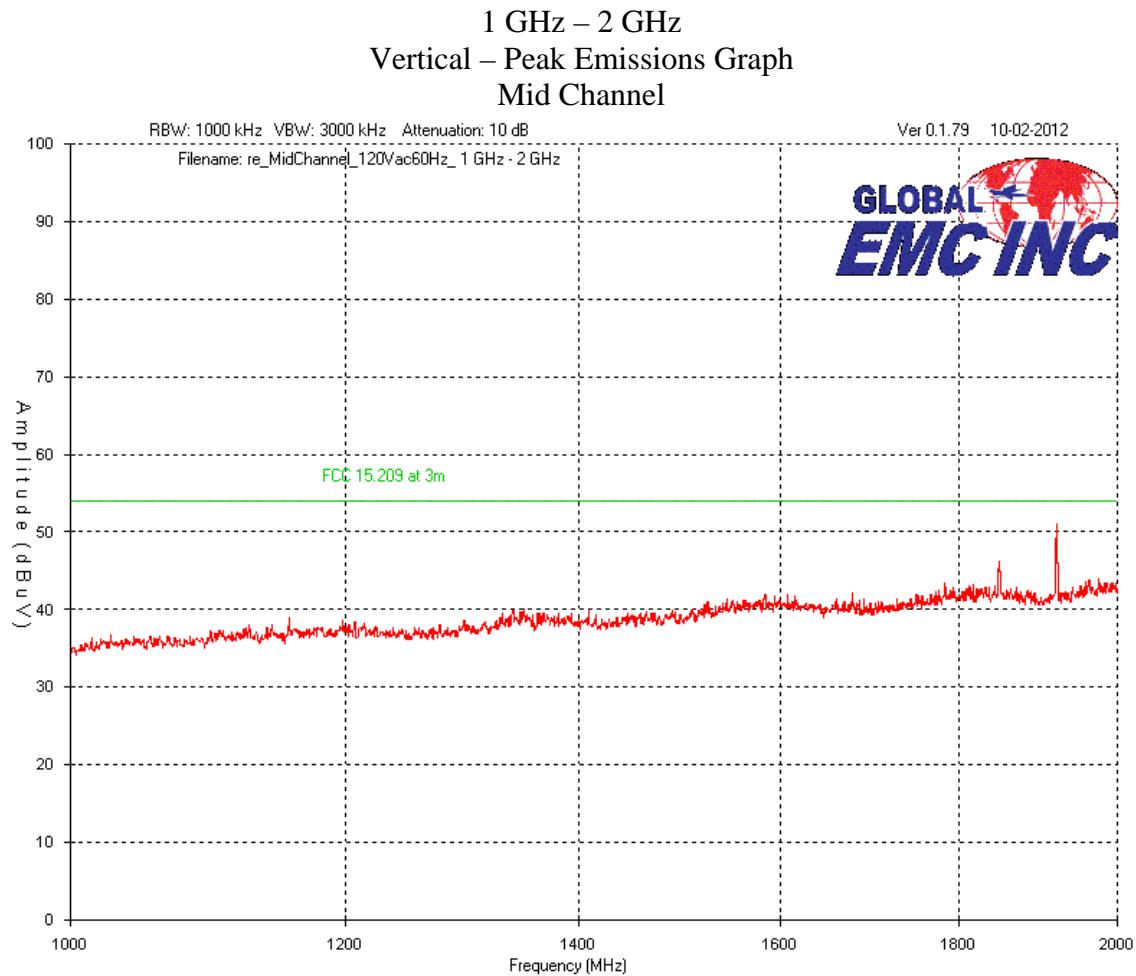
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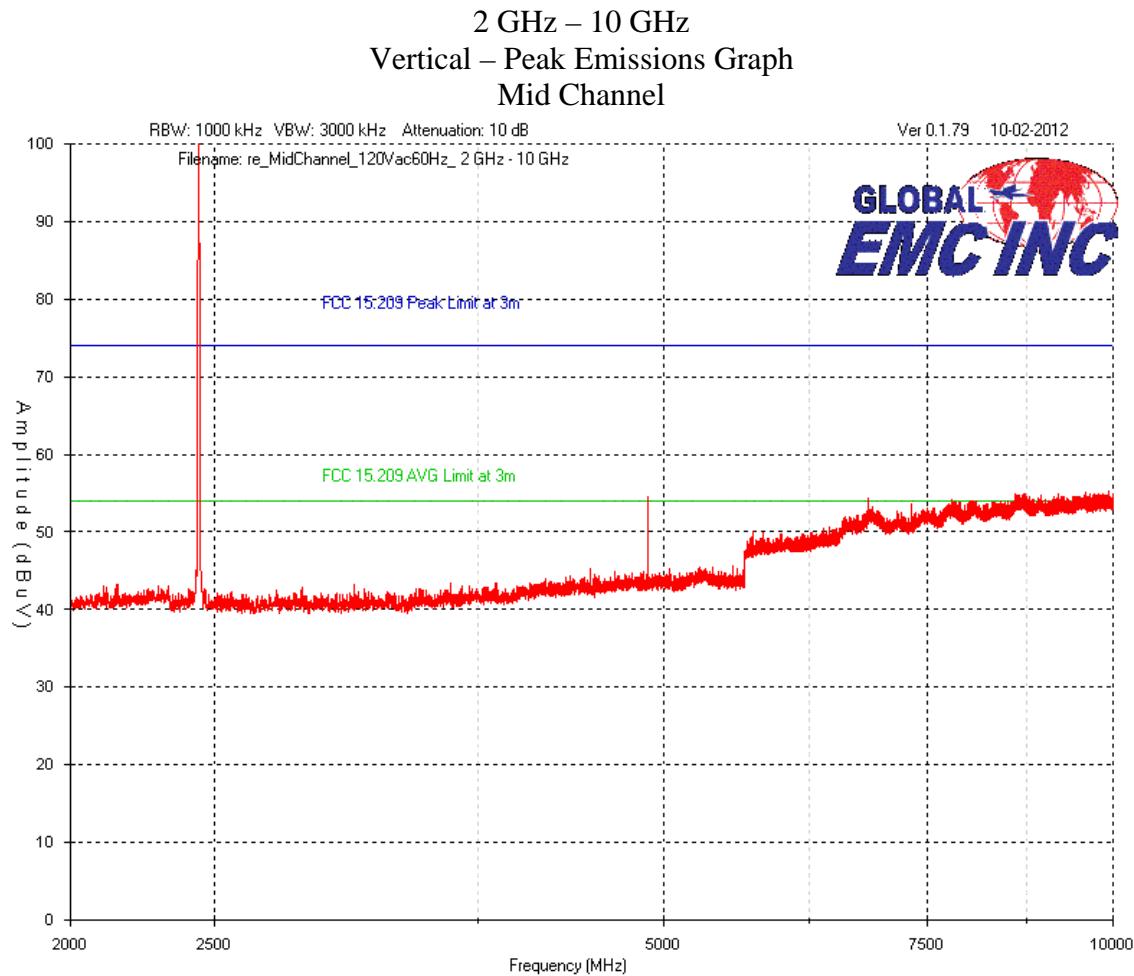
30 MHz – 1 GHz  
 Vertical – Peak Emissions Graph  
 Mid Channel



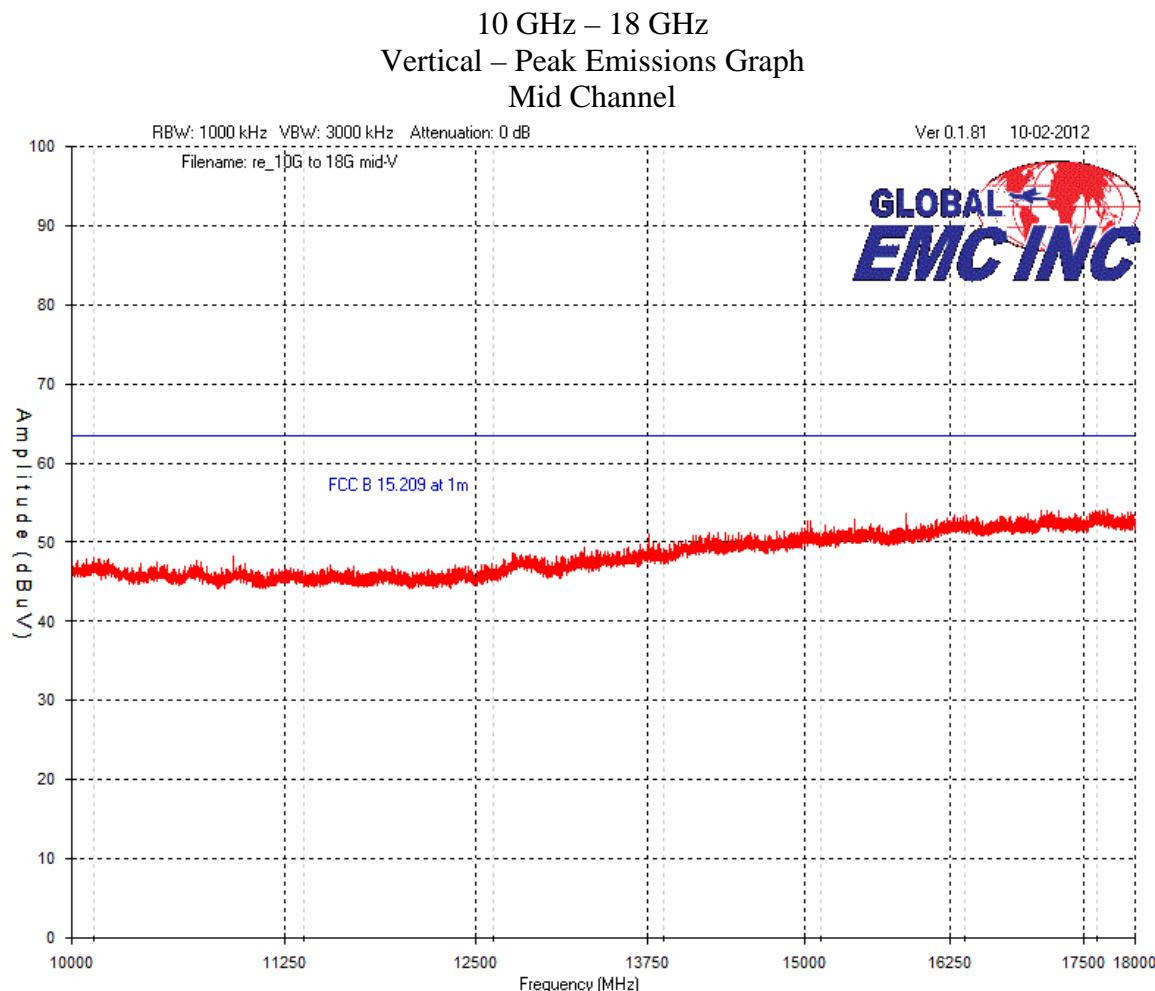
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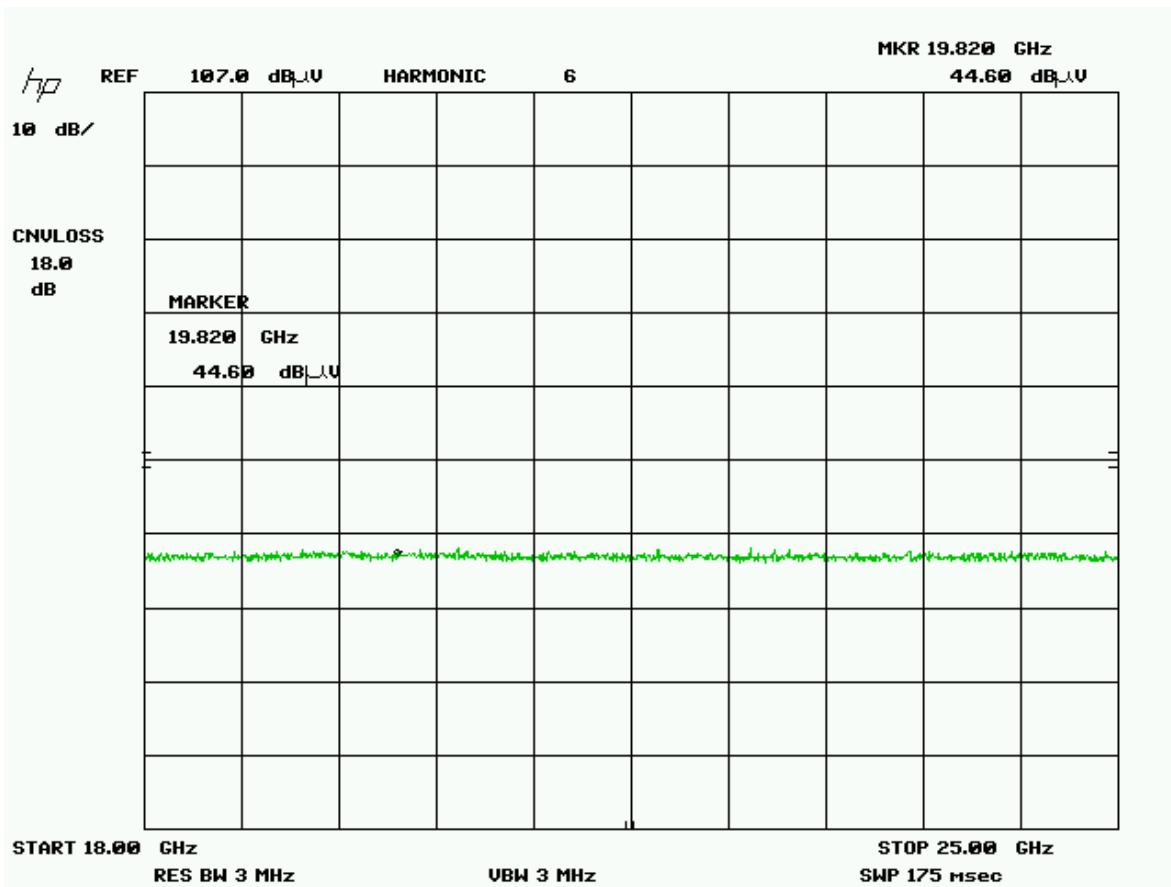
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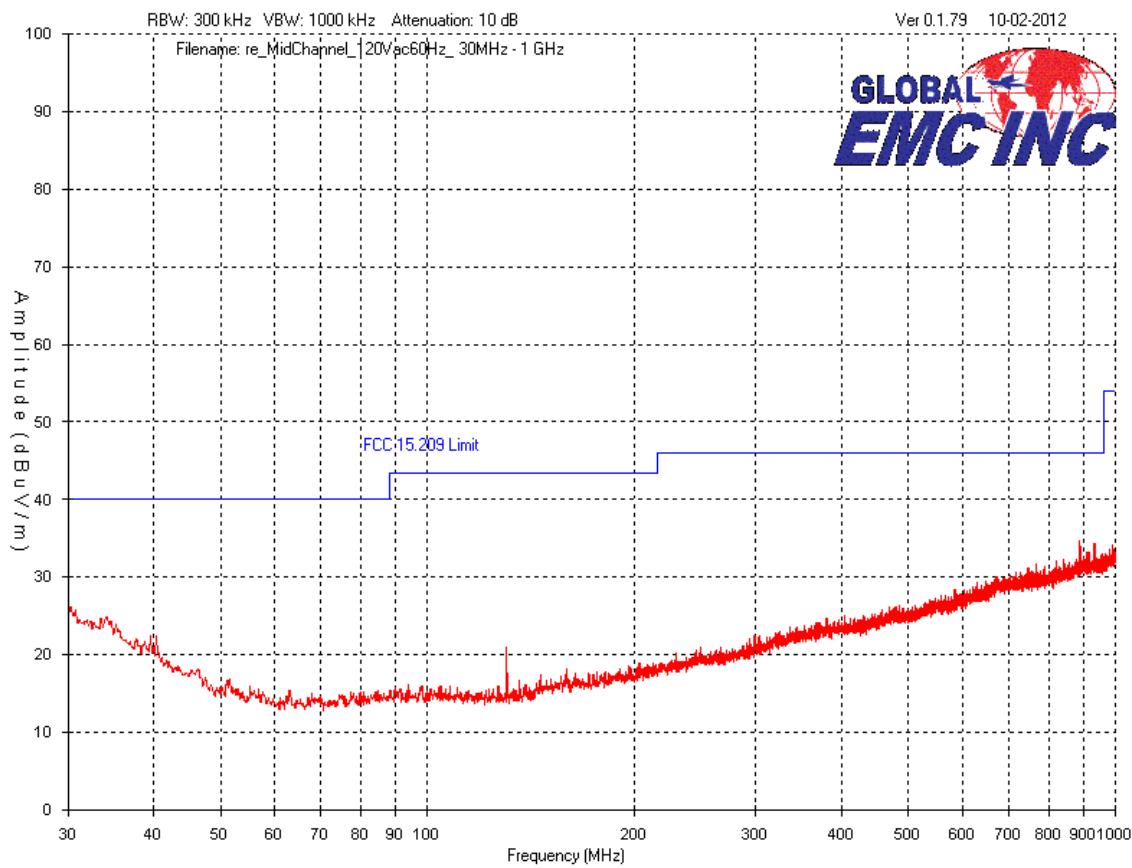
18 GHz – 25 GHz  
 Vertical – Peak Emissions Graph  
 Mid Channel



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Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



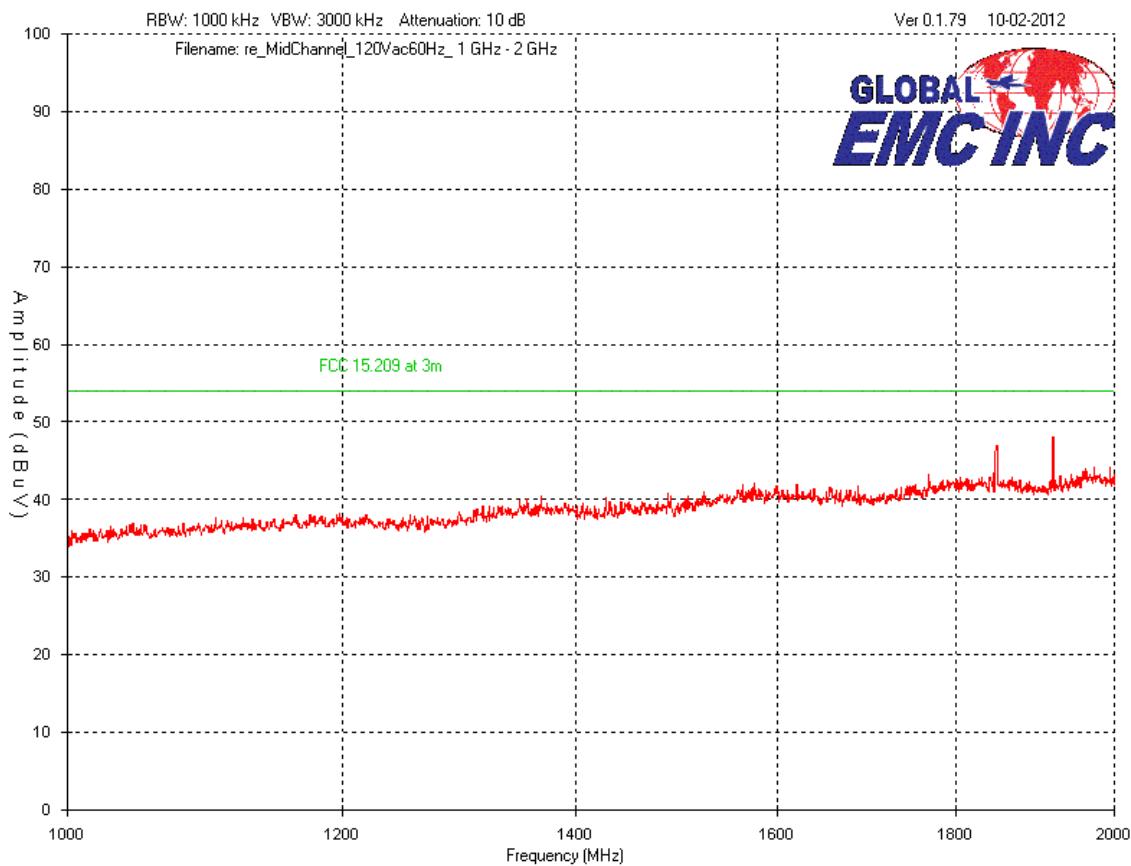
30 MHz – 1 GHz  
 Horizontal – Peak Emissions Graph  
 Mid Channel



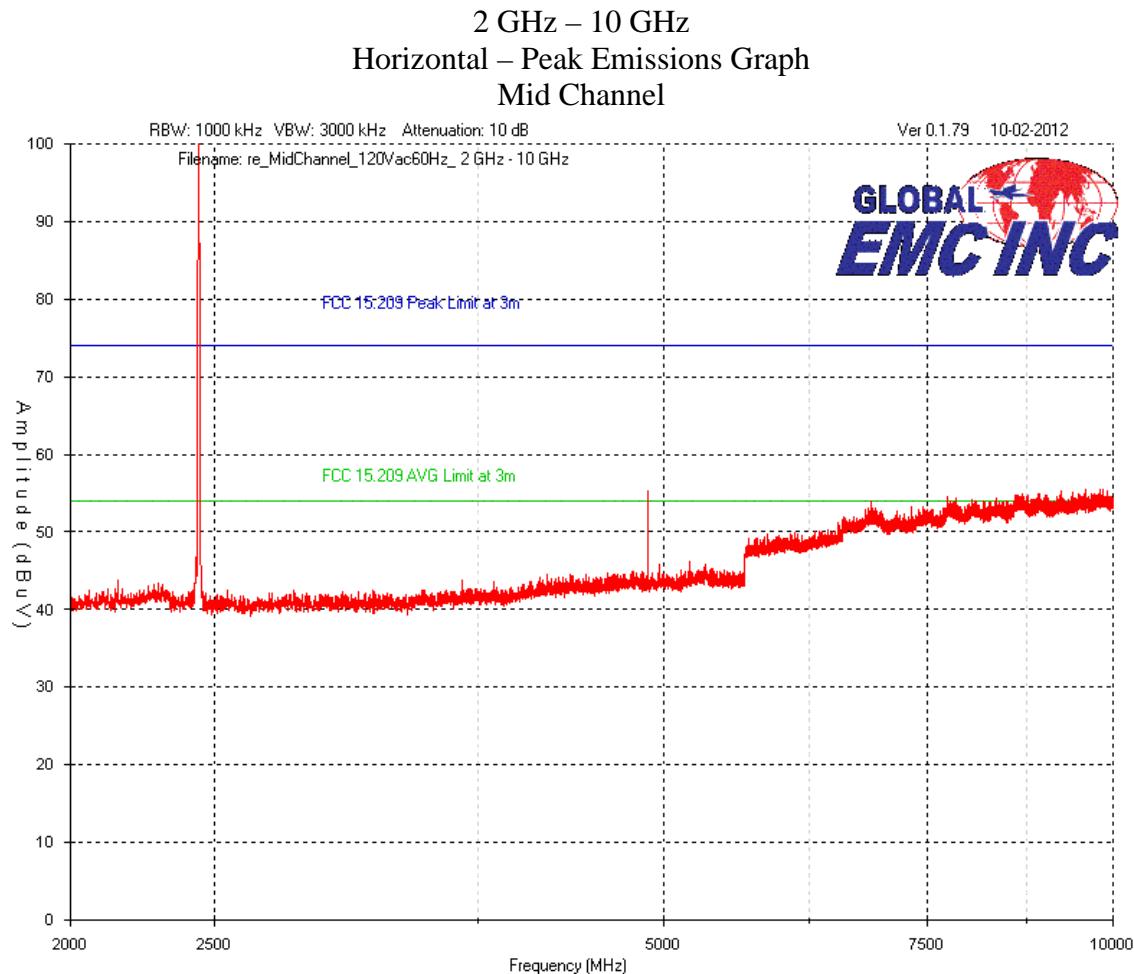
Client	Octet Matrix Inc.
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



1 GHz – 2 GHz  
 Horizontal – Peak Emissions Graph  
 Mid Channel



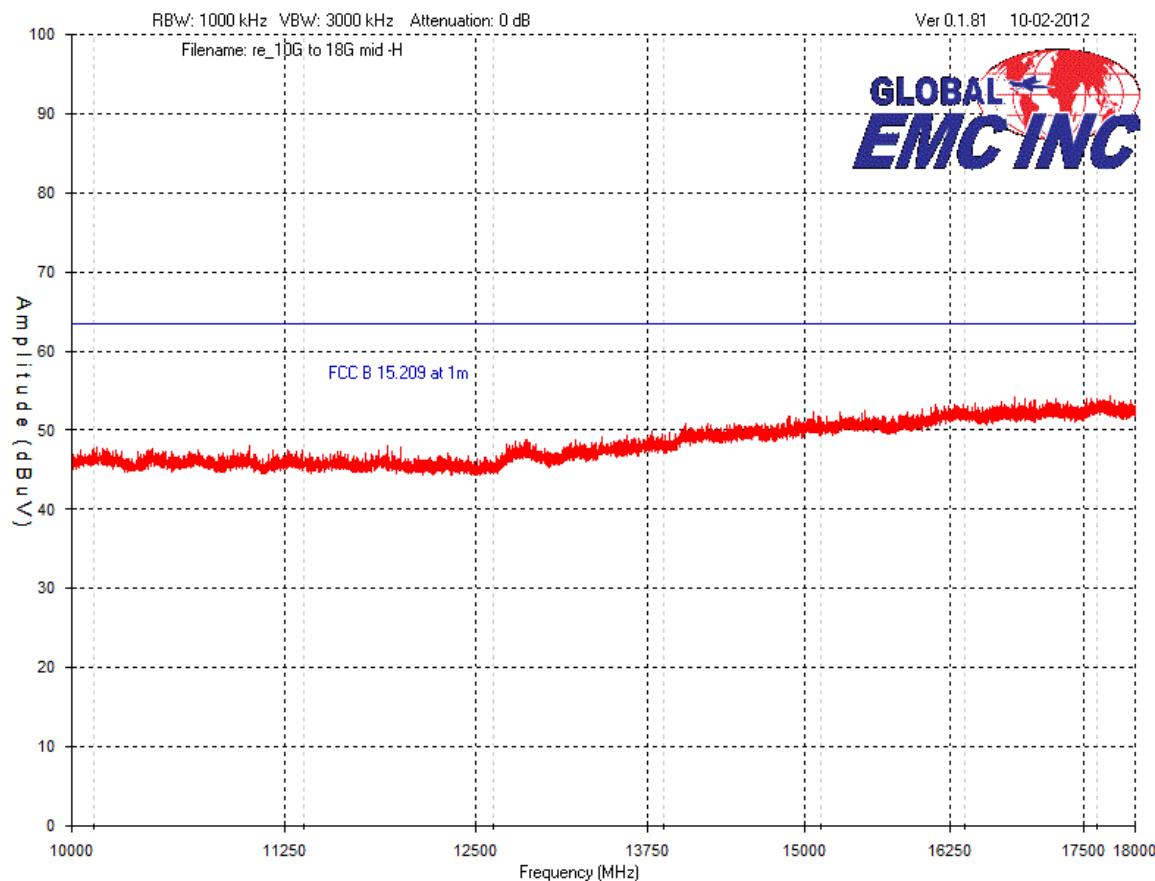
Client	Octet Matrix Inc.
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



Client	Octet Matrix Inc.
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



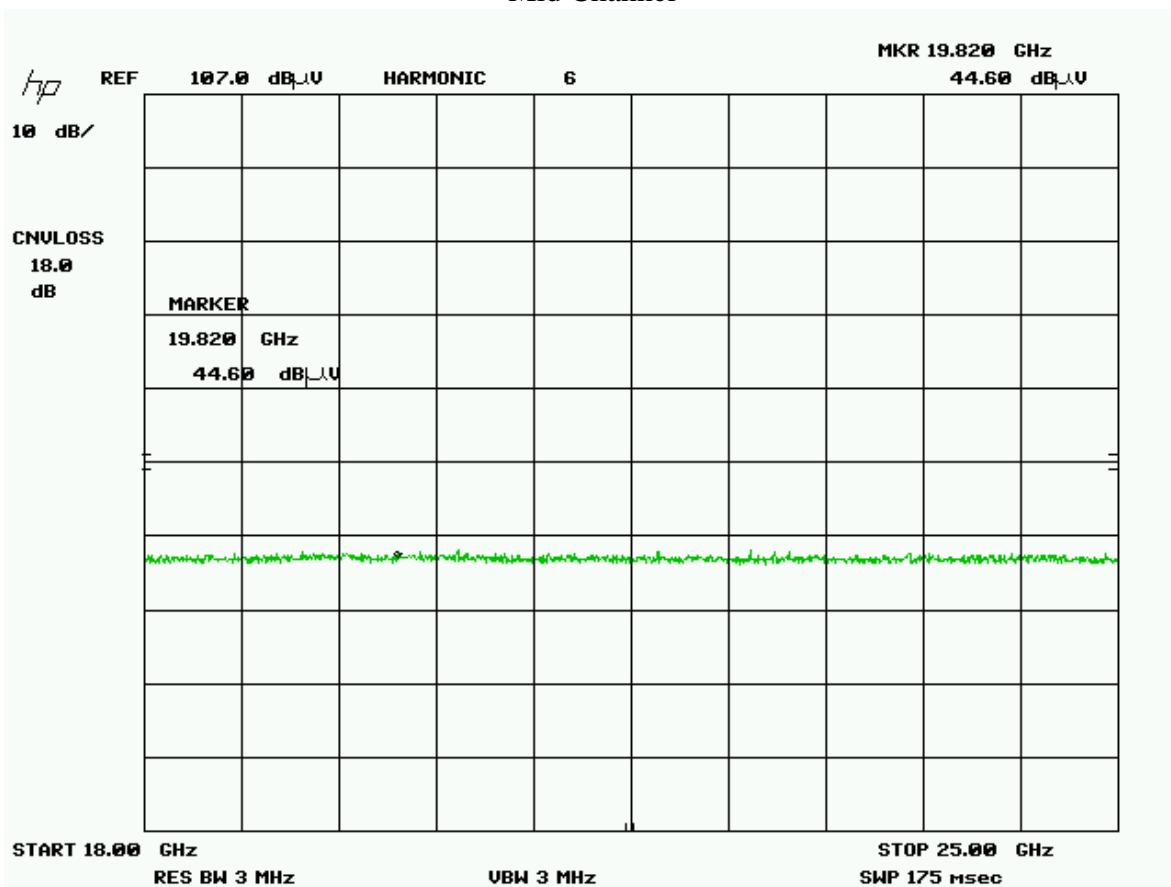
10 GHz – 18 GHz  
 Horizontal – Peak Emissions Graph  
 Mid Channel



Client	Octet Matrix Inc.
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



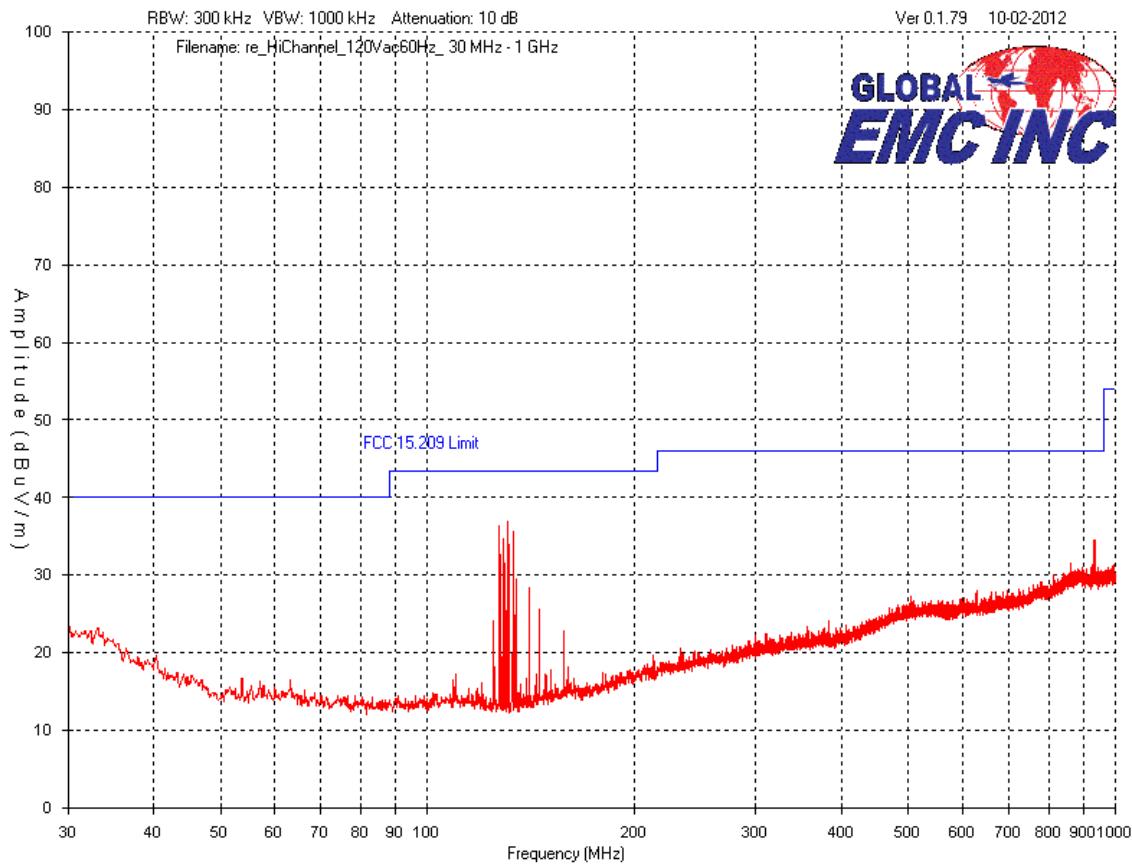
18 GHz – 25 GHz  
 Horizontal – Peak Emissions Graph  
 Mid Channel



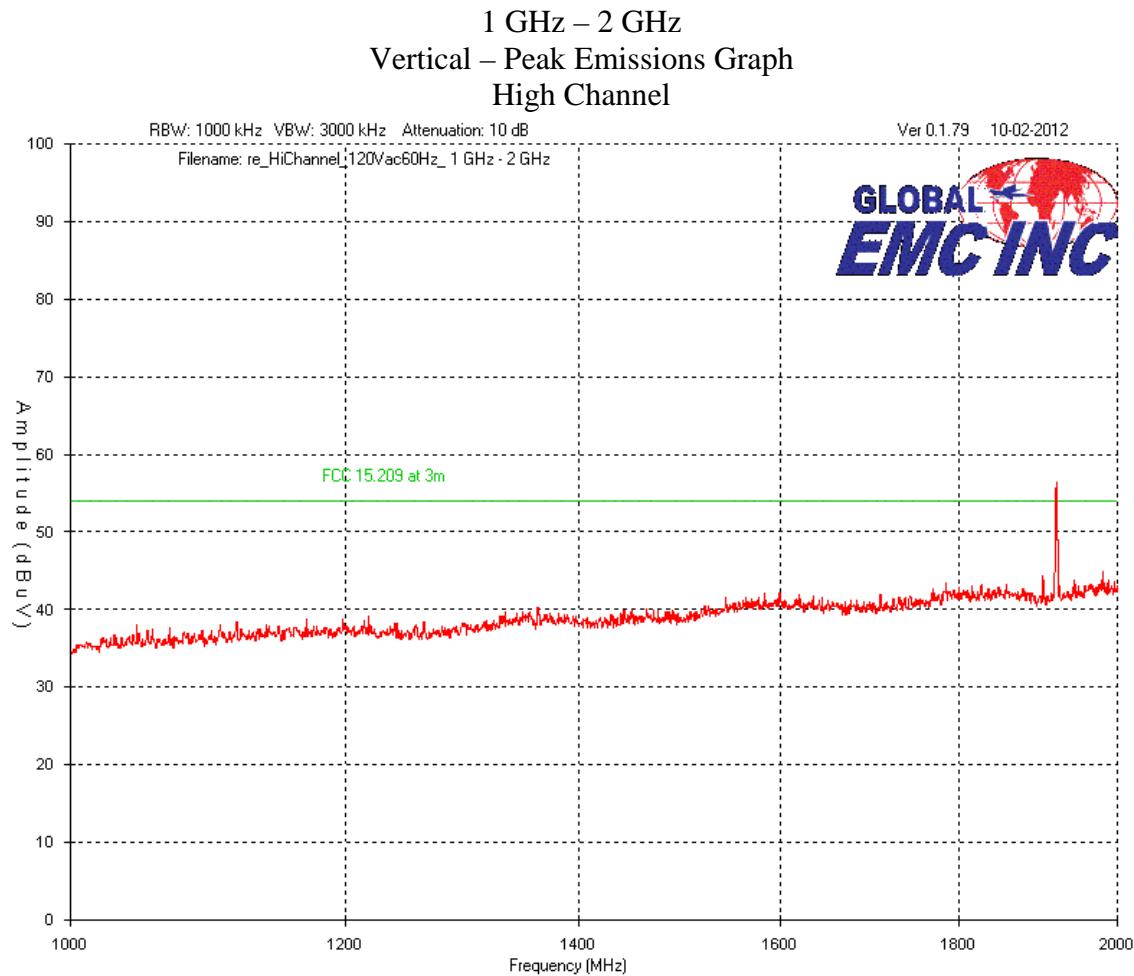
Client	Octet Matrix Inc.
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



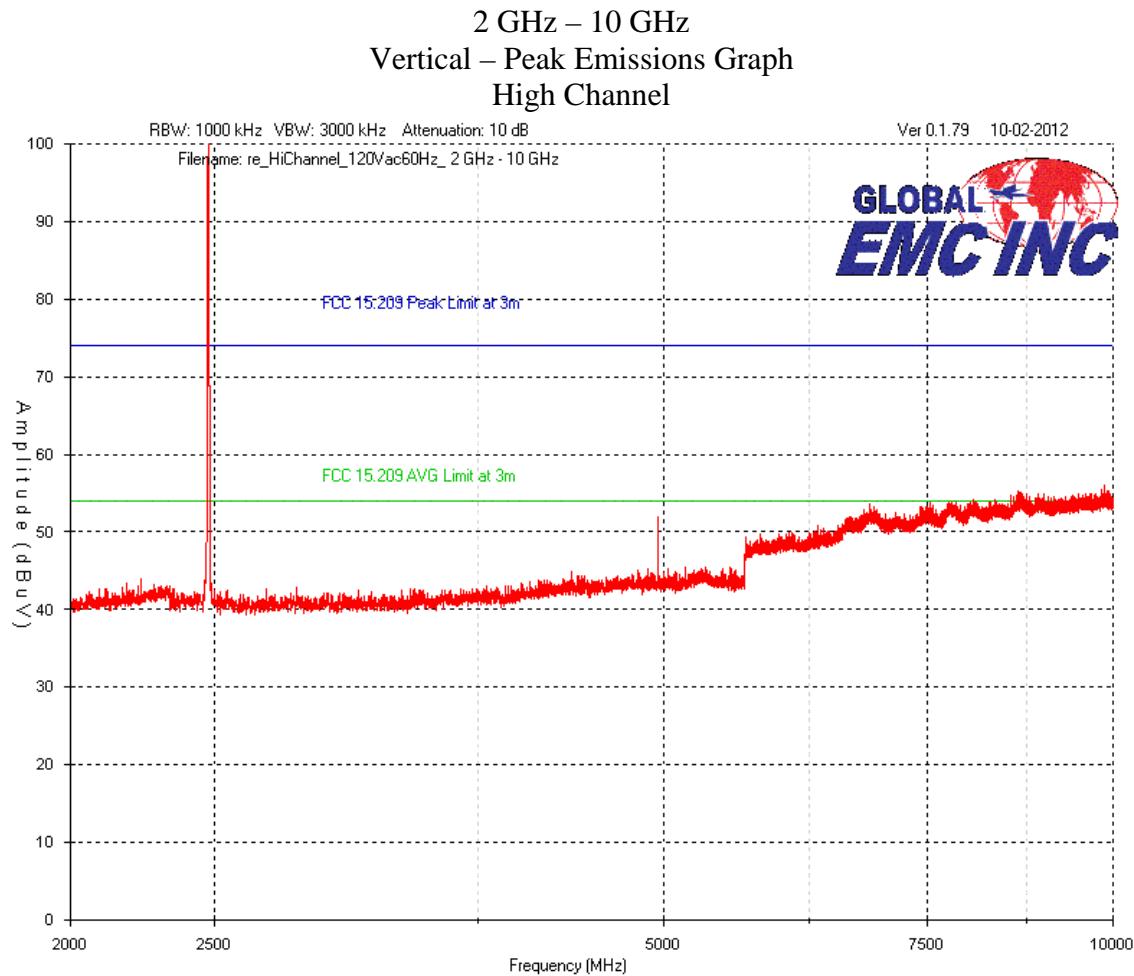
30 MHz – 1 GHz  
 Vertical – Peak Emissions Graph  
 High Channel



Client	<b>Octet Matrix Inc.</b>
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



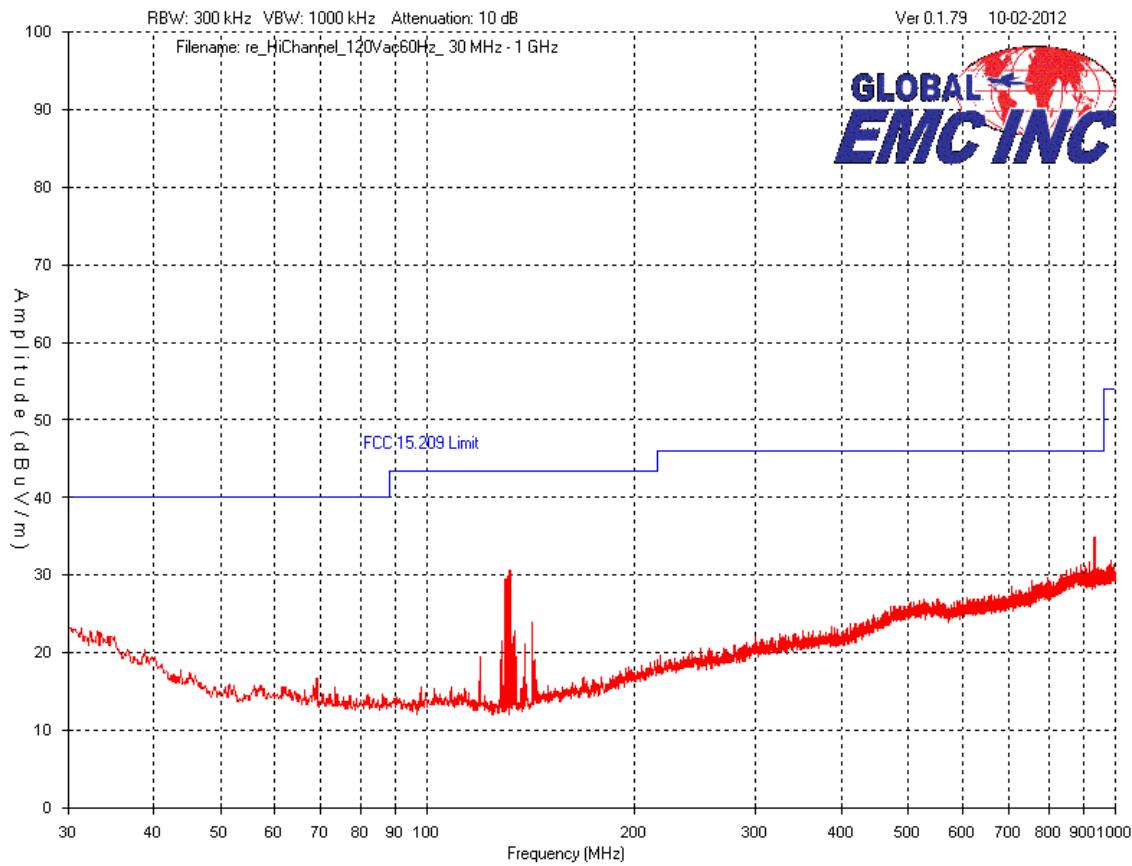
Client	Octet Matrix Inc.
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



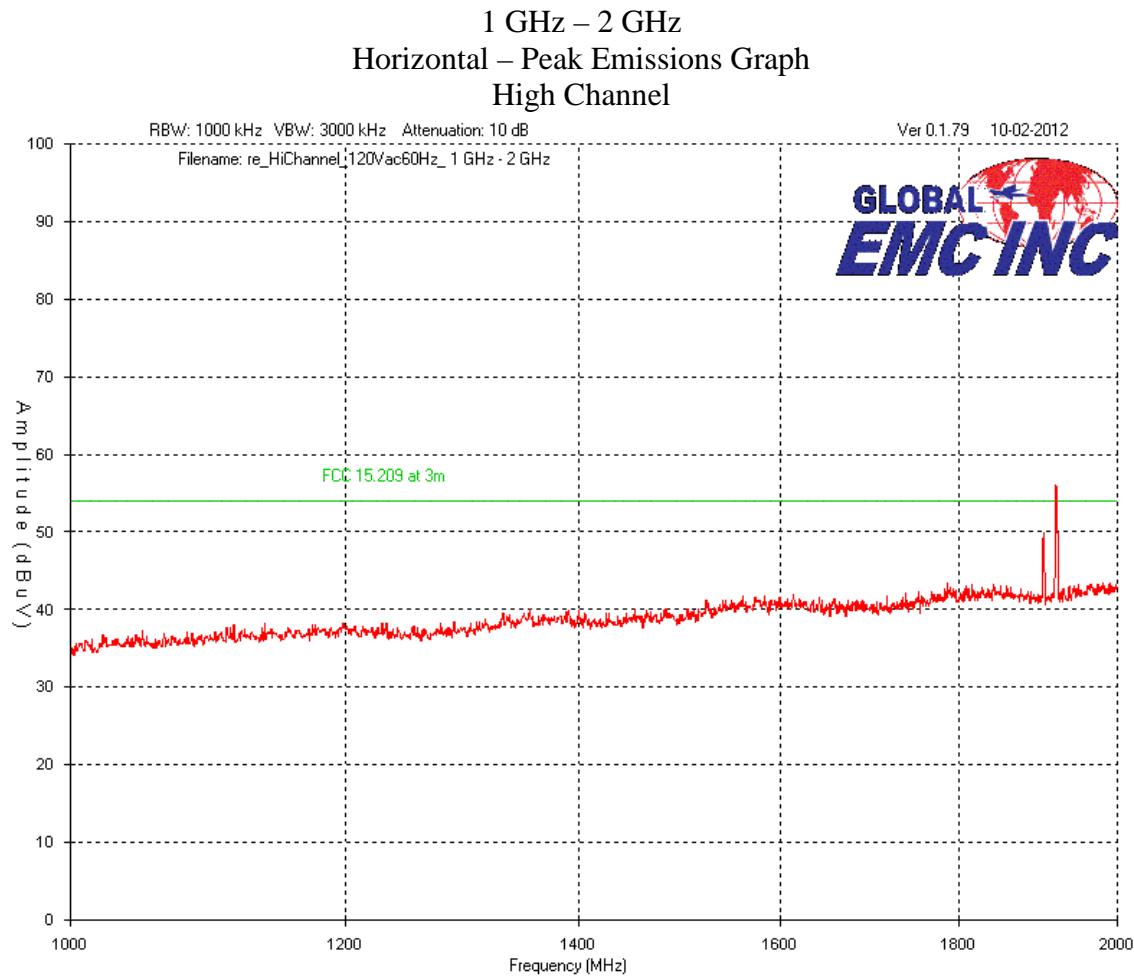
Client	Octet Matrix Inc.
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



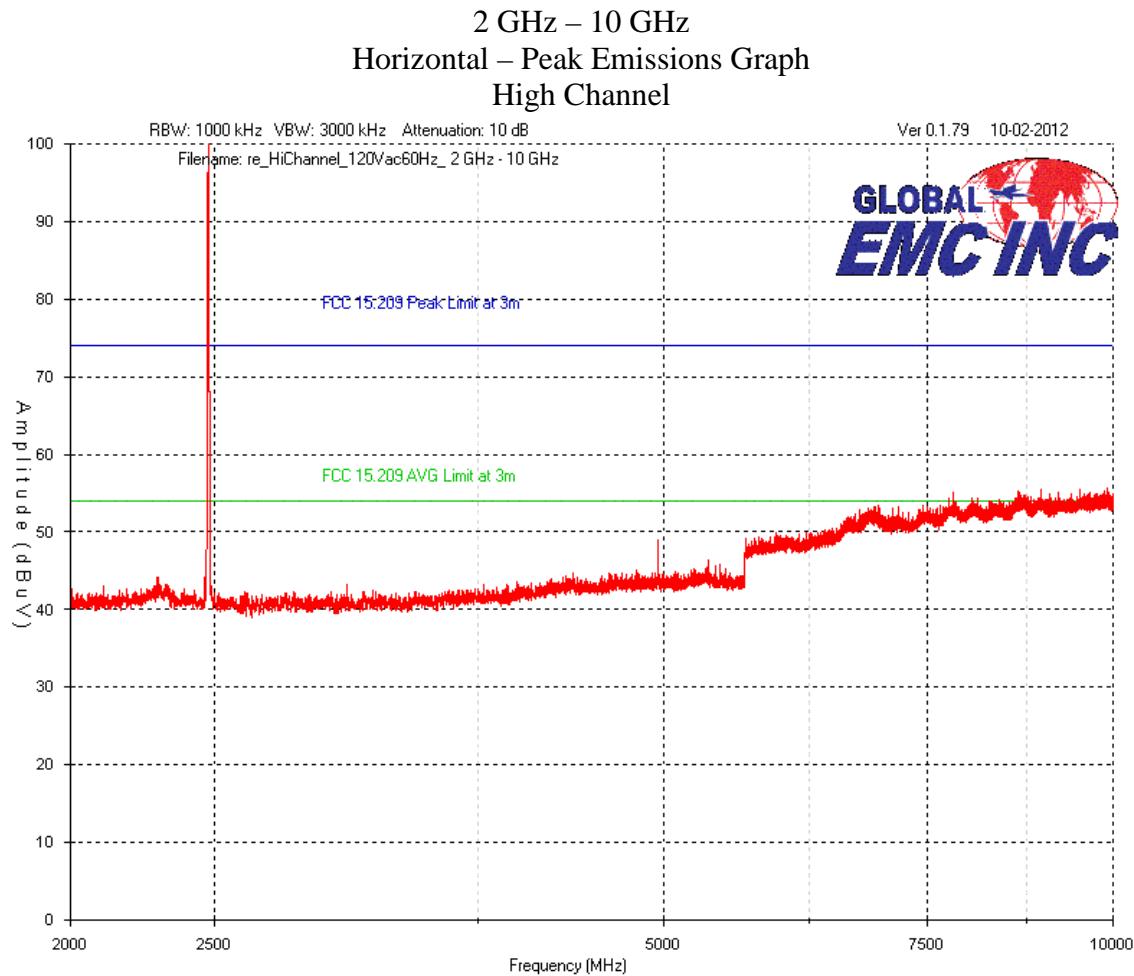
30 MHz – 1 GHz  
 Horizontal – Peak Emissions Graph  
 High Channel



Client	<b>Octet Matrix Inc.</b>
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



Client	Octet Matrix Inc.
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



Client	Octet Matrix Inc.
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



Band Edge – Low channel (EUT in horizontal position)  
Horizontal peak emissions



Client	Octet Matrix Inc.
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



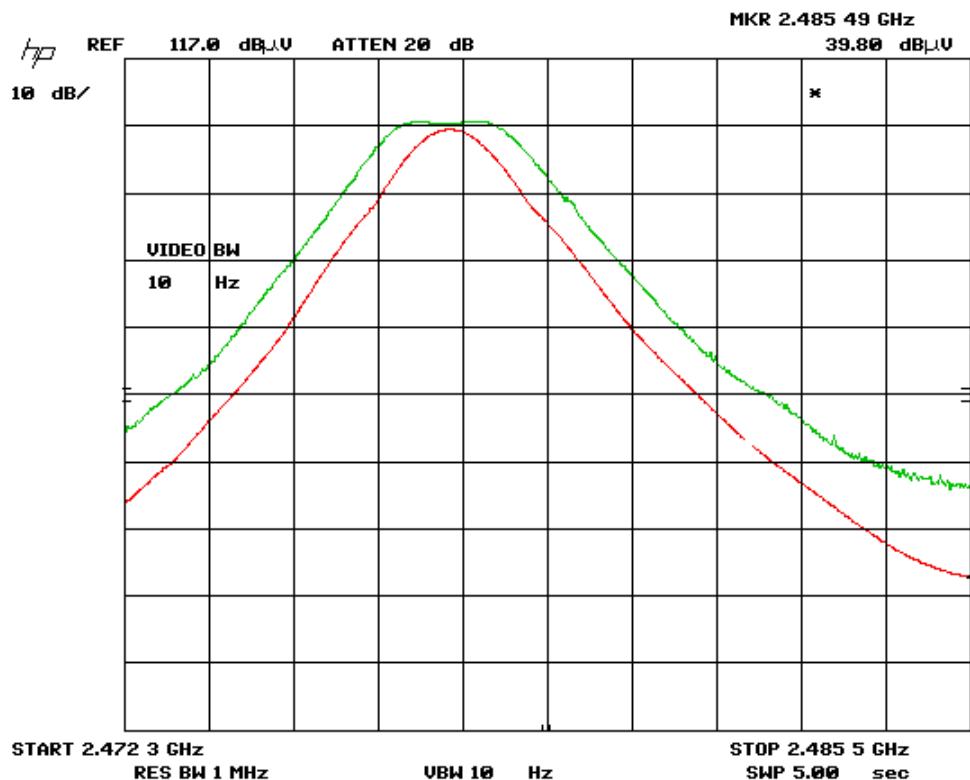
Band Edge – Low channel (EUT in horizontal position)  
Horizontal average emissions



Client	Octet Matrix Inc.
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



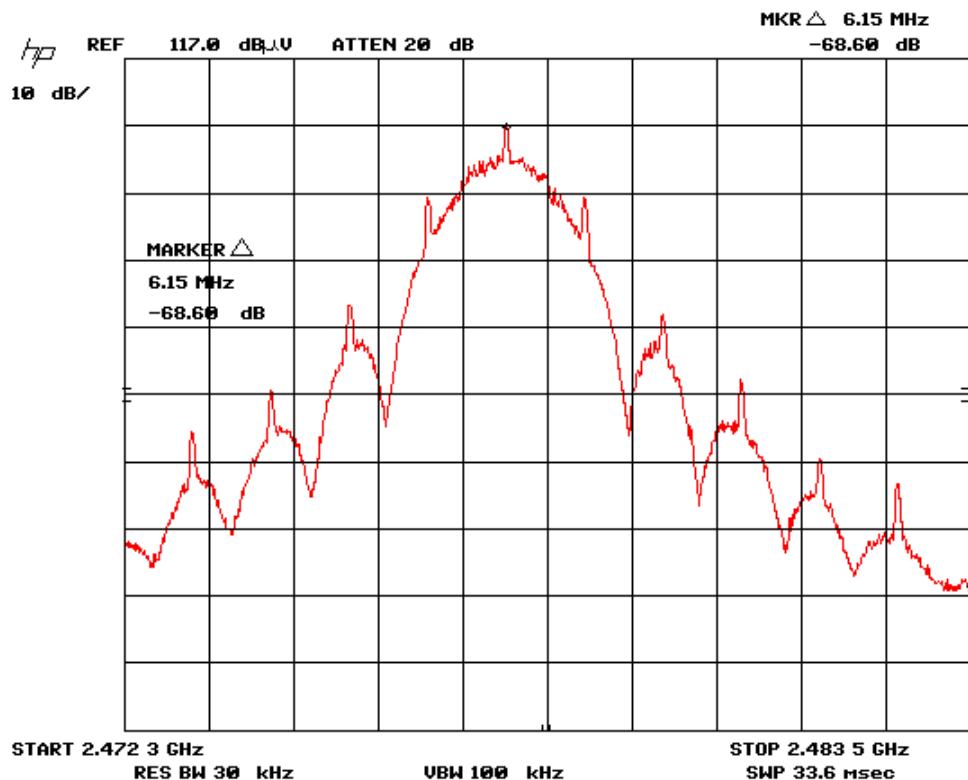
Band Edge – High channel (EUT in vertical position)  
Horizontal average and peak emissions



Client	Octet Matrix Inc.
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



Band Edge – High channel (EUT in vertical position)  
 Horizontal – Marker-Delta measurement



Client	<b>Octet Matrix Inc.</b>
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



## Final Measurements

Note: In accordance with 15.247(d), only frequencies exceeding the 15.209 limit that occur within the bands listed in 15.205, need to be verified with a quasi-peak or average detector.

The frequencies shown on the peak graphs at approximately 127 MHz to 135 MHz falls fully between 123 MHz and 138 MHz as listed in 15.205; the worst case peak reading on these frequencies is below the limit specified in 15.209; therefore, the frequencies does not need to be verified with a quasi-peak detector.

The requirement of -20dBc is verified by the conducted method; please see 'Spurious Antenna Conducted Emissions' section of this report.

For information purposes, the fundamental was measured to be 115 dBuV/m at 3 meters, and none of the unintentional radiated emissions that fall outside of the restricted bands exceeded the -20dBc (or 95 dBuV/m) requirement.

The following measurements were made at the harmonics shown in the above graphs.

Client	Octet Matrix Inc.	
Product	Wireless Digital Audio Transceiver Module	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012	

Test Frequency (MHz)	Detection mode (Q-Peak)	Antenna polarity (Horz/Vert)	Raw signal dB(µV)	Cable				Pre-Amp Gain dB	Receive d signal dB(µV/m)	Emission limit dB(µV/m)	Margin dB(µV)	Result
				Antenna factor dB	loss dB + Prese lecor	Atten dB	uator					
Low Channel - Horizontal												
2403.4	Peak	Horz	100.0	30.6	2.2	10.0	36.2	106.6				PASS
2403.4	Peak	Vert	98.6	30.6	2.2	10.0	36.2	105.2				PASS
2390	Peak	Horz	46.9	30.6	2.2	10.0	36.2	53.5	74.0	20.5		PASS
2390	Avg	Horz	34.3	30.6	2.2	10.0	36.2	40.9	54.0	13.1		PASS
2390	Peak	Vert	46.6	30.6	2.2	10.0	36.2	53.2	74.0	20.8		PASS
2390	Avg	Vert	33.9	30.6	2.2	10.0	36.2	40.5	54.0	13.5		PASS
4806.8	Peak	Horz	49.9	33.7	2.9	10.0	35.7	60.8	74.0	13.2		PASS
4806.8	Avg	Horz	31.6	33.7	2.9	10.0	35.7	42.5	54.0	11.5		PASS
4806.8	Peak	Vert	46.7	33.7	2.9	10.0	35.7	57.6	74.0	16.4		PASS
4806.8	Avg	Vert	33.6	33.7	2.9	10.0	35.7	44.5	54.0	9.5		PASS
Low Channel - Vertical												
2403.4	Peak	Horz	107.1	30.6	2.2	10.0	36.2	113.7				PASS
2403.4	Peak	Vert	98.1	30.6	2.2	10.0	36.2	104.7				PASS
2390	Peak	Horz	53.3	30.6	2.2	10.0	36.2	59.9	74.0	14.1		PASS
2390	Avg	Horz	41.1	30.6	2.2	10.0	36.2	47.7	54.0	6.3		PASS
2390	Peak	Vert	55.3	30.6	2.2	10.0	36.2	61.9	74.0	12.1		PASS
2390	Avg	Vert	40.5	30.6	2.2	10.0	36.2	47.1	54.0	6.9		PASS
4806.8	Peak	Horz	45.8	33.7	2.9	10.0	35.7	56.7	74.0	17.3		PASS
4806.8	Avg	Horz	33.2	33.7	2.9	10.0	35.7	44.1	54.0	9.9		PASS
4806.8	Peak	Vert	47.3	33.7	2.9	10.0	35.7	58.2	74.0	15.8		PASS
4806.8	Avg	Vert	35.1	33.7	2.9	10.0	35.7	46.0	54.0	8.0		PASS

Client	Octet Matrix Inc.	
Product	Wireless Digital Audio Transceiver Module	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012	

Test Frequency (MHz)	Detection mode (Q-Peak)	Antenna polarity (Horz/Vert)	Raw signal dB(µV)	Antenna factor dB	Cable loss dB + Preselcor	Attenuator dB	Pre-Amp Gain dB	Receive d signal dB(µV/m)	Emission limit dB(µV/m)	Margin dB(µV)	Result
Mid channel - Horizontal											
2440.4	Peak	Horz	103.5	30.6	2.2	10.0	36.2	110.1			PASS
2440.4	Peak	Vert	99.9	30.6	2.2	10.0	36.2	106.5			PASS
4880.8	Peak	Horz	46.2	33.7	2.9	0.0	35.7	47.1	74.0	26.9	PASS
4880.8	Avg	Horz	34.8	33.7	2.9	0.0	35.7	35.7	54.0	18.3	PASS
4880.8	Peak	Vert	48.3	33.7	2.9	0.0	35.7	49.2	74.0	24.8	PASS
4880.8	Avg	Vert	37.6	33.7	2.9	0.0	35.7	38.5	54.0	15.5	PASS
7321.2	Peak	Vert	48.3	37.9	4.3	0.0	35.9	54.6	74.0	19.4	PASS
7321.2	Avg	Vert	34.3	37.9	4.3	0.0	35.9	40.6	54.0	13.4	PASS
7321.2	Peak	Horz	48.4	37.9	4.3	0.0	35.9	54.7	74.0	19.3	PASS
7321.2	Avg	Horz	35.7	37.9	4.3	0.0	35.9	42.0	54.0	12.0	PASS
Mid channel - Vertical											
2440.4	Peak	Horz	108.4	30.6	2.2	10.0	36.2	115.0			PASS
2440.4	Peak	Vert	98.4	30.6	2.2	10.0	36.2	105.0			PASS
4880.8	Peak	Horz	51.3	33.7	2.9	0.0	35.7	52.2	74.0	21.8	PASS
4880.8	Avg	Horz	42.8	33.7	2.9	0.0	35.7	43.7	54.0	10.3	PASS
4880.8	Peak	Vert	49.8	33.7	2.9	0.0	35.7	50.7	74.0	23.3	PASS
4880.8	Avg	Vert	40.4	33.7	2.9	0.0	35.7	41.3	54.0	12.7	PASS
7321.2	Peak	Vert	50.2	37.9	4.3	0.0	35.9	56.5	74.0	17.5	PASS
7321.2	Avg	Vert	37.6	37.9	4.3	0.0	35.9	43.9	54.0	10.1	PASS
7321.2	Peak	Horz	50.2	37.9	4.3	0.0	35.9	56.5	74.0	17.5	PASS
7321.2	Avg	Horz	39.0	37.9	4.3	0.0	35.9	45.3	54.0	8.7	PASS

Client	Octet Matrix Inc.
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



Test Frequency (MHz)	Detection mode (Q-Peak)	Antenna polarity (Horz/Vert)	Raw signal dB(µV)	Antenna factor dB	Cable loss dB + Preselcor	Attenuator dB	Pre-Amp Gain dB	Receive d signal dB(µV/m)	Emission limit dB(µV/m)	Margin dB(µV)	Result
High channel 25 - Horizontal											
2477.3	Peak	Horz	102.0	30.6	2.2	10.0	36.2	108.6			PASS
2477.3	Peak	Vert	101.3	30.6	2.2	10.0	36.2	107.9			PASS
2483.5	Peak	Horz	52.4	30.6	2.2	10.0	36.2	59.0	74.0	15.0	PASS
2483.5	Avg	Horz	42.9	30.6	2.2	10.0	36.2	49.5	54.0	4.5	PASS
2483.5	Peak	Vert	52.7	30.6	2.2	10.0	36.2	59.3	74.0	14.7	PASS
2483.5	Avg	Vert	42.3	30.6	2.2	10.0	36.2	48.9	54.0	5.1	PASS
4954.6	Peak	Horz	46.4	33.7	2.9	0.0	35.7	47.3	74.0	26.7	PASS
4954.6	Avg	Horz	34.8	33.7	2.9	0.0	35.7	35.7	54.0	18.3	PASS
4954.6	Peak	Vert	47.7	33.7	2.9	0.0	35.7	48.6	74.0	25.4	PASS
4954.6	Avg	Vert	37.2	33.7	2.9	0.0	35.7	38.1	54.0	15.9	PASS
7431.9	Peak	Vert	49.7	37.9	4.3	0.0	35.9	56.0	74.0	18.0	PASS
7431.9	Avg	Vert	36.7	37.9	4.3	0.0	35.9	43.0	54.0	11.0	PASS
7431.9	Peak	Horz	49.6	37.9	4.3	0.0	35.9	55.9	74.0	18.1	PASS
7431.9	Avg	Horz	34.8	37.9	4.3	0.0	35.9	41.1	54.0	12.9	PASS
High channel 25 - Vertical											
2477.3	Peak	Horz	107.7	30.6	2.2	10.0	36.2	114.3			PASS
2477.3	Avg	Horz	106.5	30.6	2.2	10.0	36.2	113.1			PASS
2477.3	Peak	Vert	99.6	30.6	2.2	10.0	36.2	106.2			PASS
2483.5	Peak	Horz	39.1	30.6	2.2	10.0	36.2	45.7	74.0	28.3	PASS
2483.5	Avg	Horz	37.9	30.6	2.2	10.0	36.2	44.5	54.0	9.5	PASS
2485.5	Peak	Horz	52.4	30.6	2.2	10.0	36.2	59.0	74.0	15.0	PASS
2485.5	Avg	Horz	39.8	30.6	2.2	10.0	36.2	46.4	54.0	7.6	PASS
2483.5	Peak	Vert	51.1	30.6	2.2	10.0	36.2	57.7	74.0	16.3	PASS
2483.5	Avg	Vert	40.7	30.6	2.2	10.0	36.2	47.3	54.0	6.7	PASS
4954.6	Peak	Horz	50.1	33.7	2.9	0.0	35.7	51.0	74.0	23.0	PASS
4954.6	Avg	Horz	41.7	33.7	2.9	0.0	35.7	42.6	54.0	11.4	PASS
4954.6	Peak	Vert	48.6	33.7	2.9	0.0	35.7	49.5	74.0	24.5	PASS
4954.6	Avg	Vert	38.1	33.7	2.9	0.0	35.7	39.0	54.0	15.0	PASS
7431.9	Peak	Vert	50.1	37.9	4.3	0.0	35.9	56.4	74.0	17.6	PASS
7431.9	Avg	Vert	38.6	37.9	4.3	0.0	35.9	44.9	54.0	9.1	PASS
7431.9	Peak	Horz	51.0	37.9	4.3	0.0	35.9	57.3	74.0	16.7	PASS
7431.9	Avg	Horz	39.8	37.9	4.3	0.0	35.9	46.1	54.0	7.9	PASS

Note: The marker-delta method was used at 2483.5 MHz with the measuring antenna at horizontal polarity. The RBW = 30 kHz is used to obtain the marker-delta value. The marker-delta value is 68.6 dB.

Client	Octet Matrix Inc.	
Product	Wireless Digital Audio Transceiver Module	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012	

## Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	8566B	HP	12/21/ 2011	12/21/2013	GEMC 141
Quasi Peak Adapter	85650A	HP	12/21/ 2011	12/21/2013	GEMC 7
Loop Antenna	EM 6871	Electro-Metrics	1/31/ 2011	1/31/2013	GEMC 70
Loop Antenna	EM 6872	Electro-Metrics	1/31/ 2011	1/31/2013	GEMC 71
BiLog Antenna	3142-C	ETS	1/17/ 2011	1/17/2013	GEMC 137
Attenuator 10 dB	8493B	Agilent	NCR	NCR	GEMC 133
4GHZ-12GHz High Pass filter	11SH10-4000/T12000-0/0	K & L Microwave	NCR	NCR	GEMC 119
Chase Preamp 9kHz - 2 GHz	CPA9231A	Chase	8/29/2012	8/29/2014	GEMC 6403
Q-Par 1.5-18 GHz Horn	6878/24	Q-par	8/23/2012	8/23/2014	GEMC 6365
Horn Antenna 18 GHz - 26.5 GHz	SAS-572	A.H. Systems	8/27/2012	8/27/2013	GEMC 6371
18.0-26.5 GHz Harmonic Mixer	11970K	HP	21-Dec-11	21-Dec-13	GEMC 158
1-26G pre-amp	HP 8449B	HP	8/22/2012	8/22/2014	GEMC 6351
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	<b>Octet Matrix Inc.</b>
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



## *Receiver Spurious 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:

0.009 MHz – 0.490 MHz,  $2400/F(\text{kHz}) \text{ uV/m}$  at  $300 \text{ m}^1$   
 0.490 MHz – 1.705 MHz,  $24000/F(\text{kHz}) \text{ uV/m}$  at  $30 \text{ m}^1$   
 1.705 MHz – 30 MHz,  $30 \text{ uV/m}$  at  $30 \text{ m}^1$   
 30 MHz – 88 MHz,  $100 \text{ uV/m}$  ( $40.0 \text{ dBuV/m}^1$ ) at  $3 \text{ m}$   
 88 MHz – 216 MHz,  $150 \text{ uV/m}$  ( $43.5 \text{ dBuV/m}^1$ ) at  $3 \text{ m}$   
 216 MHz – 960 MHz,  $200 \text{ uV/m}$  ( $46.0 \text{ dBuV/m}^1$ ) at  $3 \text{ m}$   
 Above 960 MHz,  $500 \text{ uV/m}$  ( $54.0 \text{ dBuV/m}^1$ ) at  $3 \text{ m}$   
 Above 1000 MHz,  $500 \text{ uV/m}$  ( $54 \text{ dBuV/m}^2$ ) at  $3 \text{ m}$   
 Above 1000 MHz,  $500 \text{ uV/m}$  ( $74 \text{ dBuV/m}^3$ ) at  $3 \text{ m}$

<sup>1</sup>Limit is with 120 kHz measurement bandwidth and a using a Quasi Peak detector.

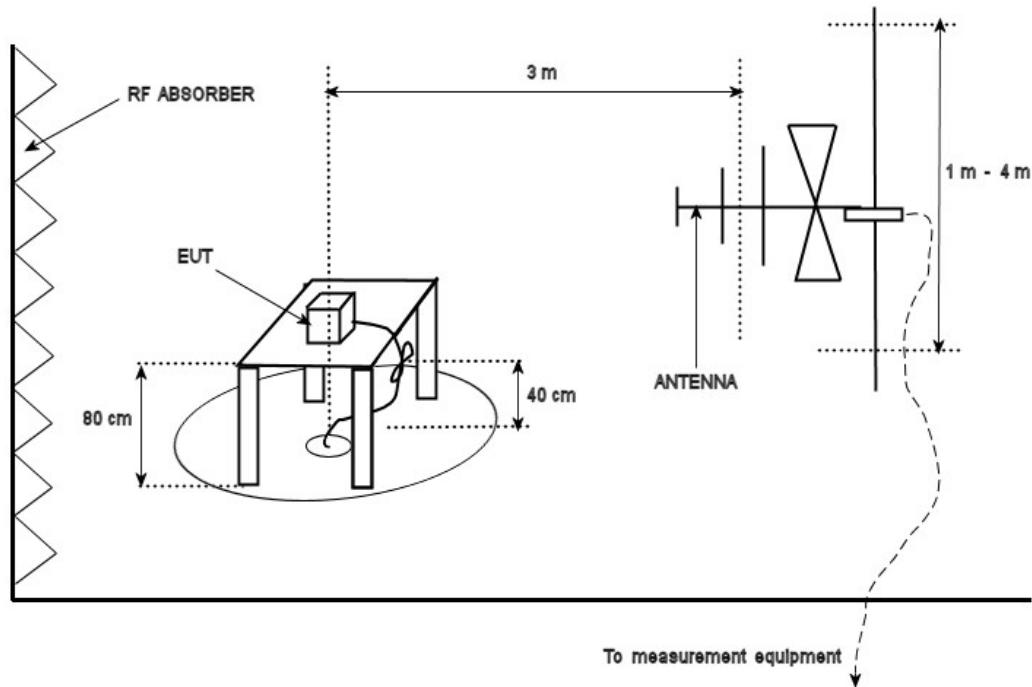
<sup>2</sup>Limit is with 1 MHz measurement bandwidth and using an Average detector

<sup>3</sup>Limit is with 1 MHz measurement bandwidth and using a Peak detector

Client	<b>Octet Matrix Inc.</b>
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



### Typical Radiated Emissions Setup



### 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 10<sup>th</sup> harmonic (a minimum of a 24.4 GHz); however no emissions were detected above 10 GHz.

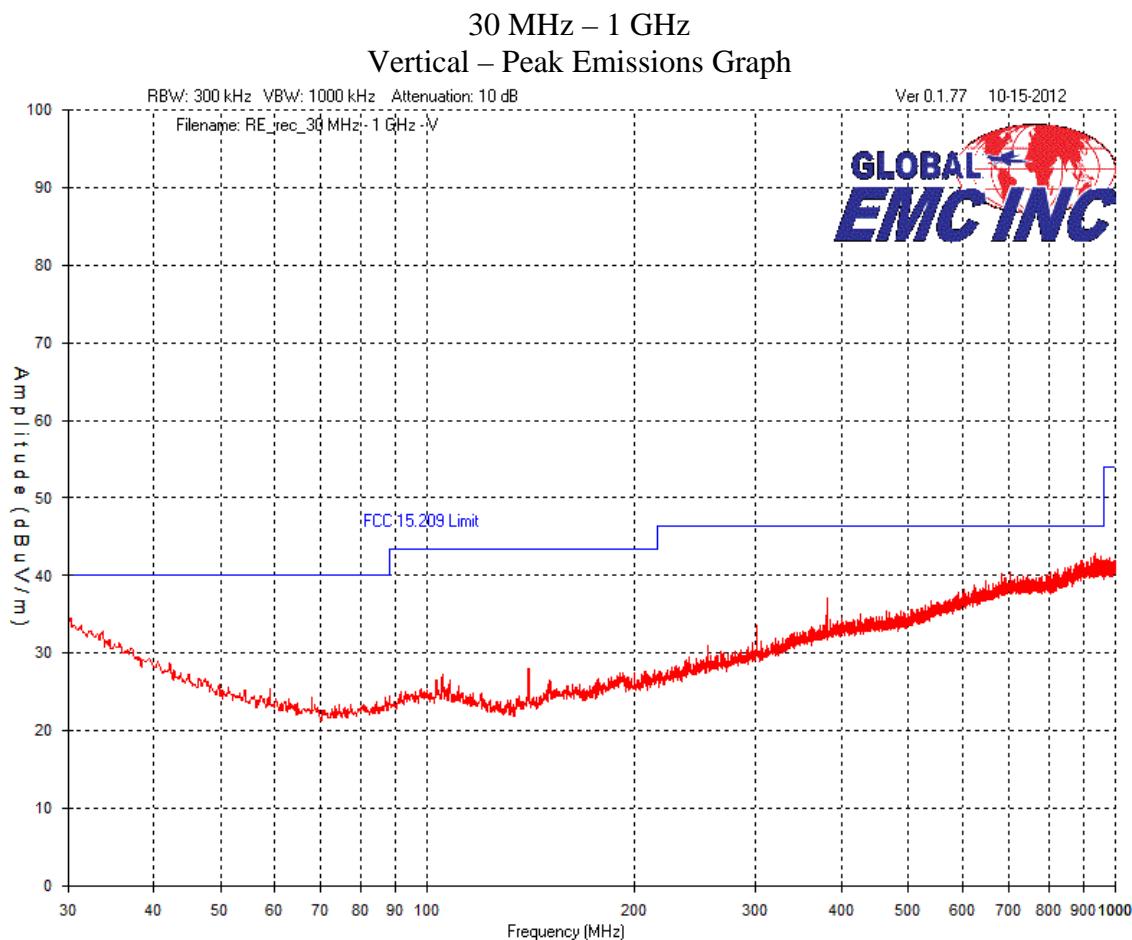
Client	<b>Octet Matrix Inc.</b>
Product	Wireless Digital Audio Transceiver Module
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Devices scanned below 30 MHz are scanned at a 3 meter test distance, and in accordance with FCC Part 15, Subpart A, Section 15.31, an extrapolation factor of 40dB/decade was used. For example for 3 meter measurements, an extrapolation factor 40 dB from 40 Log (30m / 3m) is applied.

Low, middle and high channels with frequency hopping stopped were checked, however the worst case graphs are presented where representative of all modes.

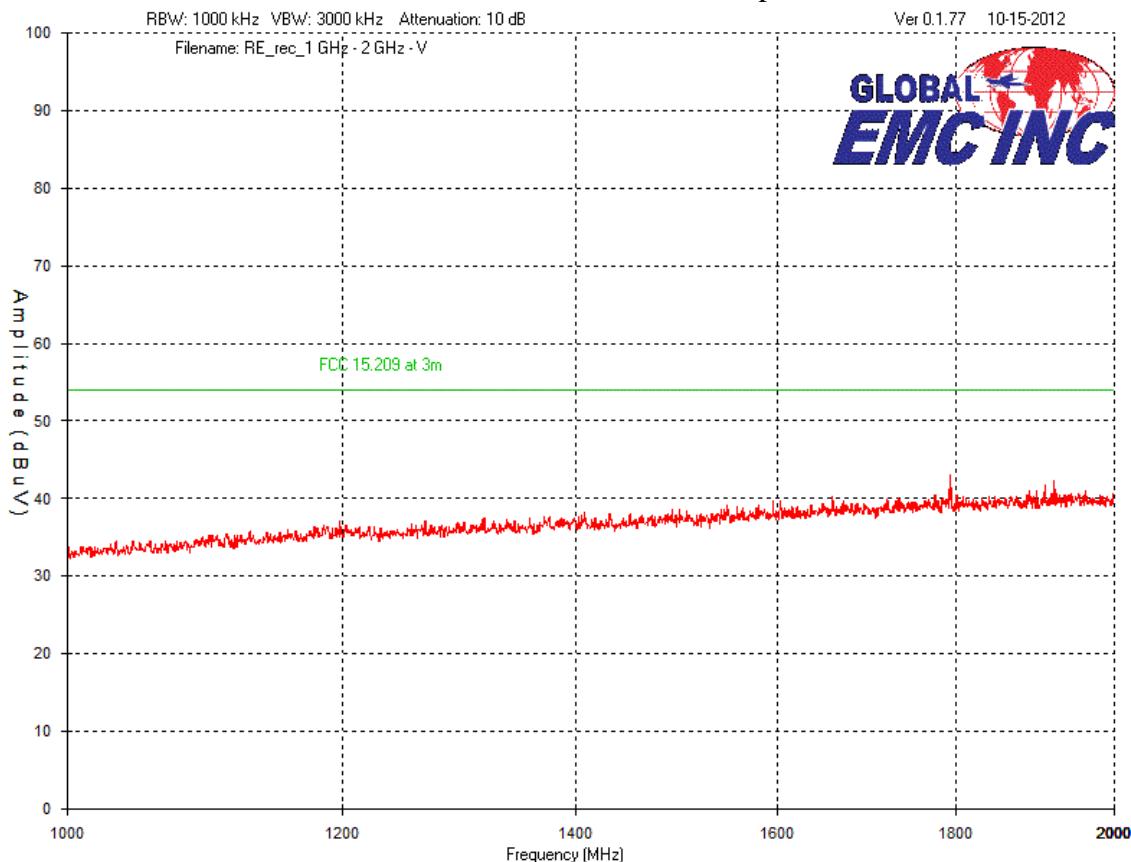
Band edge measure graphs were shown for illustrations purpose. See final measurement section for all measurements.



Client	<b>Octet Matrix Inc.</b>
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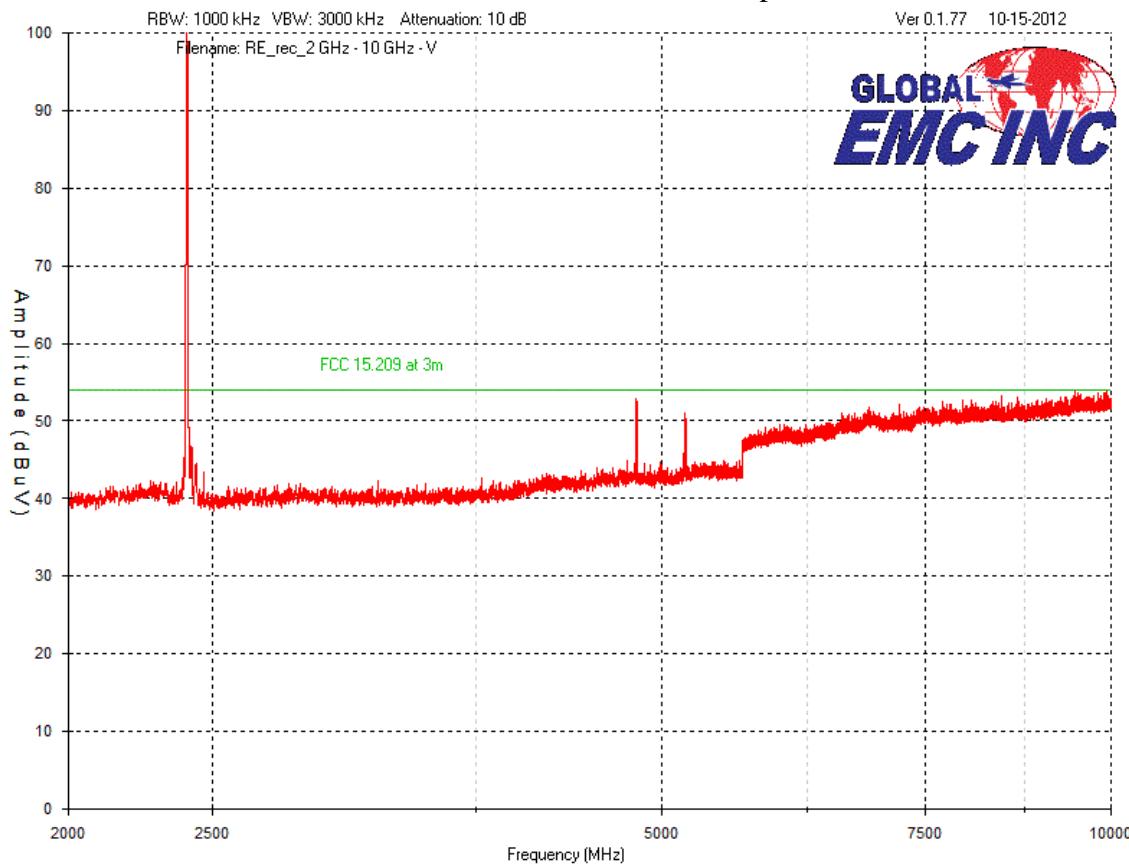
**1 GHz – 2 GHz  
Vertical – Peak Emissions Graph**



Client	<b>Octet Matrix Inc.</b>
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



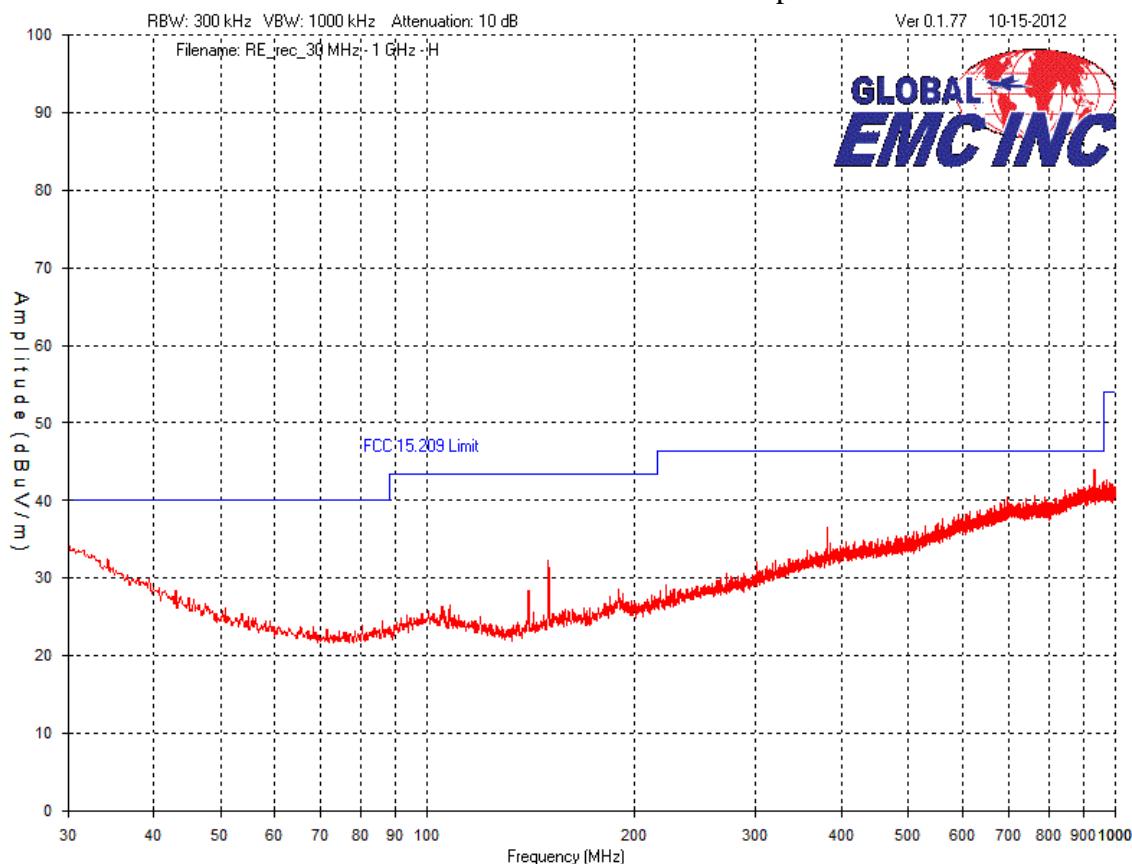
**2 GHz – 10 GHz  
Vertical – Peak Emissions Graph**



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Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



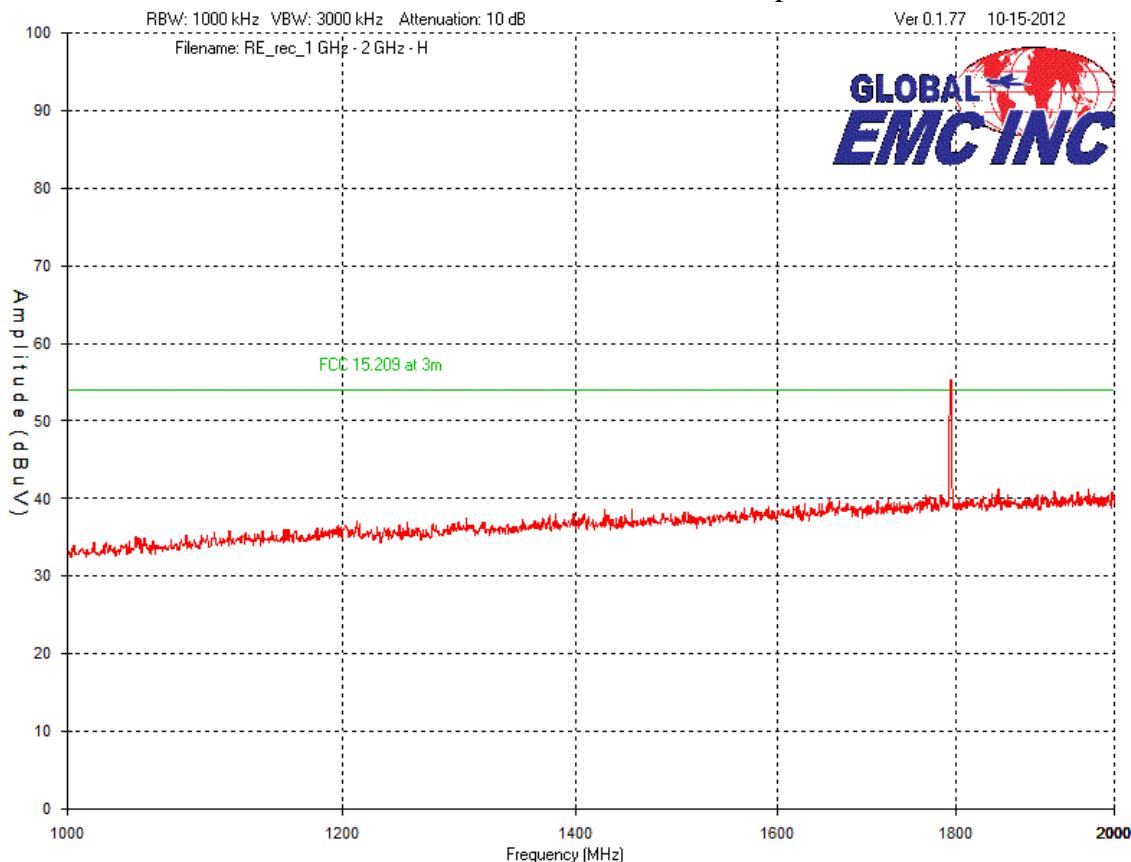
**30 MHz – 1 GHz**  
**Horizontal – Peak Emissions Graph**



Client	<b>Octet Matrix Inc.</b>
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



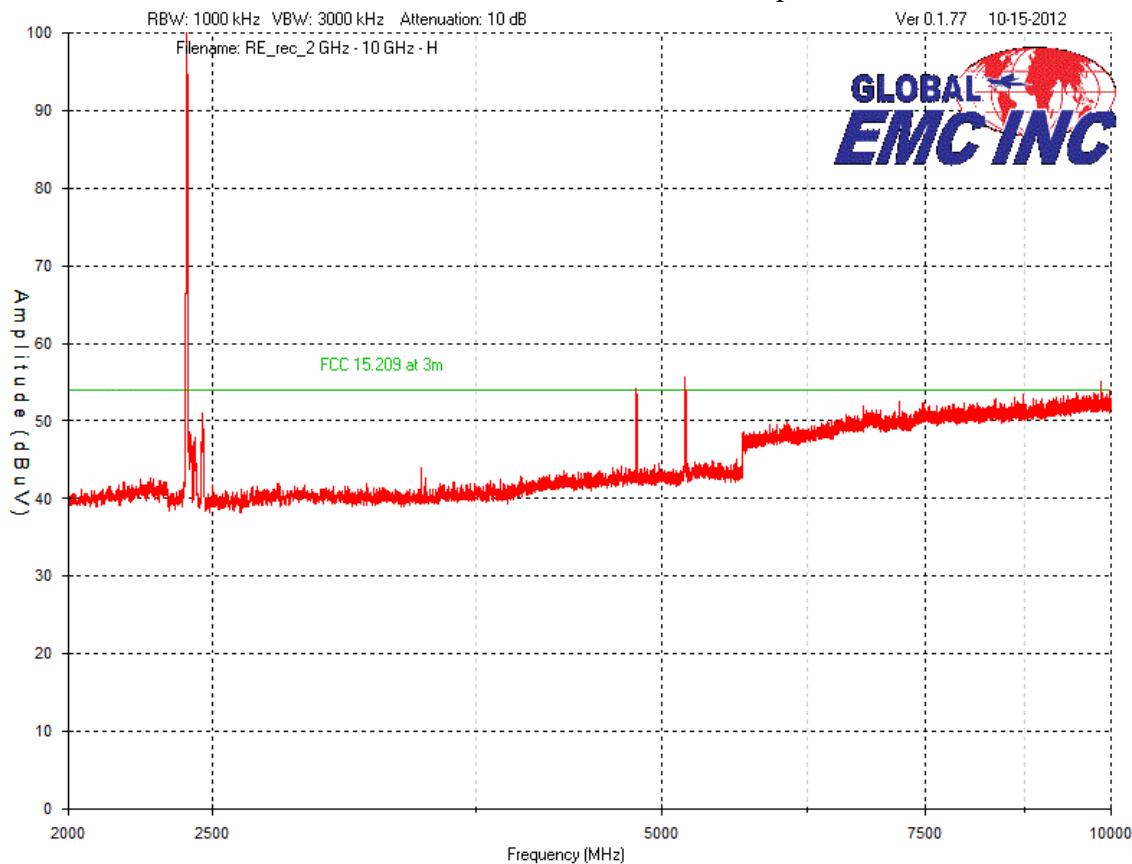
**1 GHz – 2 GHz  
Horizontal – Peak Emissions Graph**



Client	<b>Octet Matrix Inc.</b>
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



**2 GHz – 10 GHz  
Horizontal – Peak Emissions Graph**



Client	Octet Matrix Inc.	
Product	Wireless Digital Audio Transceiver Module	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012	

## Final Measurements

Note: In accordance with 15.247(d), only frequencies exceeding the 15.209 limit that occur within the bands listed in 15.205, need to be verified with a quasi-peak or average detector.

For frequency shown on the peak graphs and not listed in 15.205, measurements were taken for reference.

Average Emission Table - Vertical								
Frequency (MHz)	Raw (dBuV)	Antenna Factor (dB/m)	Cable RE Factor (dB)	Pre-Amp (dB)	Level (dBuV/m)	Limit (dB)	Margin (dB)	Pass/Fail
9932.33	34.1	39.2	2.9	-35.9	40.3	54	13.7	Pass
4808.33	45	33.1	1.9	-35.7	44.3	54	9.7	Pass
5185.67	35.8	33.7	2	-35.7	35.8	54	18.2	Pass
Average Emission Table - Horizontal								
1795	53.1	28.3	1.9	-36.4	46.9	54	7.1	Pass
5184.33	31.4	33.7	2	-35.7	31.4	54	22.6	Pass
9851	33.6	39.2	2.9	-35.9	39.8	54	14.2	Pass
4806.33	36.3	33.1	1.9	-35.7	35.6	54	18.4	Pass
5178.33	31.1	33.7	2	-35.7	31.1	54	22.9	Pass

Client	Octet Matrix Inc.	
Product	Wireless Digital Audio Transceiver Module	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012	

## Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	8566B	HP	12/21/ 2011	12/21/2013	GEMC 141
Quasi Peak Adapter	85650A	HP	12/21/ 2011	12/21/2013	GEMC 7
BiLog Antenna	3142-C	ETS	1/17/ 2011	1/17/2013	GEMC 137
Attenuator 10 dB	8493B	Agilent	NCR	NCR	GEMC 133
4GHZ-12GHz High Pass filter	11SH10-4000/T12000-0/0	K & L Microwave	NCR	NCR	GEMC 119
Chase Preamp 9kHz - 2 GHz	CPA9231A	Chase	8/29/2012	8/29/2014	GEMC 6403
Q-Par 1.5-18 GHz Horn	6878/24	Q-par	8/23/2012	8/23/2014	GEMC 6365
1-26G pre-amp	HP 8449B	HP	8/22/2012	8/22/2014	GEMC 6351
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	<b>Octet Matrix Inc.</b>
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



## *Channel Carrier Bandwidth of Frequency Hopping Systems*

### **Purpose**

The purpose of this test is to allow for results that are used to help establish other limits. Although there is not specific limit for this requirement, the derived limits dependant on this information helps allow for other spread spectrum devices to co-exist in the same frequency spectrum. This also helps prevent corruption of data by ensuring adequate channel separation to distinguish the reception of the intended information.

### **Limits**

There is no specified limit. However, an approximate calculated maximum limit can be obtained by dividing the maximum bandwidth of the frequency allocation by the minimum number of channels. Note that this is a maximum bandwidth, and the measurement is used to calculate other limits.

2.4 to 2.4835 GHz
83.5 MHz / 15
5.57 MHz

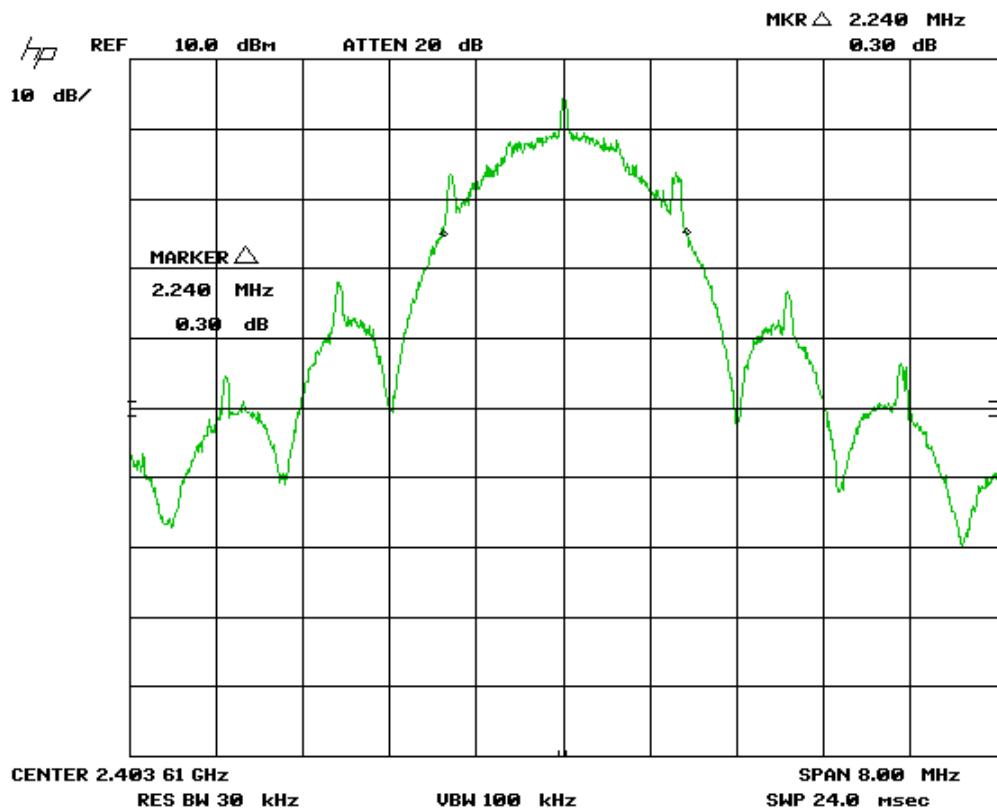
### **Results**

The EUT passed. The 20 dB BW measured was 2.240 MHz.

Client	Octet Matrix Inc.	
Product	Wireless Digital Audio Transceiver Module	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012	

## Graph(s)

The graph below shows the 20 dB bandwidth 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 20 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.



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

Client	Octet Matrix Inc.	
Product	Wireless Digital Audio Transceiver Module	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012	

## Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	8566B	HP	Dec 21, 2011	Dec 21, 2013	GEMC 141
Attenuator 10 dB	8493B	Agilent	NCR	NCR	GEMC 133
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B\_Rev1"

Client	<b>Octet Matrix Inc.</b>
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



## *Channel Carrier Separation for Frequency Hopping Systems*

### **Purpose**

The purpose of this test is to ensure that the RF energy of frequency hopping systems is sufficiently spread over a spectrum and that the radio energy is not overly dense. This limit helps allow for other spread spectrum devices to co-exist in the same frequency spectrum. This also helps prevent corruption of data by ensuring adequate channel separation to distinguish the reception of the intended information.

### **Limits**

The limits are as defined in 47 CFR FCC Part 15 Section 15.247(a)(1)

No conditions	902 to 928 MHz	2.4 to 2.4835 GHz	5.275 to 5.85 GHz
< 125 mW	25 kHz or 20 dB BW <sup>1</sup>	25 kHz or 20 dB BW <sup>1</sup>	25 kHz or 20 dB BW <sup>1</sup>

Note 1: Whichever is greater. The 20 dB BW of the system was measured to be 2.24 MHz and the rated RF power of the EUT is 16 dBm; therefore, a limit of 2/3 of 20 dB BW was applied. A limit 1.49 MHz was applied to the EUT.

### **Results**

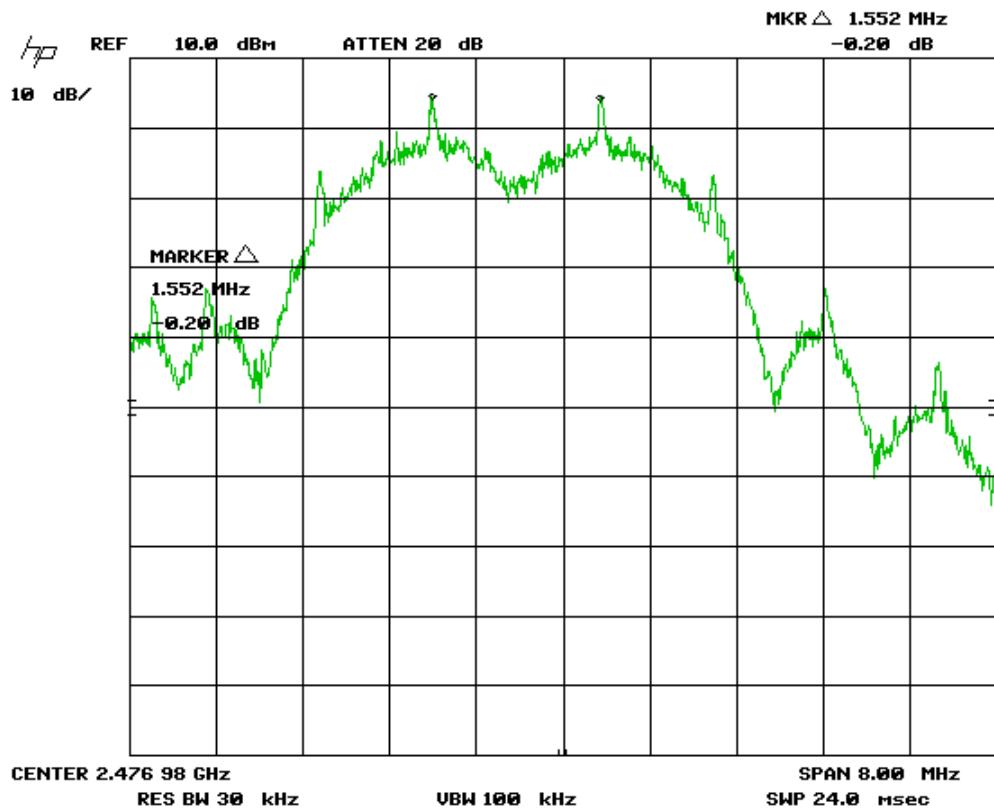
The EUT passed the requirements of channel carrier spacing. It exceeded the EUT's 2/3 of 20 dB bandwidth which is 1.49 MHz (see Note 1). The device had a channel spacing of 1.55 MHz.

Client	Octet Matrix Inc.
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



## Graph(s)

The graph 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 channel spacing of the signal being measured. This measurement is a peak measurement. Max hold is performed for a duration of not less than 1 minute, as the device is stepped through two adjacent channels.



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

Client	Octet Matrix Inc.	
Product	Wireless Digital Audio Transceiver Module	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012	

## Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	8566B	HP	Dec 21, 2011	Dec 21, 2013	GEMC 141
Attenuator 10 dB	8493B	Agilent	NCR	NCR	GEMC 133
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B\_Rev1"

Client	<b>Octet Matrix Inc.</b>
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



## *Number of Channels for Frequency Hopping Systems*

### **Purpose**

The purpose of this test is to ensure that the RF energy of frequency hopping systems is sufficiently spread over a spectrum and that the radio energy is not overly dense. This limit allows for other spread spectrum devices to co-exist in the same frequency spectrum. This also helps prevent corruption of data by ensuring adequate channel separation to distinguish the reception of the intended information.

### **Limits**

The limits are as defined in 47 CFR FCC Part 15 Section 15.247(a)(1)

No conditions	902 to 928 MHz	2.4 to 2.4835 GHz	5.275 to 5.85 GHz
	>= 50 channels	>= 15 channels	>= 75 channels
20 dB BW exceeds 250 kHz	>= 25 channels	>= 15 channels	>= 75 channels

### **Results**

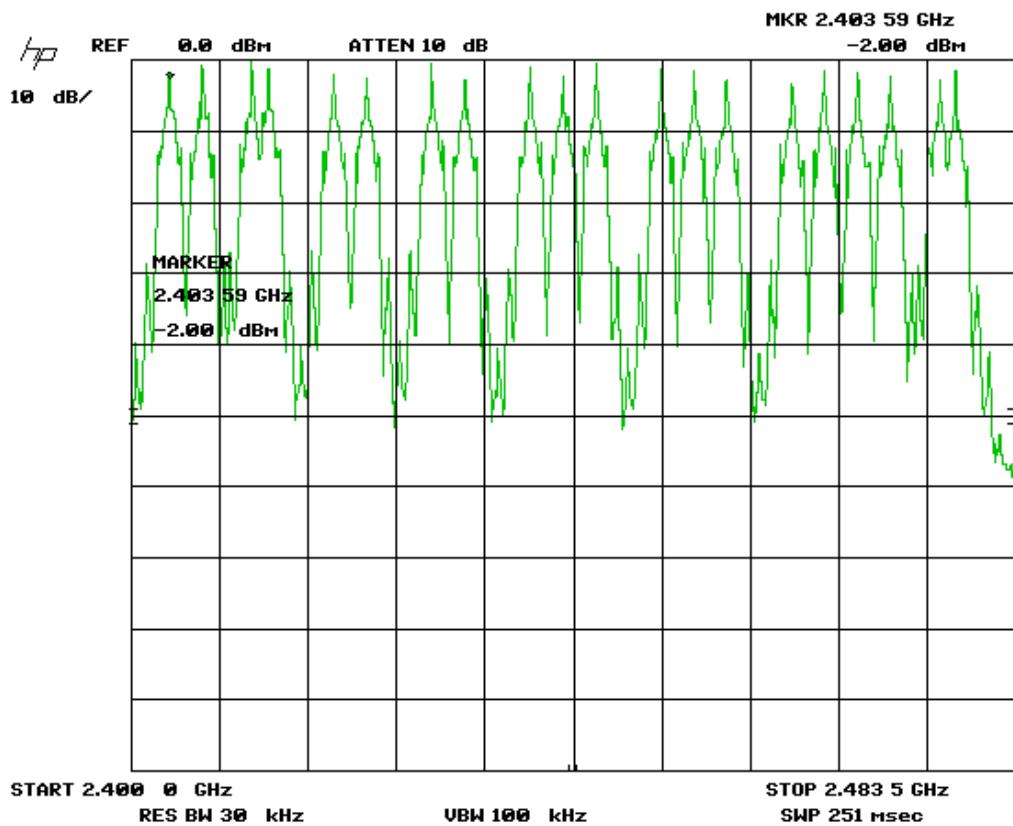
The EUT passed the requirements of the number of channels. The number of channels the device occupies is 20 channels in the allocation band of 2.4 to 2.4835 GHz.

Client	Octet Matrix Inc.
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



## Graph(s)

The graph below shows the number of occupied channels 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 channel spacing of the signal being measured. This measurement is a peak measurement. Max hold is performed for a duration of not less than 10 minutes, or as sufficient to capture the channels occupied.



The 20 pseudo random channels are given below in MHz:

2403.585	2422.017	2443.521	2465.025
2406.657	2428.161	2449.665	2468.097
2411.265	2431.233	2452.737	2471.169
2412.801	2437.377	2455.809	2475.777
2418.945	2440.449	2461.953	2477.313

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

Client	<b>Octet Matrix Inc.</b>
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



Client	Octet Matrix Inc.	
Product	Wireless Digital Audio Transceiver Module	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012	

## Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	8566B	HP	Dec 21, 2011	Dec 21, 2013	GEMC 141
Attenuator 10 dB	8493B	Agilent	NCR	NCR	GEMC 133
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B\_Rev1"

Client	<b>Octet Matrix Inc.</b>
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



## *Frequency Occupancy for Frequency Hopping Systems*

### **Purpose**

The purpose of this test is to ensure that the RF energy of frequency hopping systems is hopping at a minimum defined rate. This helps ensure sufficient time off to enable other frequency hopping devices to co-operate within this allocated band.

### **Limits**

For 2400 – 2483.5 MHz systems, the limits are as defined in 47 CFR FCC Part 15 Section 15.247(a)(1)(iii).

For frequency hopping systems in 2400 – 2483.5 MHz, the unit shall use at least 15 channels. The average time of occupancy shall not be greater than 0.4s in a period of 0.4s multiplied by the number of channels occupied.

### **Results**

The EUT passed the requirements. The EUT cycles through its pseudo-random generated list of hopping frequencies. There are 20 channels occupied in total. The average occupancy time is 1.76 ms per channel and each channel is repeated every 50.0 ms.

The complete observation time is

$$\begin{aligned}
 &= \# \text{ of channels} \times 400 \text{ ms} \\
 &= 20 \times 400 \text{ ms} \\
 &= 8,000 \text{ ms} \\
 &= 8 \text{ s}
 \end{aligned}$$

Number of time a channel is occupied in 8 s = 8 s / 50 ms

$$\begin{aligned}
 &= 8000 \text{ ms} / 50 \text{ ms} \\
 &= 160 \text{ times.}
 \end{aligned}$$

Total occupancy time in 8 s is

$$\begin{aligned}
 &= 160 \times 1.76 \text{ ms} \\
 &= 281.6 \text{ ms}
 \end{aligned}$$

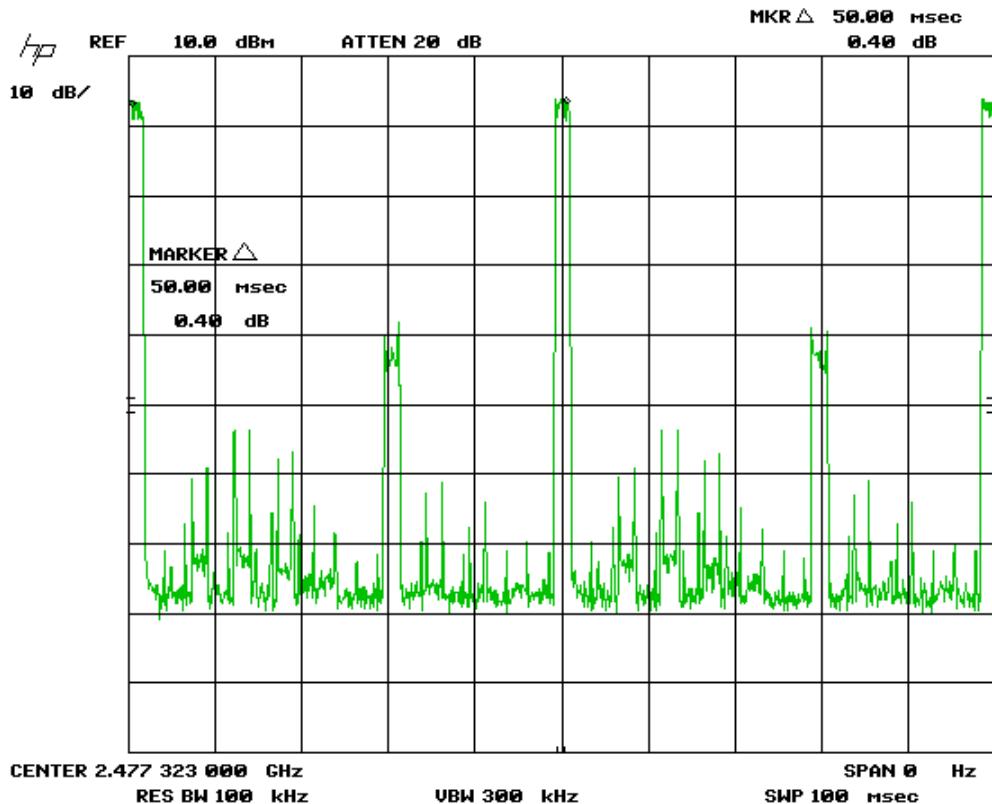
The EUT has an average occupancy of 281.6 ms within an 8 second period. This is under the 400 ms limit as per 15.247 (a) 1 (iii)

Client	Octet Matrix Inc.
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



## Graph(s)

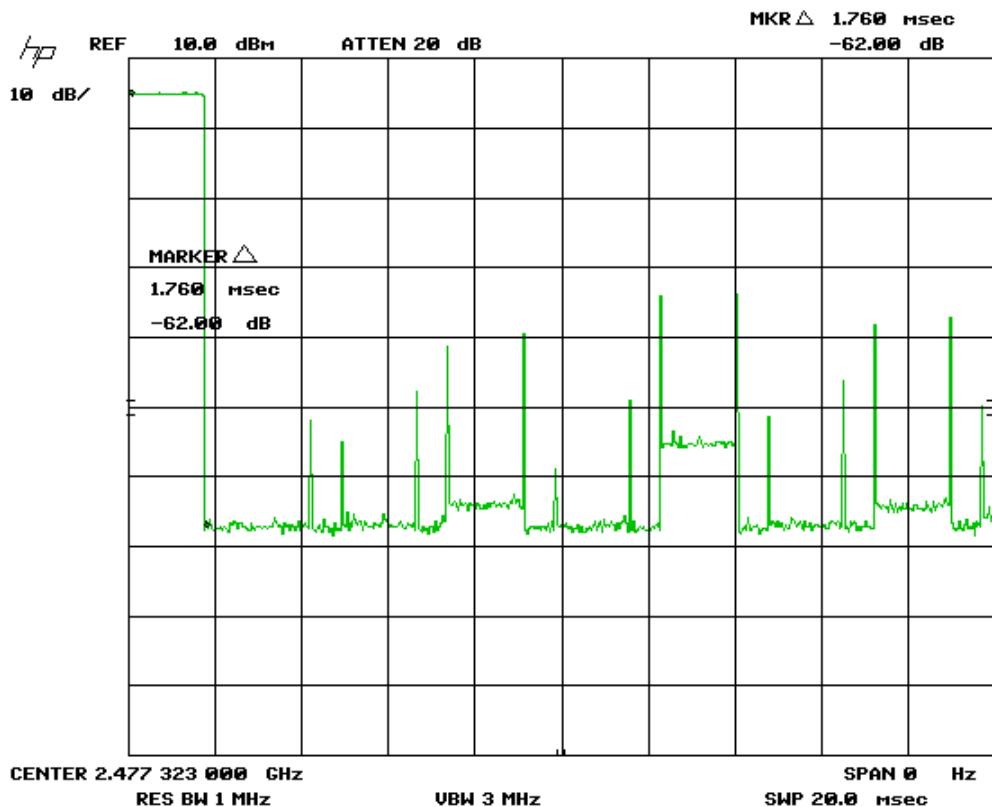
The graph shown below shows the repeat time of the pseudorandom generated hopping list.  
Hopping List repeat rate



Client	Octet Matrix Inc.
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



On time during each channel



Client	Octet Matrix Inc.	
Product	Wireless Digital Audio Transceiver Module	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012	

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

## Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	8566B	HP	Dec 21, 2011	Dec 21, 2013	GEMC 141
Attenuator 10 dB	8493B	Agilent	NCR	NCR	GEMC 133
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B\_Rev1"

Client	<b>Octet Matrix Inc.</b>
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



## *Maximum Peak Envelope Conducted Power - FHSS*

### **Purpose**

The purpose of this test is to ensure that the maximum power conducted to the radiating element does not exceed the limits specified.

### **Limits**

The limits are defined in 15.247(b).

For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, the limit is 1 watt. For all other frequency hopping systems in the 2400–2483.5 MHz band, the limit is 0.125 watts.

### **Results**

The EUT passed. The peak power measured was 15.7 dBm (37.15 mW).

Client	Octet Matrix Inc.
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



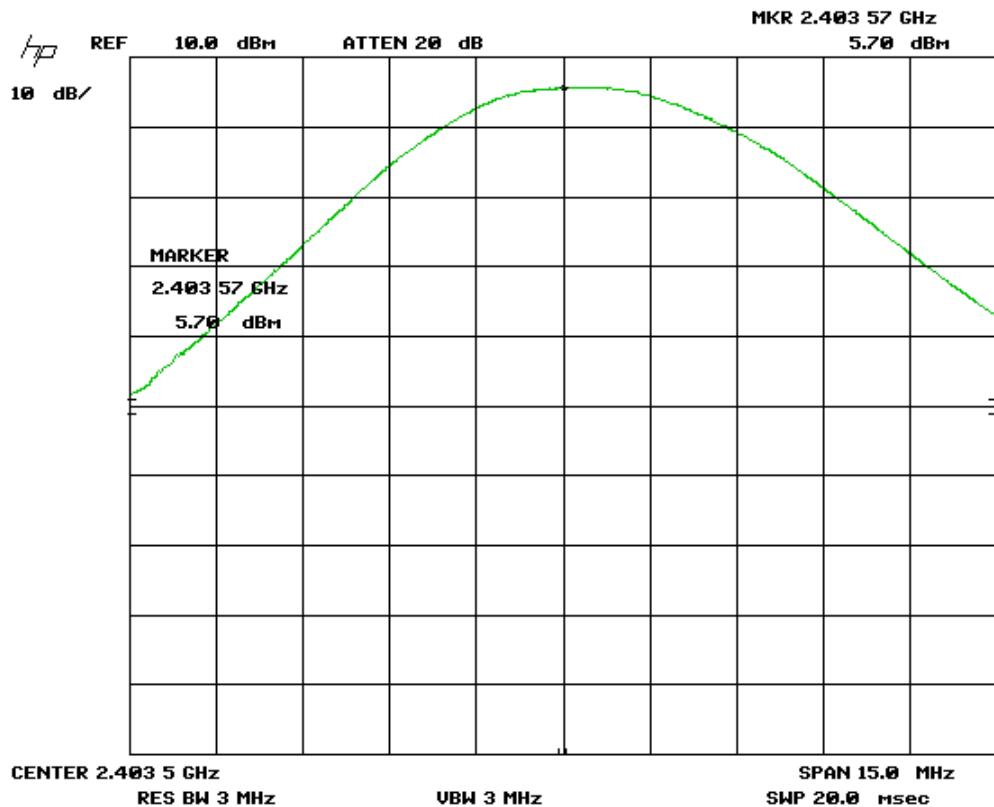
## Measurement(s)

The graphs shown below shows the peak power output of the device during the antenna conducted measurement during transmit operation of the EUT.

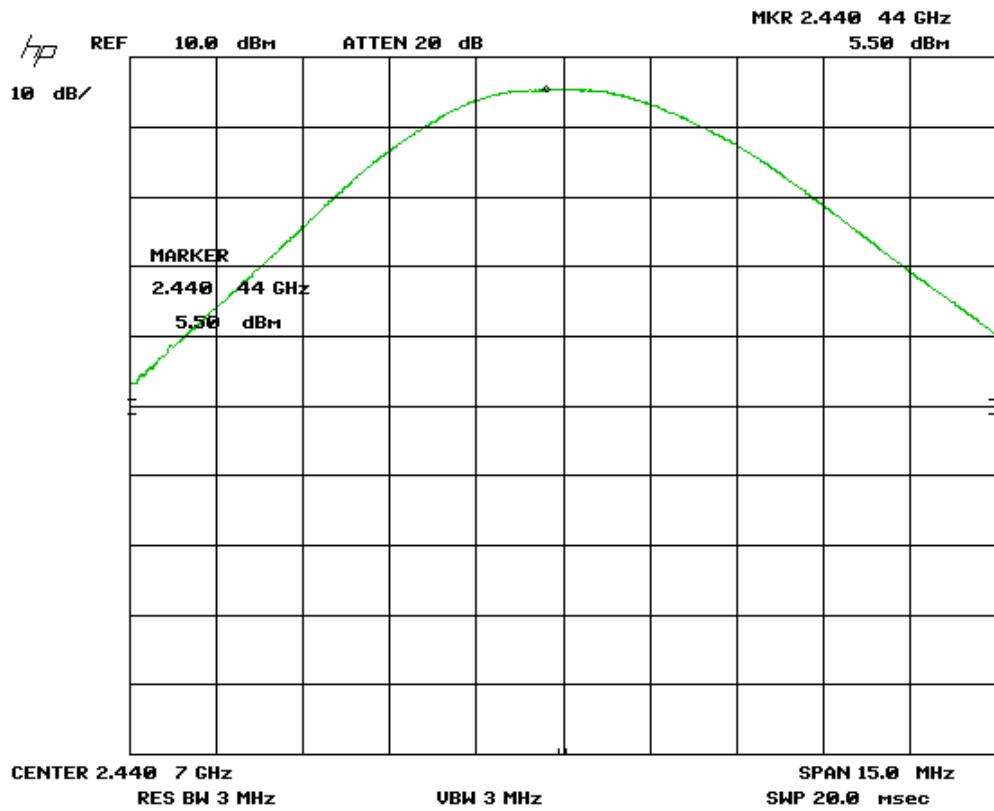
Frequency (MHz)	Reading (dBm)	Atten	dBm	mW
2403.57	5.7	10	15.7	37.15
2440.44	5.5	10	15.5	35.48
2477.69	5.5	10	15.5	35.48

## Graph(s)

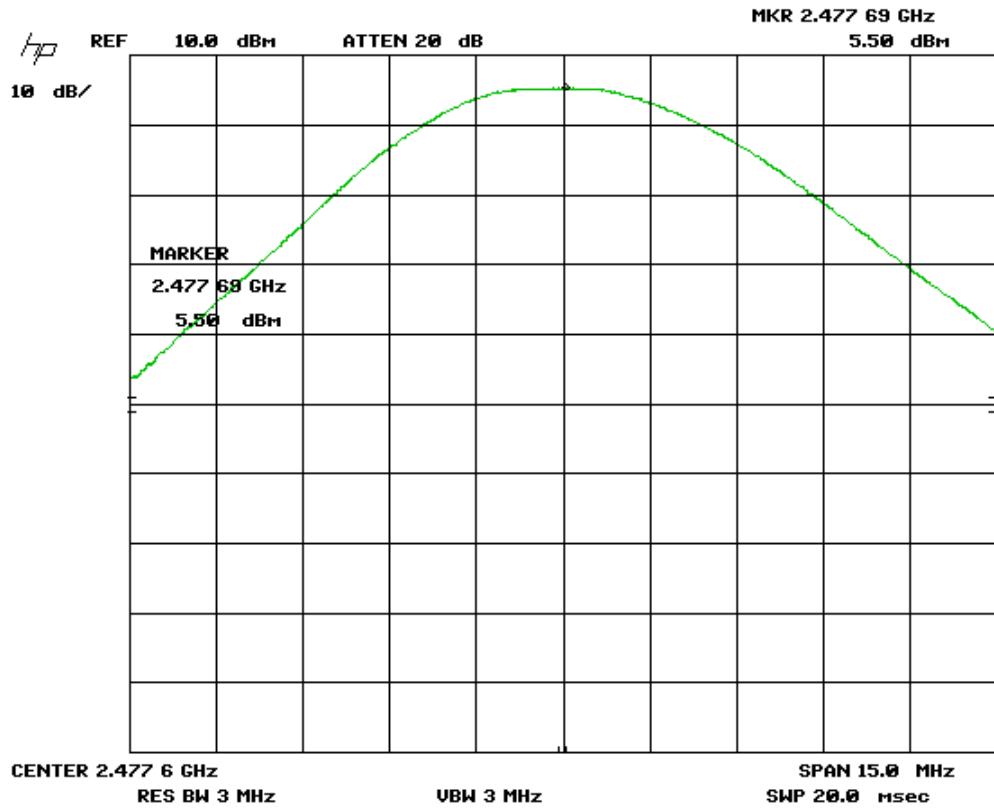
The graphs shown below shows the peak power output of the device during the antenna conducted measurement during transmit operation of the EUT. Note there was 10 dB of external attenuation taken during this measurement.



Client	Octet Matrix Inc.
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



Client	Octet Matrix Inc.	
Product	Wireless Digital Audio Transceiver Module	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012	



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

## Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	8566B	HP	Dec 21, 2011	Dec 21, 2013	GEMC 141
Attenuator 10 dB	8493B	Agilent	NCR	NCR	GEMC 133
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B\_Rev1"

Client	<b>Octet Matrix Inc.</b>	
Product	Wireless Digital Audio Transceiver Module	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012	

## *Spurious Conducted Emissions - FHSS*

### **Purpose**

The purpose of this test is to ensure that the maximum power conducted to the radiating element does not exceed the limits specified.

### **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.

### **Results**

The EUT passed. The peak power measured was 15.7 dBm (37.15 mW). The worst case (at band edge) was 55.8 dB below the fundamental. Low, middle, and high channels with frequency hopping stopped was investigated.

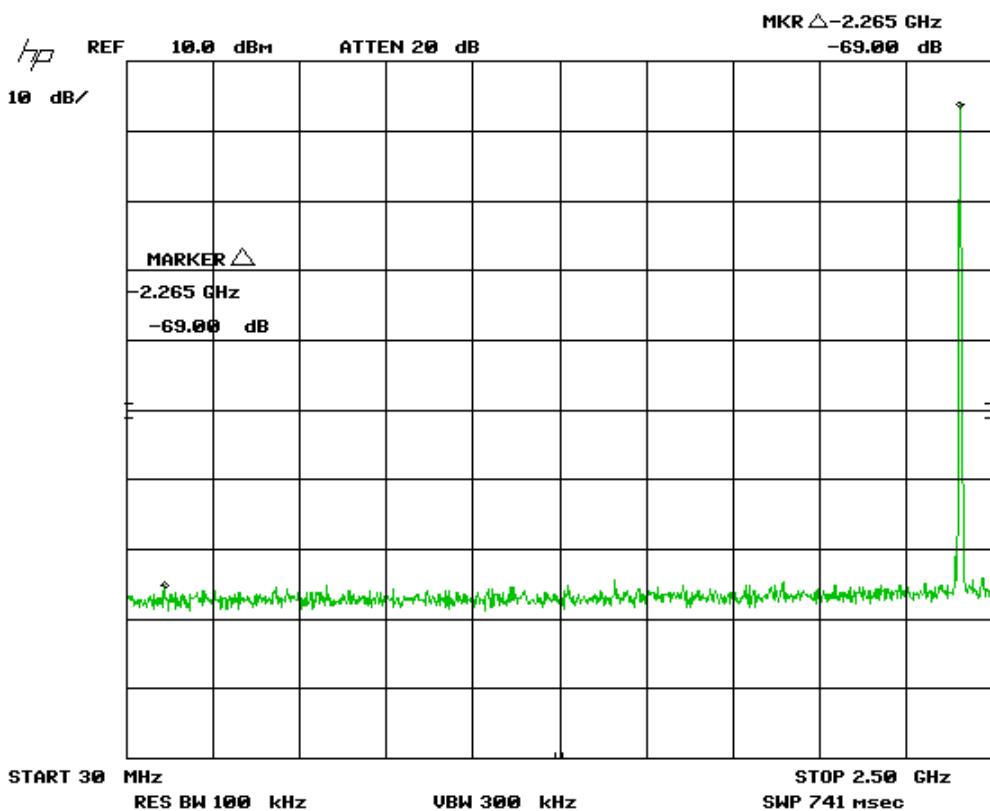
Client	Octet Matrix Inc.
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



## 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.

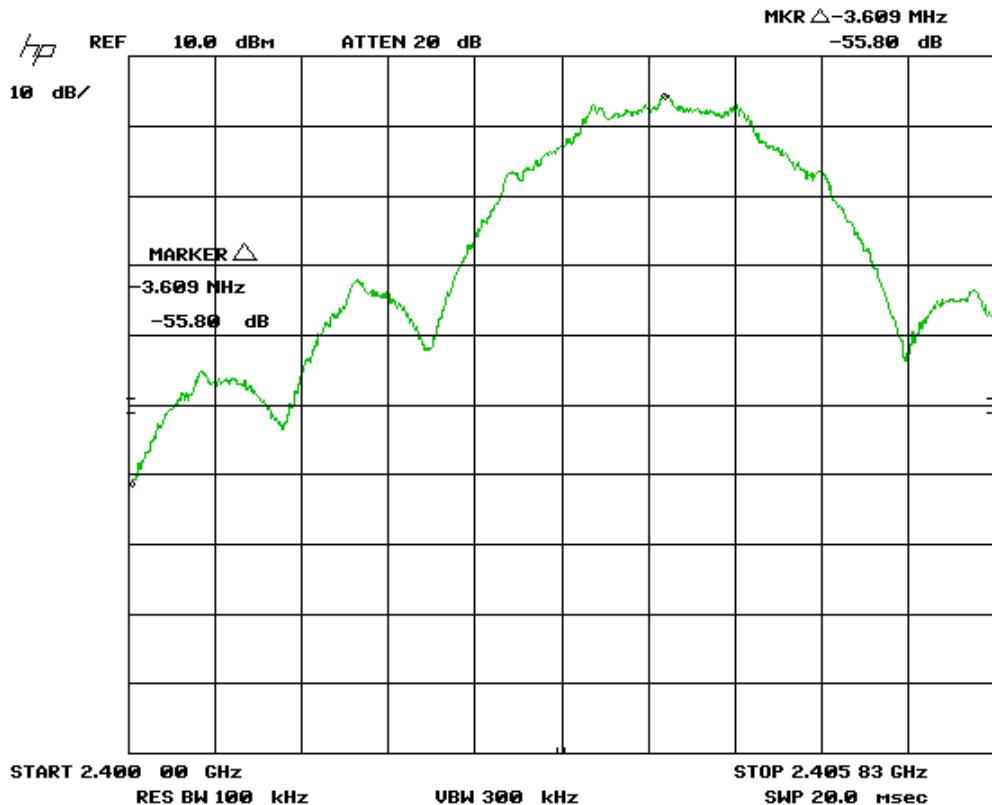
Frequencies below fundamental



Client	Octet Matrix Inc.
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



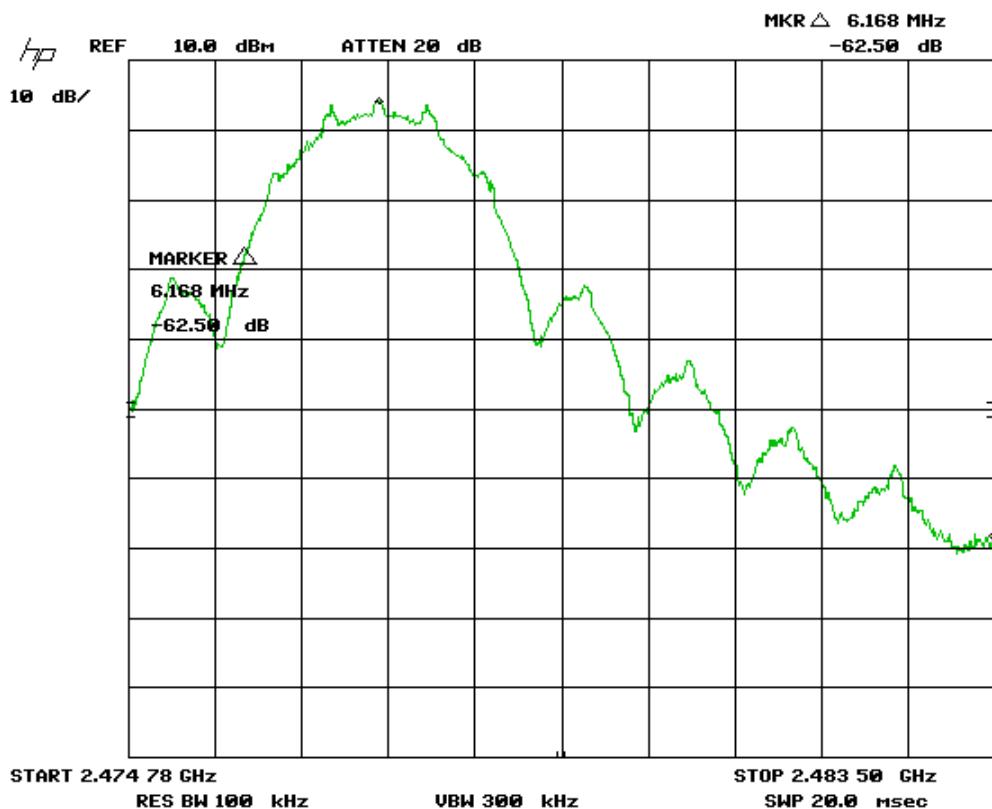
Band edge (low)



Client	Octet Matrix Inc.
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



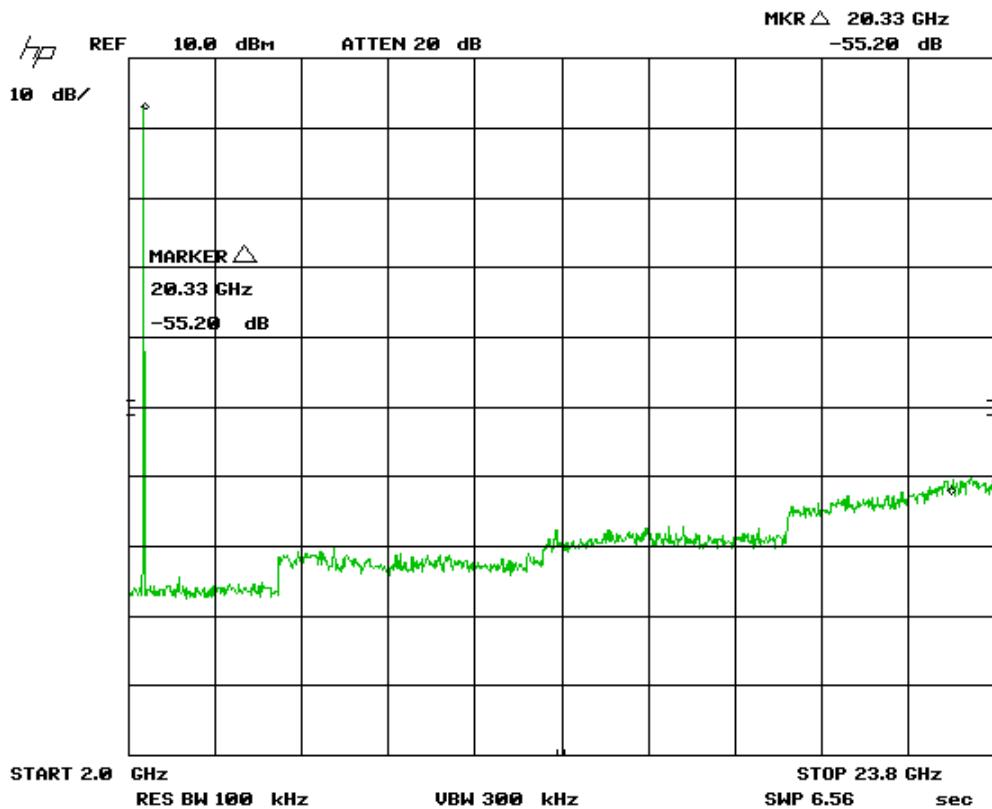
### Band Edge (high)



Client	Octet Matrix Inc.
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



### Harmonics



Note: Additionally this device was scanned to 26 GHz with no harmonics found between 22 GHz and 26 GHz.

Client	Octet Matrix Inc.	
Product	Wireless Digital Audio Transceiver Module	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012	

## Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	8566B	HP	Dec 21, 2011	Dec 21, 2013	GEMC 141
Attenuator 10 dB	8493B	Agilent	NCR	NCR	GEMC 133
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B\_Rev1"

Client	<b>Octet Matrix Inc.</b>
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



## ***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<sup>2</sup>. The distance used for calculations was 20cm, as this is the minimum distance an operator will be from the EUT during normal operation, as stated by the manufacturer.

Client	<b>Octet Matrix Inc.</b>
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



## Results

The EUT passed the requirements. The worst case calculated power density was 0.0079 mW/cm<sup>2</sup>, this is significantly under the 1.0 mW/cm<sup>2</sup> requirement.

## Calculations

Method 1 (conducted power)

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

Where Pt = 15.7 dBm or 37.2 mW as per Peak power conducted output

Where G = 3 dBi, or numerically 2

Where R = 20 cm

$$P_d = (37.2 \text{ mW} * 2) / (4 * \pi * 20\text{cm}^2)$$

$$P_d = 74.4 \text{ mW} / 5026 \text{ cm}^2$$

$$P_d = 0.0148 \text{ mW/cm}^2$$

Client	<b>Octet Matrix Inc.</b>	
Product	Wireless Digital Audio Transceiver Module	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012	

## Appendix A – EUT Summary

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

### General EUT Description

Client Details	
Organization / Address	Octet Matrix Incorporated 119 S Pleasant Rd Lake, Zurich, IL 60047
Contact	Scott Lightner
Phone	847-740-2430
Email	scott@octet-matrix.com
Manufacturer Details (if not same as above)	
Organization / Address	Eleven Engineering, Inc. 10150 - 100 Street, Suite 900 Edmonton, AB, Canada T5J 0P6
Contact	Ryan Baron
Phone	780-425-6511 x244
Email	baron@eleveneng.com
EUT (Equipment Under Test) Details	
EUT Name (for report title)	Wireless Digital Audio Transceiver Module
EUT Model / SN (if known)	EA-60026-01
EUT revision	New product
Software version	HT700 EMI Test (OS1.1b1.9) rc5 - Sept 26, 2012
EUT is powered using	DC
Input voltage range(s) (V)	4.0 - 5.5 VDC
Frequency range(s) (Hz)	2403.585 MHz - 2477.313 MHz
Rated input current (A)	100 mA max.
Number of power supplies in EUT	1
Transmits RF energy? (describe)	Yes
Basic EUT functionality description	Digital audio wireless transceiver

Client	<b>Octet Matrix Inc.</b>
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



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	<b>Octet Matrix Inc.</b>
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



## **Appendix B – EUT and Test Setup Photographs**

Client	<b>Octet Matrix Inc.</b>
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012

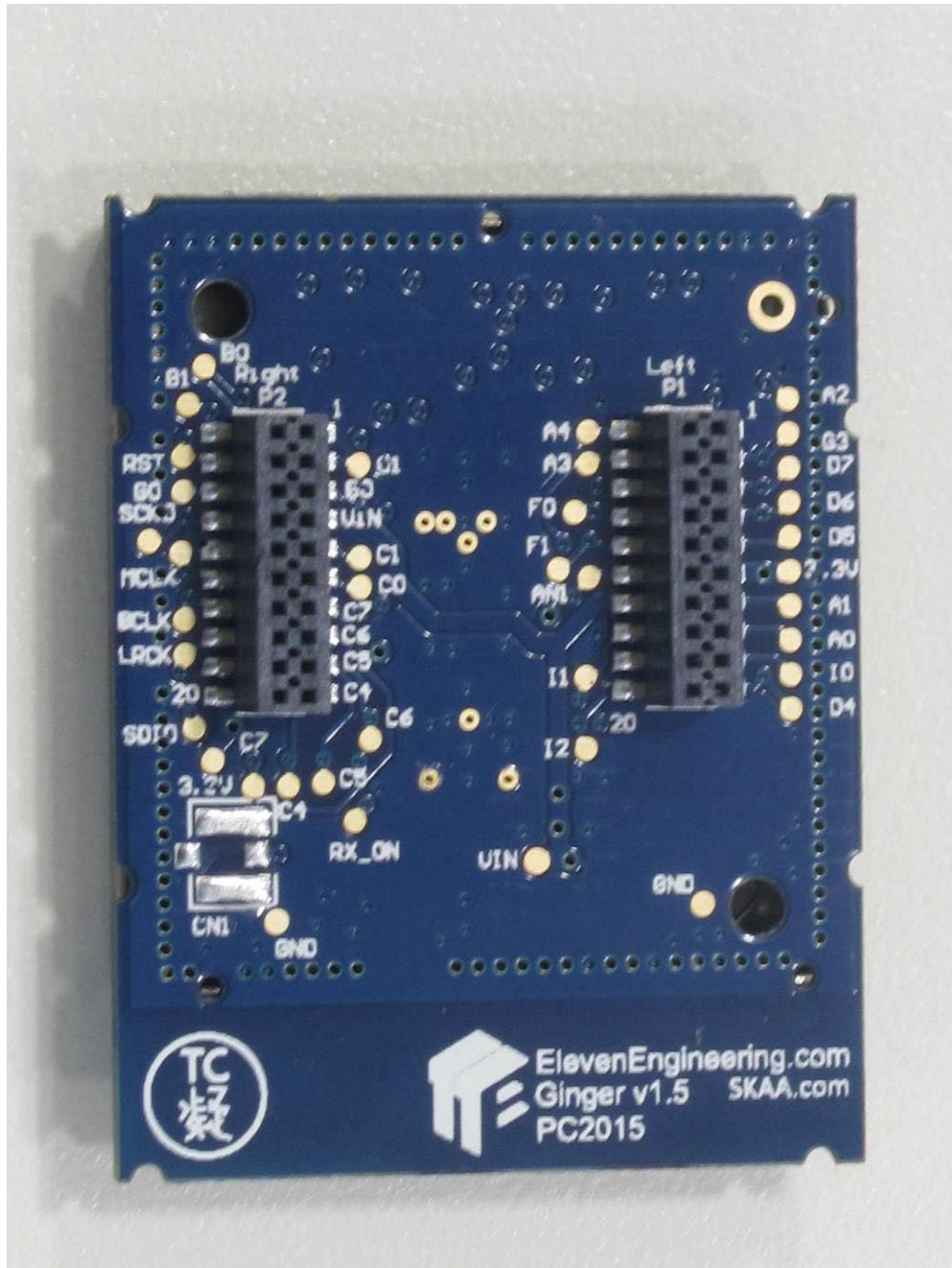


Note: These photos are for information purposes only. Also refer to PDF files that are separate from this test report.



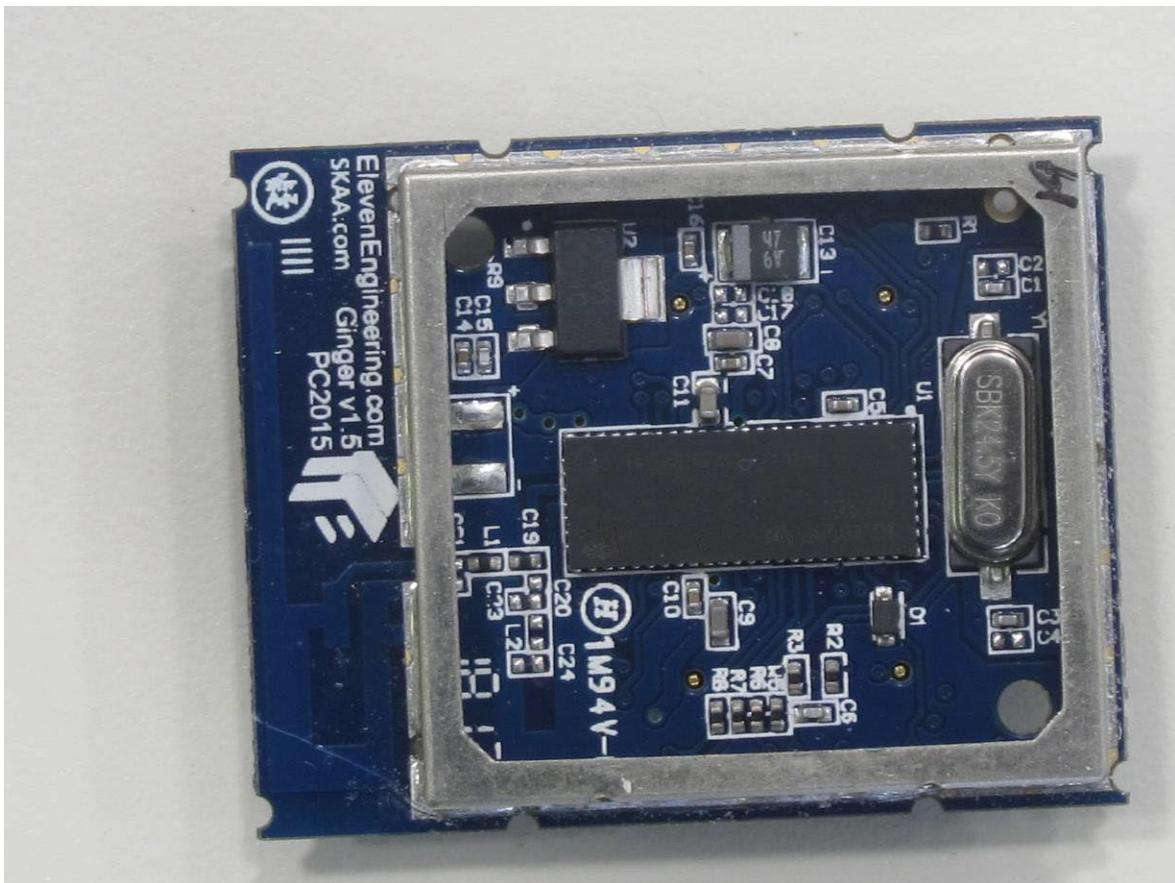
**Figure 1:EUT front view**

Client	<b>Octet Matrix Inc.</b>	
Product	Wireless Digital Audio Transceiver Module	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012	



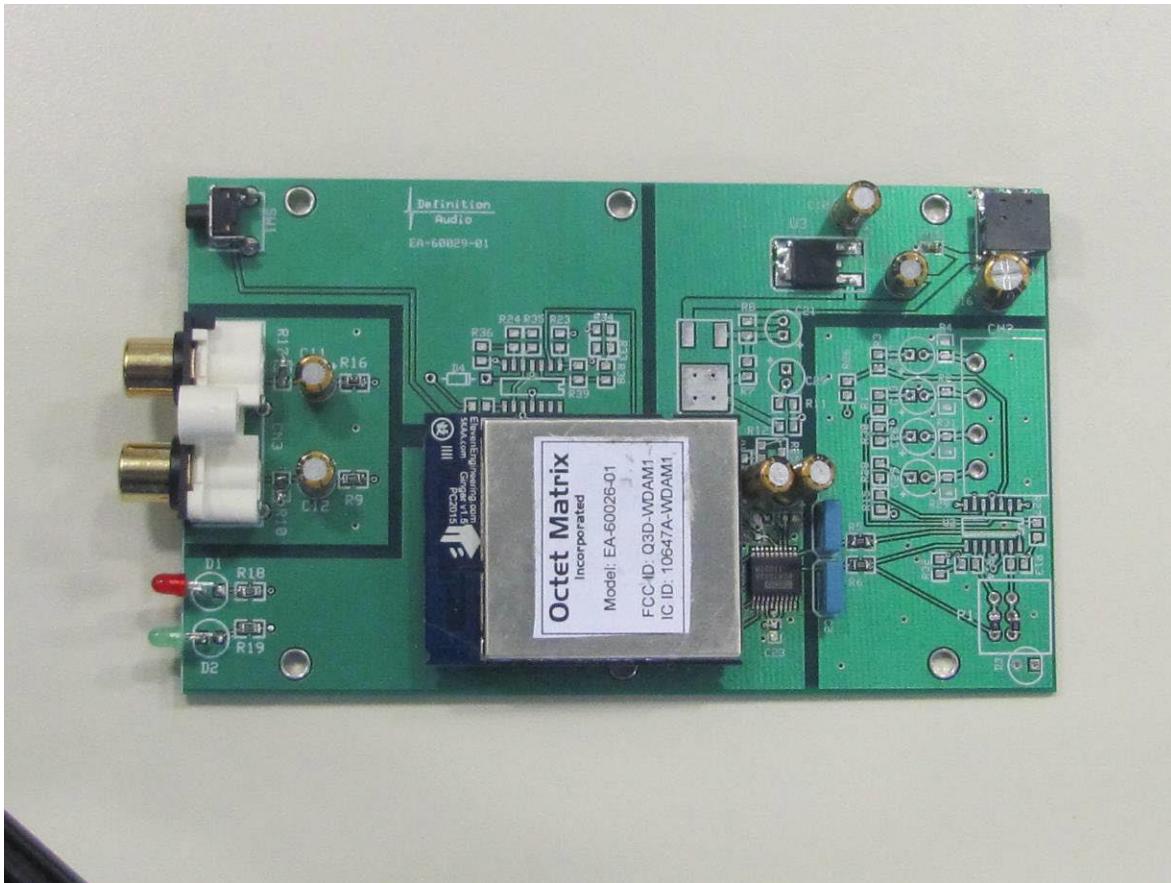
**Figure 2: EUT rear view**

Client	<b>Octet Matrix Inc.</b>
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



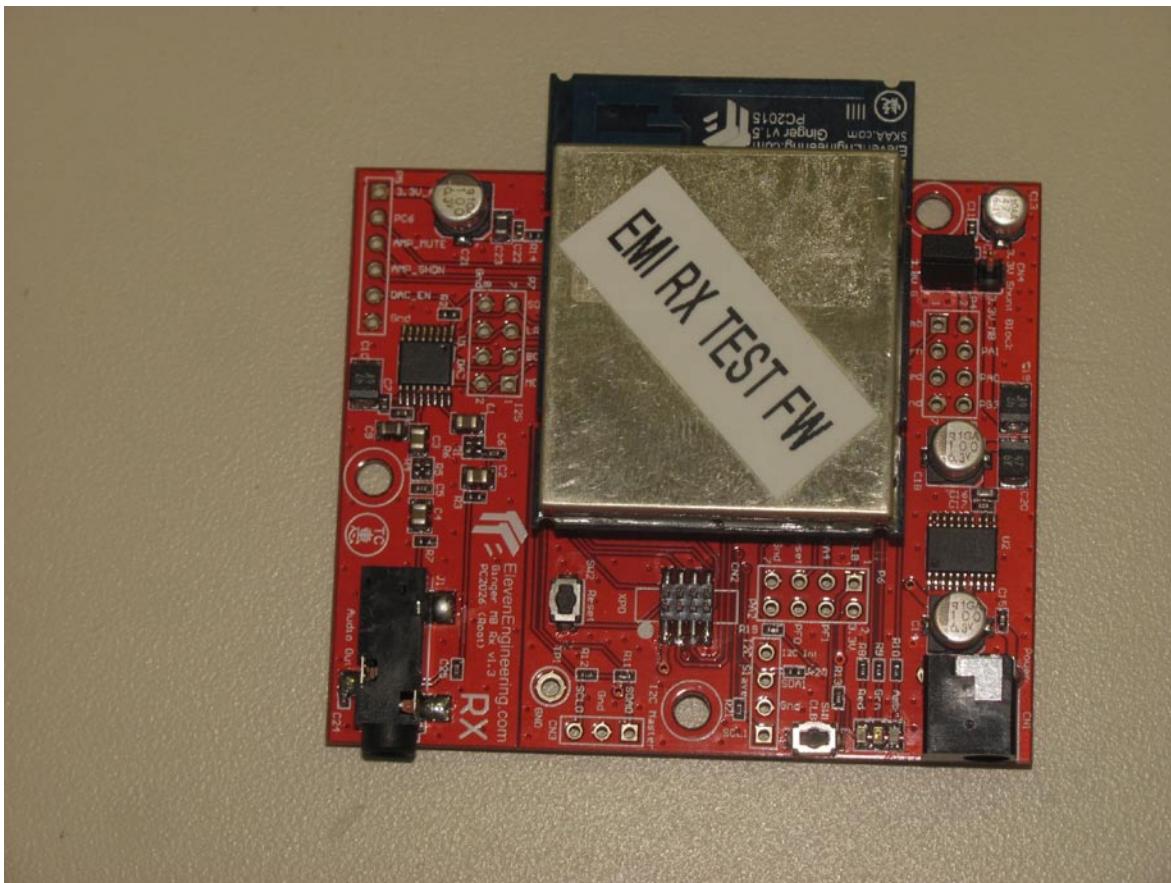
**Figure 3: EUT internal view**

Client	<b>Octet Matrix Inc.</b>
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



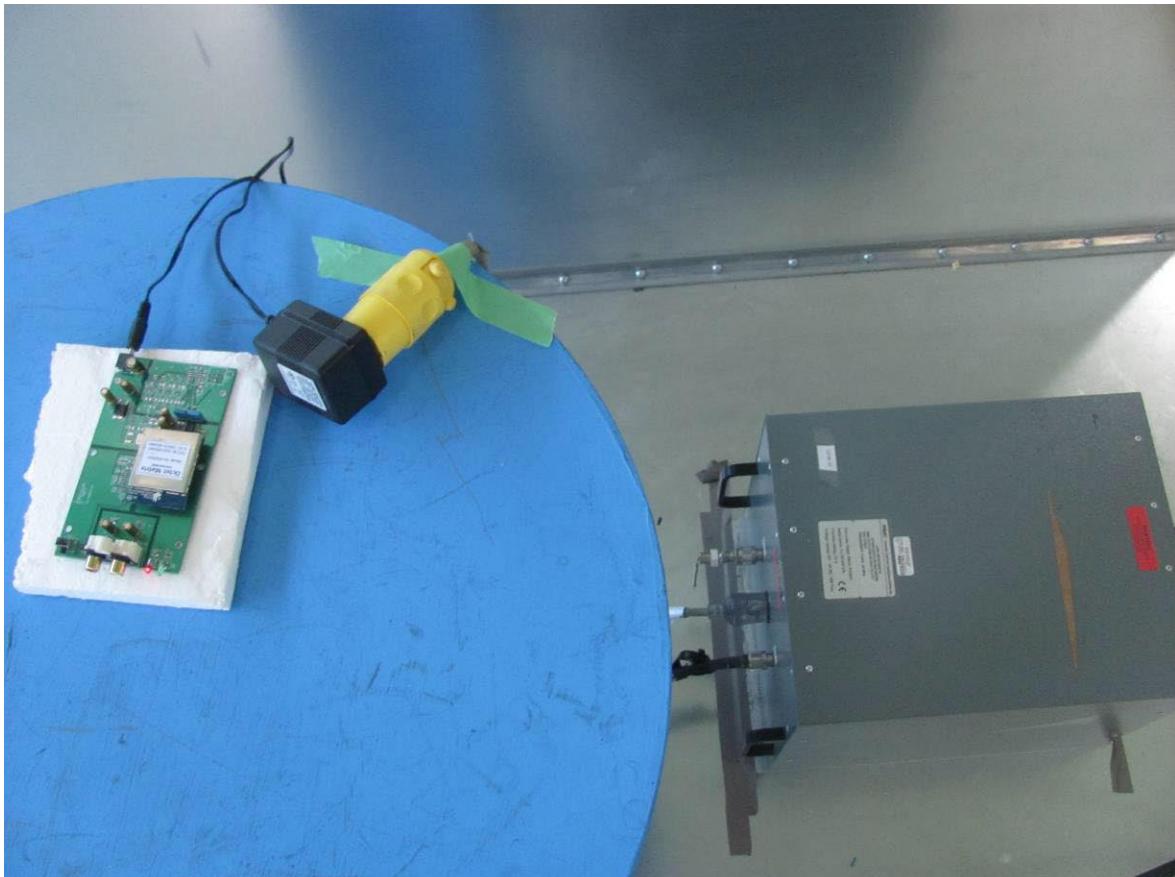
**Figure 4: EUT transmitter test support**

Client	<b>Octet Matrix Inc.</b>
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



**Figure 5: EUT receiver test support**

Client	<b>Octet Matrix Inc.</b>
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



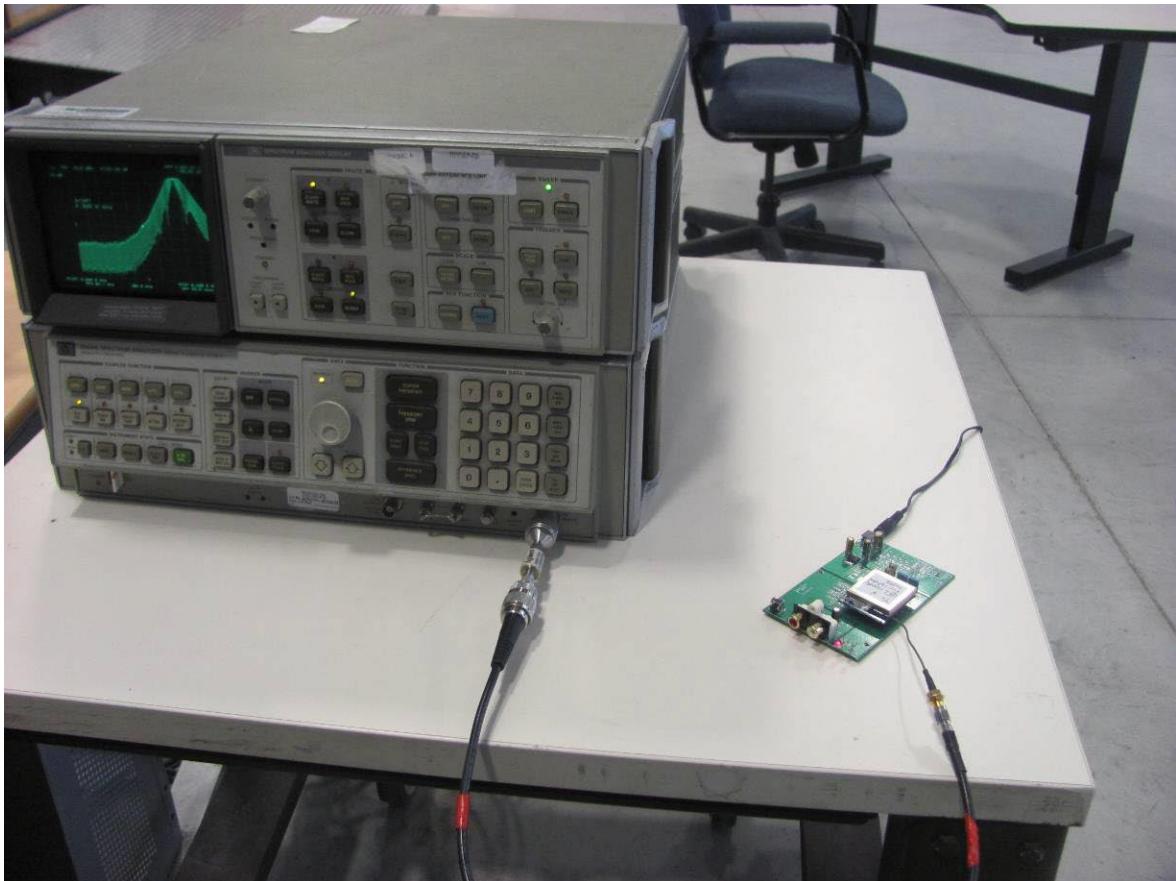
**Figure 6: Power line conducted emission setup – photo 1**

Client	<b>Octet Matrix Inc.</b>
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



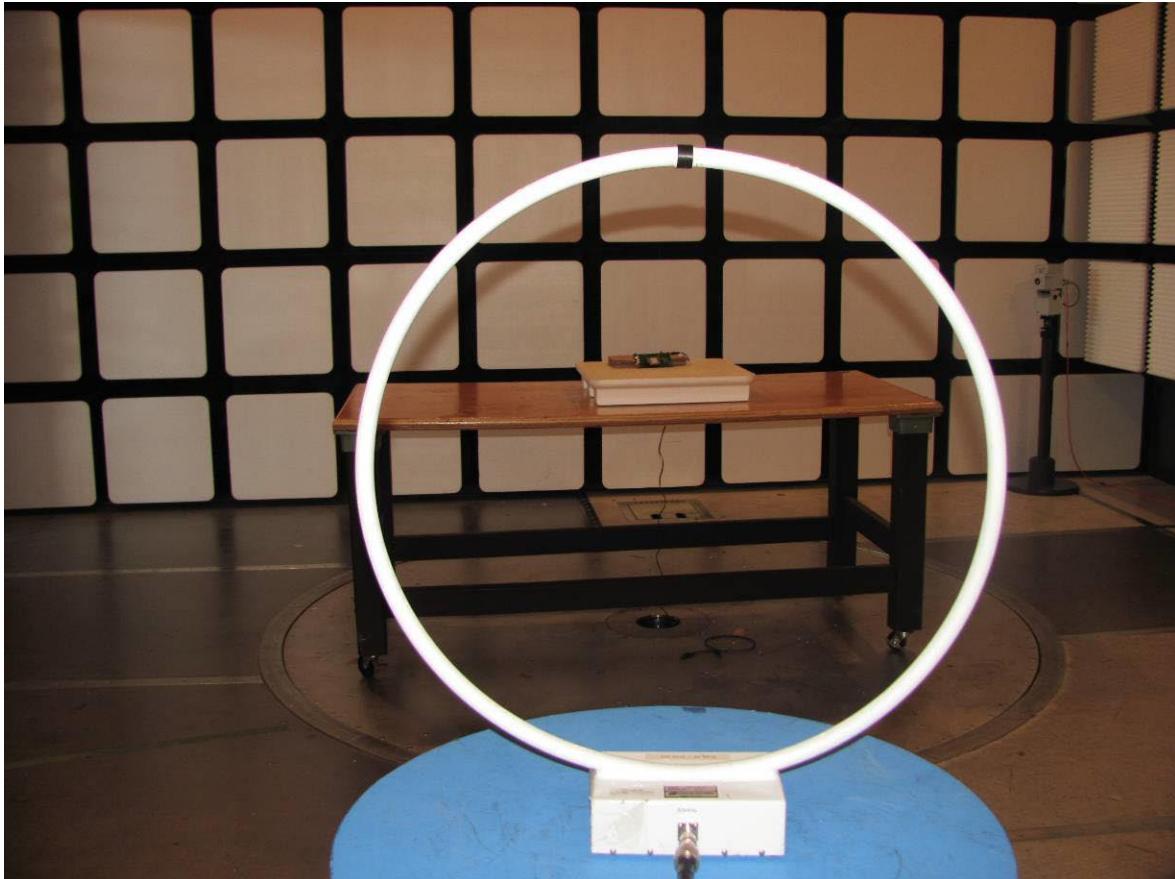
**Figure 7: Power line conducted emission setup – photo 2**

Client	<b>Octet Matrix Inc.</b>	
Product	Wireless Digital Audio Transceiver Module	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012	



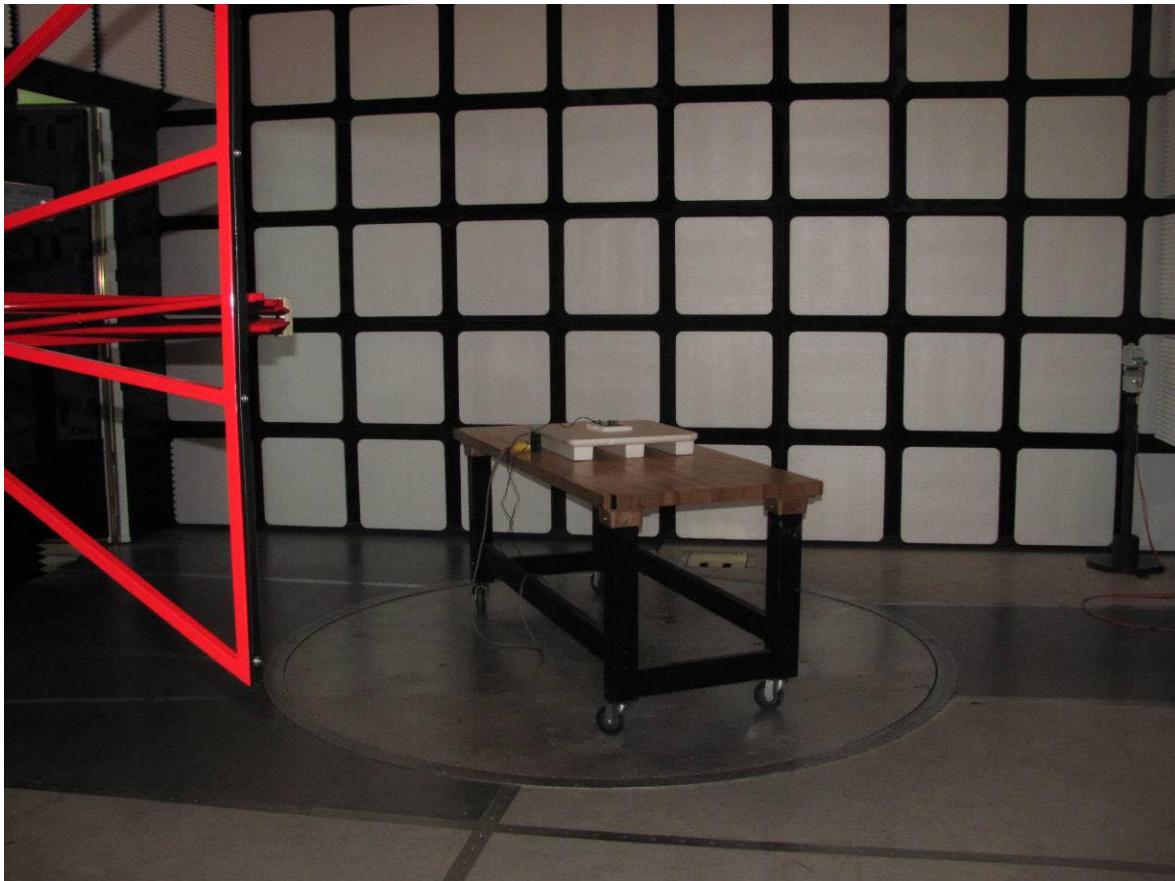
**Figure 8: Antenna conducted emission setup – photo**

Client	<b>Octet Matrix Inc.</b>
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



**Figure 9: Radiated emission setup – photo 1**

Client	<b>Octet Matrix Inc.</b>
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



**Figure 10: Radiated emission setup – photo 2**

Client	<b>Octet Matrix Inc.</b>
Product	Wireless Digital Audio Transceiver Module
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2012



**Figure 11: Radiated emission setup – photo 3**