MET Laboratories, Inc. *Safety Certification - EMI - Telecom Environmental Simulation*

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June 14, 2017

Ooma, Inc.
1840 Embarcadero Rd.
Palo Alto, CA 94303

Dear Vi Lu,

Enclosed is the Class II Permissive Change EMC Wireless test report for compliance testing of the Ooma, Inc., TELOAIR105 as tested to the requirements of Title 47 of the CFR, Ch. 1 (10-1-06 ed.), Part 15, Subpart B and ICES-003, Issue 6, January 2016 for a Class B Digital Device and Subpart D and RSS-213, Issue 3, March 2015 for Intentional Radiators.

Thank you for using the services of MET Laboratories, Inc. If you have any questions regarding these results or if MET can be of further service to you, please contact me.

Sincerely yours,
MET LABORATORIES, INC.

Jennifer Warnell
Documentation Department

Reference: (\Ooma, Inc.\EMCS93841-FCC15D Rev. 2)

Electromagnetic Compatibility Criteria
Class II Permissive Change Test Report

for the

Ooma, Inc.
Model TELOAIR105

Tested under
the FCC Rules contained in
Title 47 of the CFR, Part 15. Subpart B and ICES-003
for Unintentional Radiators
Title 47 of the CFR, Part 15. Subpart D and RSS-213
for Intentional Radiators

MET Report: EMCS93841-FCC15D Rev. 2

June 14, 2017

Prepared For:

Ooma, Inc.
1840 Embarcadero Rd.
Palo Alto, CA 94303

Prepared By:
MET Laboratories, Inc.
914 W. Patapsco Ave.
Baltimore, MD 21230

Electromagnetic Compatibility Criteria
Class II Permissive Change Test Report

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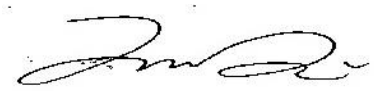

Jun Qi, Project Engineer
Electromagnetic Compatibility Lab

Jennifer Warnell
Documentation Department

Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of Part 15 Subparts B & D, of the FCC Rules and Industry Canada standards ICES-003, Issue 6, January 2016 and RSS-213, Issue 3, March 2015 under normal use and maintenance.

Asad Bajwa
Director, Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
∅	May 16, 2017	Initial Issue.
1	June 1, 2017	Updated MPE.
2	June 14, 2017	Updated MPE.

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List of Terms and Abbreviations

AC	**A**lternating **C**urrent
ACF	**A**ntenna **C**orrection **F**actor
Cal	**Cal**ibration
d	**M**easurement **D**istance
dB	**D**eci**b**els
dBµA	**D**eci**b**els above one **micro**amp
dBµV	**D**eci**b**els above one **micro**volt
dBµA/m	**D**eci**b**els above one **micro**amp **per m**eter
dBµV/m	**D**eci**b**els above one **micro**volt **per m**eter
DC	**D**irect **C**urrent
E	**E**lectric Field
DSL	**D**igital **S**ubscriber **L**ine
ESD	**E**lectro**s**tatic **D**ischarge
EUT	**E**quipment **U**nder **T**est
f	**F**requency
FCC	**F**ederal **C**ommunications **C**ommission
GRP	**G**round **R**eference **P**lane
H	Magnetic Field
HCP	**H**orizontal **C**oupling **P**lane
Hz	**H**ert**z**
IEC	**I**nternational **E**lectrotechnical **C**ommission
kHz	**k**ilo**h**ert**z**
kPa	**k**ilo**pa**scal
kV	**k**ilo**v**olt
LISN	**L**ine **I**mpedance **S**tabilization **N**etwork
MHz	**M**ega**h**ertz
µH	**microh**enry
µ	**microf**arad
µs	**micros**econds
NEBS	**N**etwork **E**quipment-**B**uilding **S**ystem
PRF	**P**ulse **R**epetition **F**requency
RF	**R**adio **F**requency
RMS	**R**oot-**M**ean-**S**quare
TWT	**T**raveling **W**ave **T**ube
V/m	**V**olts **per m**eter
VCP	**V**ertical **C**oupling **P**lane

I. Executive Summary

A. Purpose of Test

An EMC evaluation was performed to determine compliance of the Ooma, Inc. TELOAIR105, with the requirements of Part 15 Subpart B and Subpart D. All references are to the most current version of Title 47 of the Code of Federal Regulations in effect. In accordance with §2.1033, the following data is presented in support of the Certification of the TELOAIR105. Ooma, Inc. should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the TELOAIR105, has been **permanently** discontinued.

B. Executive Summary

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15 Subpart B and Subpart D, in accordance with Ooma, Inc., purchase order number 8879.

Requirement	FCC Part	Canada RSS-213	Test Procedure (Section numbers refer to ANSI C63.17 unless otherwise noted)	Result
Conducted Emissions	15.315 & 15.207	6.3	ANSI C63.4:2014	Compliant
RF Exposure	15.319 (i) & 1.1307(b), 2.1091 and 2.1093	RSS-102	ANSI/IEEE C95.1	Compliant
Conducted Emission Limits for a Class B Digital Device	47 CFR Part 15.107 (a)	ICES-003 Issue 6 January 2016	ANSI C63.4:2014	Compliant
Radiated Emission Limits for a Class B Digital Device	47 CFR Part 15.109 (a)	ICES-003 Issue 6 January 2016	ANSI C63.4:2014	Compliant

Table 1. Executive Summary of EMC Part 15 Subpart D ComplianceTesting

II. Equipment Configuration

A. Overview

MET Laboratories, Inc. was contracted by Ooma, Inc. to perform testing on the TELOAIR105, under Ooma, Inc.'s purchase order number 8879.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Ooma, Inc., TELOAIR105.

The results obtained relate only to the item(s) tested.

Model(s) Tested:	TELOAIR105	
Model(s) Covered:	Ooma Telo, Ooma Office, Ooma Telo 2, TELOAIR105	
EUT Specifications:	Primary Power: 120 VAC, 60 Hz	
	FCC ID: XFT-TELO103 IC: 9769A-OOMATELO103	
	Operating Mode:	DECT Base Station
	Type of Modulations:	GFSK
	EUT Frequency Ranges:	1921.536-1928.448 MHz
Analysis:	The results obtained relate only to the item(s) tested.	
Environmental Test Conditions:	Temperature: 15-35º C	
	Relative Humidity: 30-60%	
	Barometric Pressure: 860-1060 mbar	
Evaluated by:	Djed Mouada	
Report Type:	Class II Permissive Change	
Report Date(s):	June 14, 2017	

B. References

CFR 47, Part 15, Subpart D	Federal Communication Commission, Code of Federal Regulations, Title 47, Part 15: General Rules and Regulations, Allocation, Assignment, and Use of Radio Frequencies
CFR 47, Part 15, Subpart B	Electromagnetic Compatibility: Criteria for Radio Frequency Devices
ICES-003, Issue 6, January 2016	Information Technology Equipment (ITE) - Limits and methods of measurement
RSS-213, Issue 3, March 2015	2 GHz Licence-exempt Personal Communications Service Devices (LE-PCS)
ANSI C63.4:2014	Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical And Electronic Equipment in the Range of 9 kHz to 40 GHz
ISO/IEC 17025:2005	General Requirements for the Competence of Testing and Calibration Laboratories

C. Test Site

All testing was performed at MET Laboratories, Inc., 3162 Belick St., Santa Clara, CA 95054. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

Radiated Emissions measurements were performed in a semi-anechoic chamber (equivalent to an Open Area Test Site). In accordance with §2.948(a)(3), a complete site description is contained at MET Laboratories.

D. Description of Test Sample

It is a VOIP phone system using DECT wireless technology with integrated FXS telephone port and two 10/100 Mbps Ethernet ports. It is designed to be a DECT phone base-station as well as a VOIP router allowing access to Ooma telephony services. It also has built-in Wi-Fi and Bluetooth capabilities.

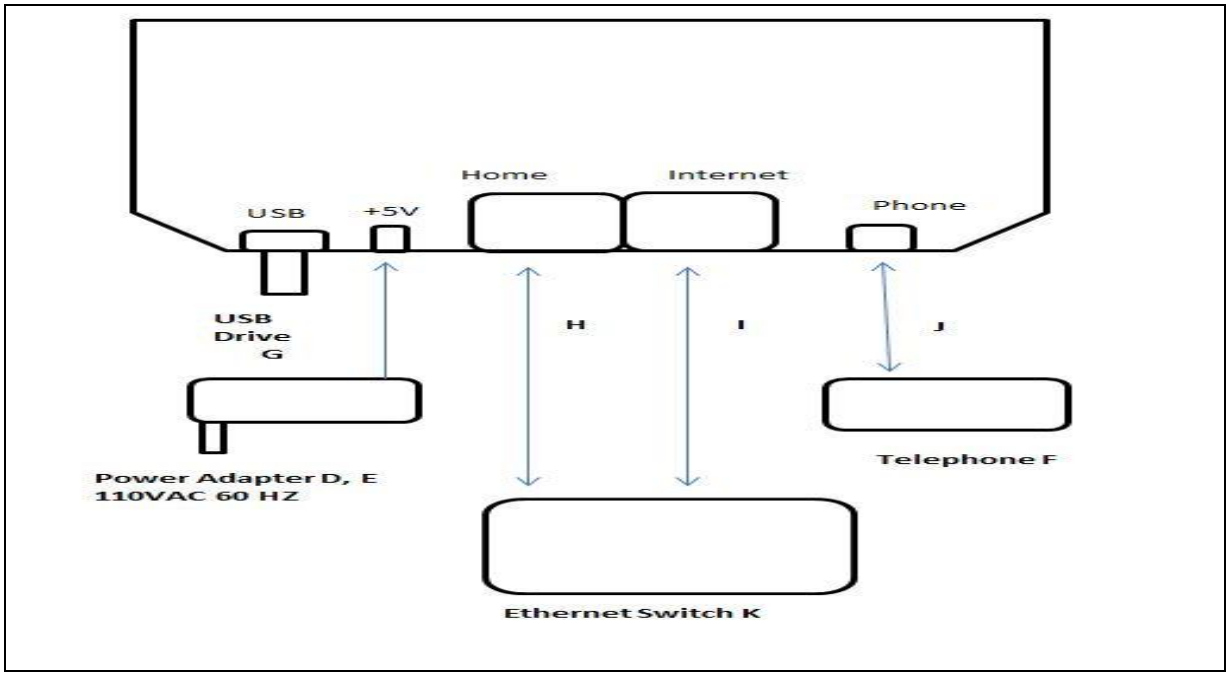


Figure 1. Block Diagram of Test Configuration

E. Equipment Configuration

The EUT was set up as outlined in Figure 1, Block Diagram of Test Setup. All cards, racks, etc., incorporated as part of the EUT is included in the following list.

Ref. ID	Name / Description	Model Number	Part Number	Serial Number
C	TELOAIR105	-	-	-
D	Amigo Power Adapter	ADS0248T-W050300	-	-
E	Genwelled Power Adapter	CYSE18-050300U	-	-

Table 2. Equipment Configuration

F. Support Equipment

Ref. ID	Name / Description	Manufacturer	Model Number
F	ATT telephone	ATT	TR1909
G	USB Flash Drive	Patriot	PSF16GLSABUSB
H	Home RJ45 Ethernet Cable	--	--
I	INTERNET RJ45 Ethernet Cable	--	--
J	Phone RJ11 Cable	--	--
K	Ethernet Switch	TP-LINK	TL-SG105

Table 3. Support Equipment

G. Mode of Operation

The frequency of highest disturbance, with respect to the limit, was found by investigating disturbances at a number of significant frequencies. This provides confidence that the probable frequency of maximum disturbance has been found and that the associated cable, EUT arrangement and mode of operation has been identified.

H. Method of Monitoring

The Ooma logo on top of the device should be blue.

I. Modifications

a) Modifications to EUT
No modifications were made to the EUT.

b) Modifications to Test Standard
No modifications were made to the standard.

J. Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to Ooma, Inc. upon completion of testing.

III. Electromagnetic Compatibility Criteria for Unintentional Radiators

Electromagnetic Compatibility Criteria for Unintentional Radiators

§ 15.107 Conducted Emissions Limits

Test Requirement(s):

15.107 (a) Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in Table 4. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals.

15.107 (b) For a Class A digital device that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in Table 4. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals. The lower limit applies at the band edges.

Frequency range (MHz)	Class A Conducted Limits (dBµV)		*Class B Conducted Limits (dBµV)	
	Quasi-Peak	Average	Quasi-Peak	Average
* 0.15- 0.45	79	66	66 - 56	56 - 46
0.45 - 0.5	79	66	56	46
0.5 - 30	73	60	60	50
Note 1 — The lower limit shall apply at the transition frequencies. Note 2 — The limit decreases linearly with the logarithm if the frequency in the range 0.15 MHz to 0.5 MHz.				

Table 4. Conducted Limits for Radio Frequency Devices calculated from FCC Part 15 Subsections 15.107(a) (b)

Test Procedures: The EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber. The method of testing, test conditions, and test procedures of ANSI C63.4 were used. The EUT was powered through a 50Ω/50µH LISN. An EMI receiver, connected to the measurement port of the LISN, scanned the frequency range from 150 kHz to 30 MHz in order to find the peak conducted emissions. All peak emissions within 6 dB of the limit were re-measured using a quasi-peak and/or average detector as appropriate.

Test Results: The EUT was found compliant with the Class B requirement(s) of this section. Measured emissions were below applicable limits.

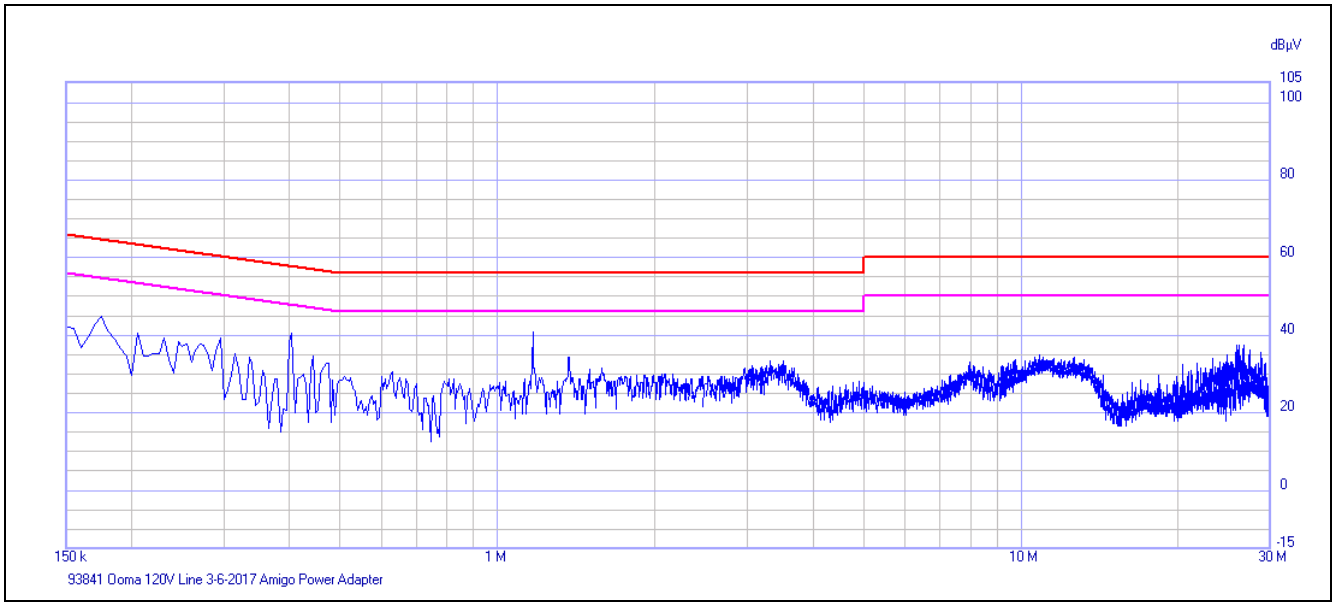
Test Engineer(s): Jason Lee

Test Date(s): 03/06/17

Conducted Emissions, Phase Line, Ooma Amigo Power Adapter (120 VAC, 60 Hz)

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Results	Average Amplitude	Average Limit	Delta	Results
Line	0.15	50.6	66	-15.4	Pass	37.88	56	-18.12	Pass
Line	0.205	38.33	63.413	-25.083	Pass	31.29	53.413	-22.123	Pass
Line	0.175	45.91	64.723	-18.813	Pass	42.78	54.723	-11.943	Pass
Line	0.405	40.54	57.773	-17.233	Pass	35.29	47.773	-12.483	Pass
Line	1.18	27.31	56	-28.69	Pass	19.82	46	-26.18	Pass
Line	0.295	34.59	60.398	-25.808	Pass	30	50.398	-20.398	Pass

Table 5. Conducted Emissions, Phase Line, Ooma Amigo Power Adapter

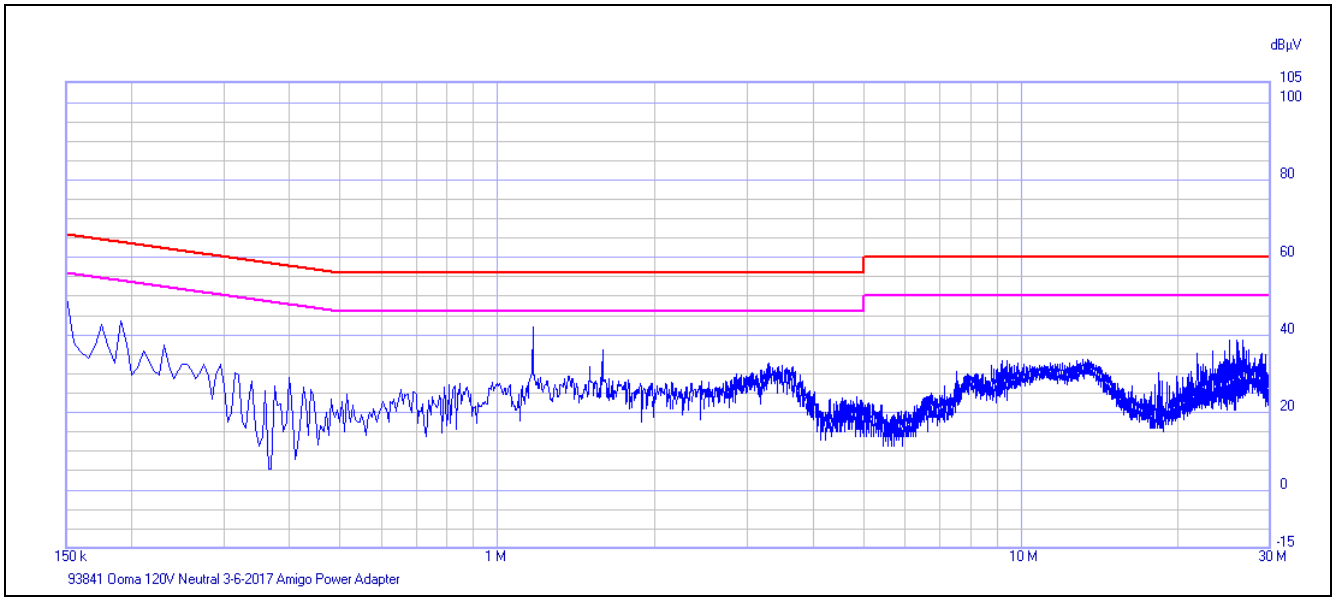


Plot 1. Conducted Emission, Phase Line, Ooma Amigo Power Adapter

Conducted Emissions, Neutral Line, Ooma Amigo Power Adapter (120 VAC, 60 Hz)

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Results	Average Amplitude	Average Limit	Delta	Results
Neutral	0.15	46	66	-20	Pass	33.76	56	-22.24	Pass
Neutral	0.175	46.07	64.723	-18.653	Pass	33.86	54.723	-20.863	Pass
Neutral	0.19	38.41	64.042	-25.632	Pass	27.47	54.042	-26.572	Pass
Neutral	1.18	26.7	56	-29.3	Pass	19.33	46	-26.67	Pass
Neutral	25.875	34.62	60	-25.38	Pass	27.66	50	-22.34	Pass
Neutral	26.49	36.07	60	-23.93	Pass	30.05	50	-19.95	Pass

Table 6. Conducted Emissions, Neutral Line, Ooma Amigo Power Adapter

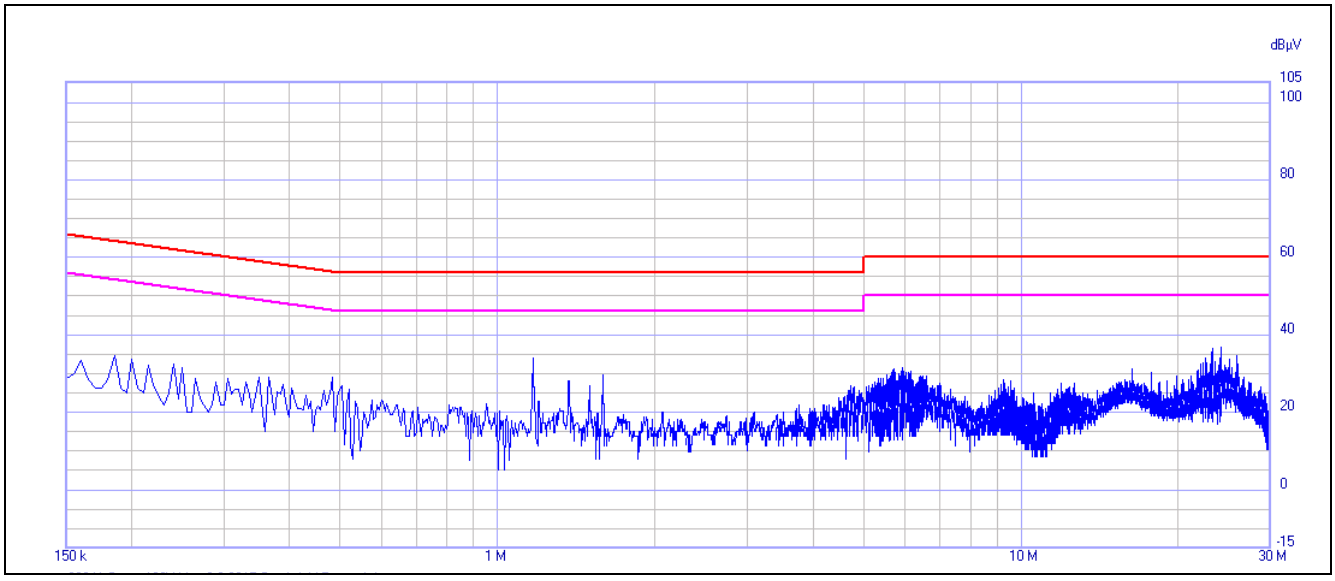


Plot 2. Conducted Emission, Neutral Line, Ooma Amigo Power Adapter

Conducted Emissions, Phase Line, Ooma Genwelled Power Adapter (120 VAC, 60 Hz)

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Results	Average Amplitude	Average Limit	Delta	Results
Line	0.185	31.05	64.263	-33.213	Pass	20.91	54.263	-33.353	Pass
Line	1.18	20.45	56	-35.55	Pass	28.67	46	-17.33	Pass
Line	22.575	35.14	60	-24.86	Pass	35.14	50	-14.86	Pass
Line	23.215	25.39	60	-34.61	Pass	16.84	50	-33.16	Pass
Line	24.095	25.58	60	-34.42	Pass	17.63	50	-32.37	Pass
Line	25.88	29.75	60	-30.25	Pass	24.17	50	-25.83	Pass

Table 7. Conducted Emissions, Phase Line, Ooma Genwelled Power Adapter

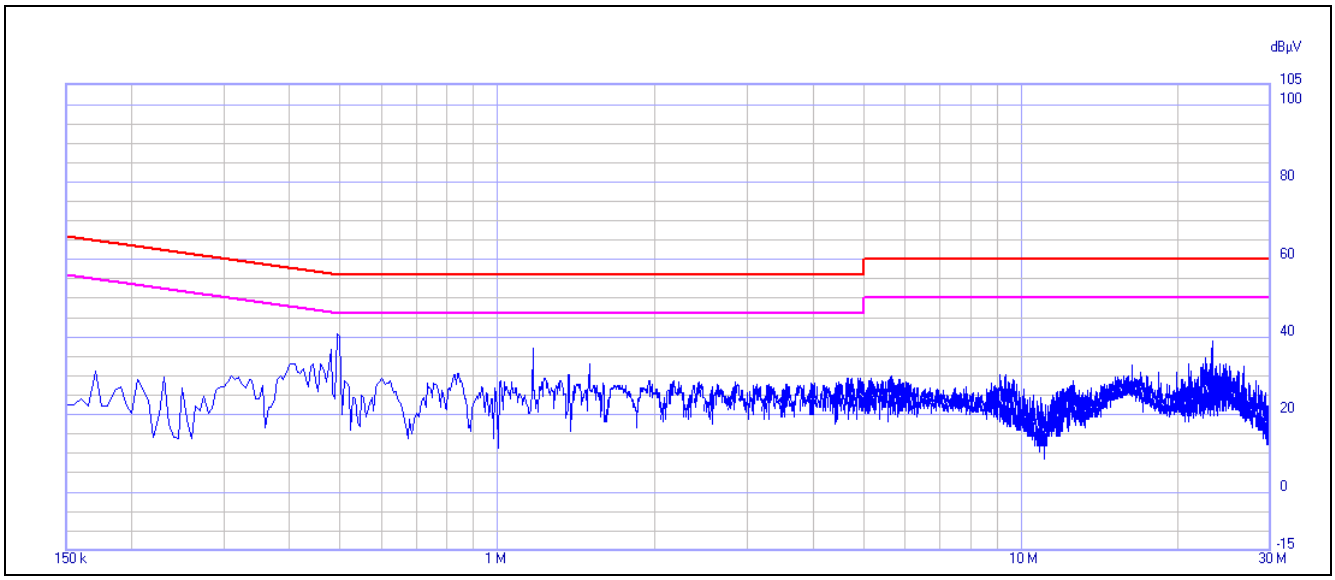


Plot 3. Conducted Emission, Phase Line, Ooma Genwelled Power Adapter

Conducted Emissions, Neutral Line, Ooma Genwelled Power Adapter (120 VAC, 60 Hz)

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Results	Average Amplitude	Average Limit	Delta	Results
Neutral	0.445	30.42	56.993	-26.573	Pass	26.51	46.993	-20.483	Pass
Neutral	0.485	32.6	56.26	-23.66	Pass	33.68	46.26	-12.58	Pass
Neutral	0.495	39.79	56.086	-16.296	Pass	38.23	46.086	-7.856	Pass
Neutral	1.18	24.23	56	-31.77	Pass	15.58	46	-30.42	Pass
Neutral	22.52	28.94	60	-31.06	Pass	22.13	50	-27.87	Pass
Neutral	23.265	25.64	60	-34.36	Pass	17.2	50	-32.8	Pass

Table 8. Conducted Emissions, Neutral Line, Ooma Genwelled Power Adapter



Plot 4. Conducted Emission, Neutral Line, Ooma Genwelled Power Adapter

Conducted Emission Limits Test Setup

Photograph 1. Conducted Emissions, Test Setup, Ooma Amigo Power Adapter

Photograph 2. Conducted Emissions, Test Setup, Ooma Genwelled Power Adapter

Radiated Emission Limits

§ 15.109 Radiated Emissions Limits

Test Requirement(s): **15.109 (a)** Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the Class B limits expressed in Table 9.

15.109 (b) The field strength of radiated emissions from a Class A digital device, as determined at a distance of 10 meters, shall not exceed the Class A limits expressed in Table 9.

Frequency (MHz)	Field Strength (dBµV/m)	
	§15.109 (b), Class A Limit (dBµV) @ 10m	§15.109 (a),Class B Limit (dBµV) @ 3m
30 - 88	39.00	40.00
88 - 216	43.50	43.50
216 - 960	46.40	46.00
Above 960	49.50	54.00

Table 9. Radiated Emissions Limits calculated from FCC Part 15, §15.109 (a) (b)

Test Procedures: The EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber. The method of testing and test conditions of ANSI C63.4 were used. An antenna was located 10m from the EUT on an adjustable mast. A pre-scan was first performed in order to find prominent radiated emissions. For final emissions measurements at each frequency of interest, the EUT was rotated and the antenna height was varied between 1 m and 4 m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. Unless otherwise specified, measurements were made using a quasi-peak detector with a 120 kHz bandwidth.

Test Results: The EUT was found compliant with the Class B requirement(s) of this section. Measured emissions were below applicable limits. Above 18GHz, only noise floor observed.

Test Engineer(s): Juan Velasquez

Test Date(s): 03/01/17

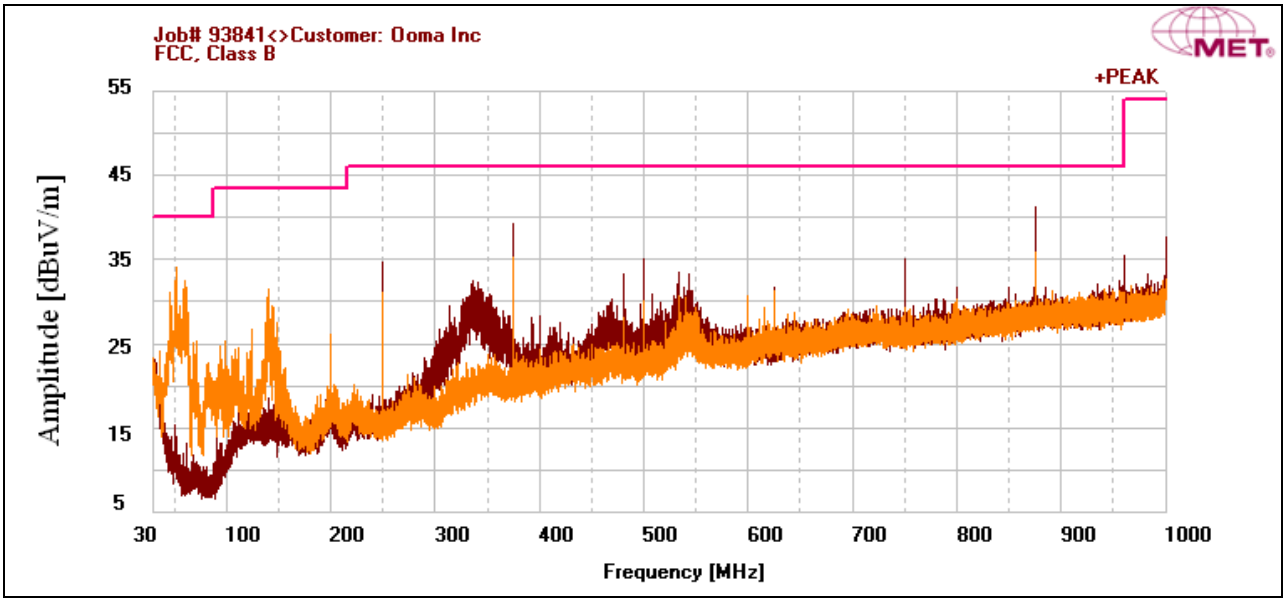
Radiated Emissions Limits Test Results, Ooma Amigo Power Adapter

Frequency (MHz)	Antenna Polarity	EUT Azimuth (Degrees)	Antenna Height (cm)	Uncorrected Amplitude (dBµV)	ACF (dB/m)	Pre Amp Gain (dB)	CBL (dB)	DCF (dB)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
875	H	356	100	11.7	22.6	0	5.424	0	39.724	46	-6.276
375	H	272	100	20.2	15.7	0	3.489	0	39.389	46	-6.611
375	V	341	145.76	14.5	15.5	0	3.489	0	33.489	46	-12.511
875.04	V	294	138.35	12.4	22.1	0	5.424	0	39.924	46	-6.076
58.72	V	242	100	23.7	7.572	0	1.345	0	32.617	40	-7.383
250	H	276	133.76	20	12.2	0	2.884	0	35.084	46	-10.916

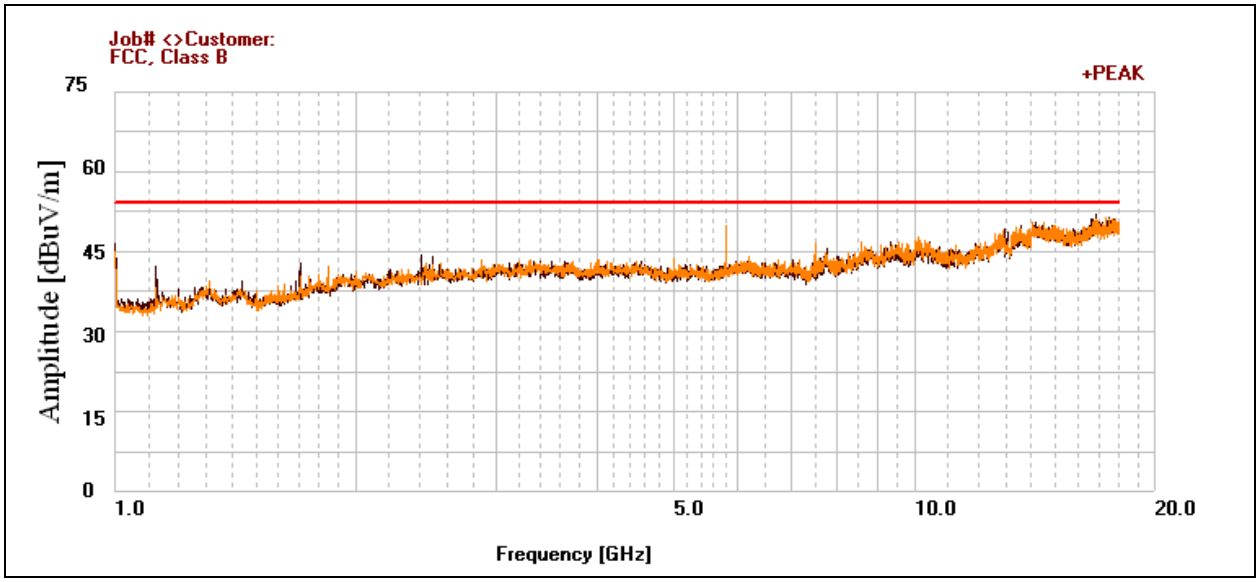
Table 10. Radiated Emissions, Ooma Amigo Power Adapter, 30 MHz – 1 GHz

Frequency (MHz)	Antenna Polarity	EUT Azimuth (Degrees)	Antenna Height (cm)	Uncorrected Amplitude (dBµV)	ACF (dB/m)	Pre Amp Gain (dB)	CBL (dB)	DCF (dB)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1125	H	290	123.58	40.55	27.784	36.071	0	0	32.263	54	-21.737
1125	V	9	100	39.72	27.159	36.071	0	0	30.808	54	-23.192
1704	H	310	100	42	29.079	36.309	0	0	34.77	54	-19.23
1704	V	51	111.11	36.07	29.036	36.309	0	0	28.797	54	-25.203
6016	V	359	100	30.16	34.998	34.739	0	0	30.419	54	-23.581
7500	V	3	126	44	35.945	35.28	0	0	44.665	54	-9.335
20100	V	359	100	35.94	40.82	35.749	0	0	41.011	54	-12.989
37174	V	0	200	35.78	31.532	34.073	0	0	43.239	54	-10.761

Table 11. Radiated Emissions, Ooma Amigo Power Adapter, 1 GHz – 40GHz



Plot 5. Radiated Emissions, Ooma Amigo Power Adapter, 30 MHz – 1 GHz



Plot 6. Radiated Emissions, Ooma Amigo Power Adapter, 1 GHz – 18 GHz

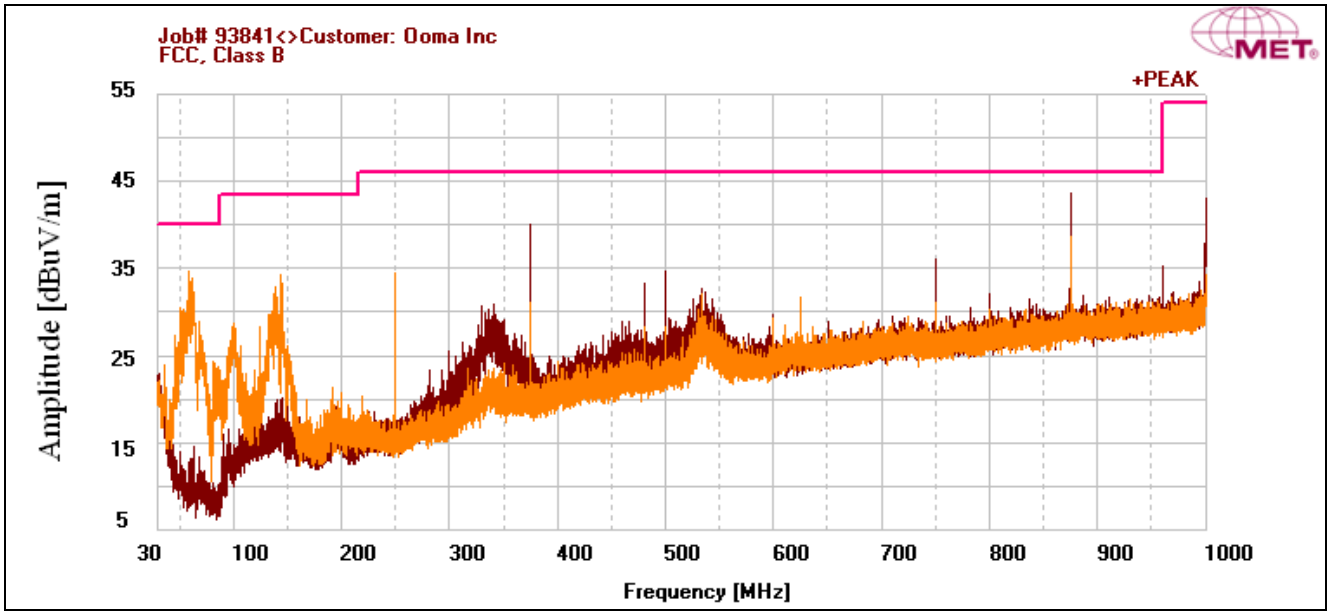
Radiated Emissions Limits Test Results, Ooma Genwelled Power Adapter

Frequency (MHz)	Antenna Polarity	EUT Azimuth (Degrees)	Antenna Height (cm)	Uncorrected Amplitude (dBµV)	ACF (dB/m)	Pre Amp Gain (dB)	CBL (dB)	DCF (dB)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
875	H	316	100	15.4	22.6	0	5.424	0	43.424	46	-2.576
875.04	V	336	113.76	11.4	22.1	0	5.424	0	38.924	46	-7.076
375	H	269	100	20.8	15.7	0	3.489	0	39.989	46	-6.011
250	V	295	100	18.5	12.3	0	2.884	0	33.684	46	-12.316
58.72	V	333	100	25.5	7.572	0	1.345	0	34.417	40	-5.583
143.28	V	194	100	16.6	13.5	0	2.134	0	32.234	43.5	-11.266

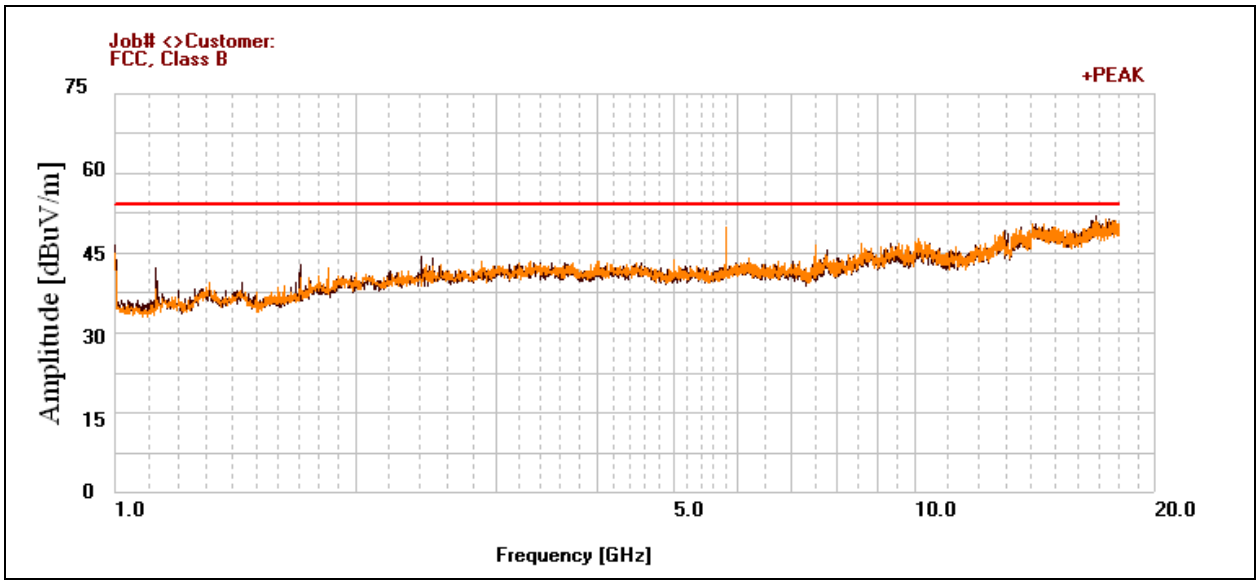
Table 12. Radiated Emissions, Ooma Genwelled Power Adapter, 30 MHz – 1 GHz

Frequency (MHz)	Antenna Polarity	EUT Azimuth (Degrees)	Antenna Height (cm)	Uncorrected Amplitude (dBµV)	ACF (dB/m)	Pre Amp Gain (dB)	CBL (dB)	DCF (dB)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1125	H	290	123.58	40.55	27.784	36.071	0	0	32.263	54	-21.737
1125	V	9	100	39.72	27.159	36.071	0	0	30.808	54	-23.192
1704	H	310	100	42	29.079	36.309	0	0	34.77	54	-19.23
1704	V	51	111.11	36.07	29.036	36.309	0	0	28.797	54	-25.203
6016	V	359	100	30.16	34.998	34.739	0	0	30.419	54	-23.581
7500	V	3	126	44	35.945	35.28	0	0	44.665	54	-9.335
20100	V	359	100	35.94	40.82	35.749	0	0	41.011	54	-12.989
37174	V	0	200	35.78	31.532	34.073	0	0	43.239	54	-10.761

Table 13. Radiated Emissions, Ooma Genwelled Power Adapter, 1 GHz – 40GHz

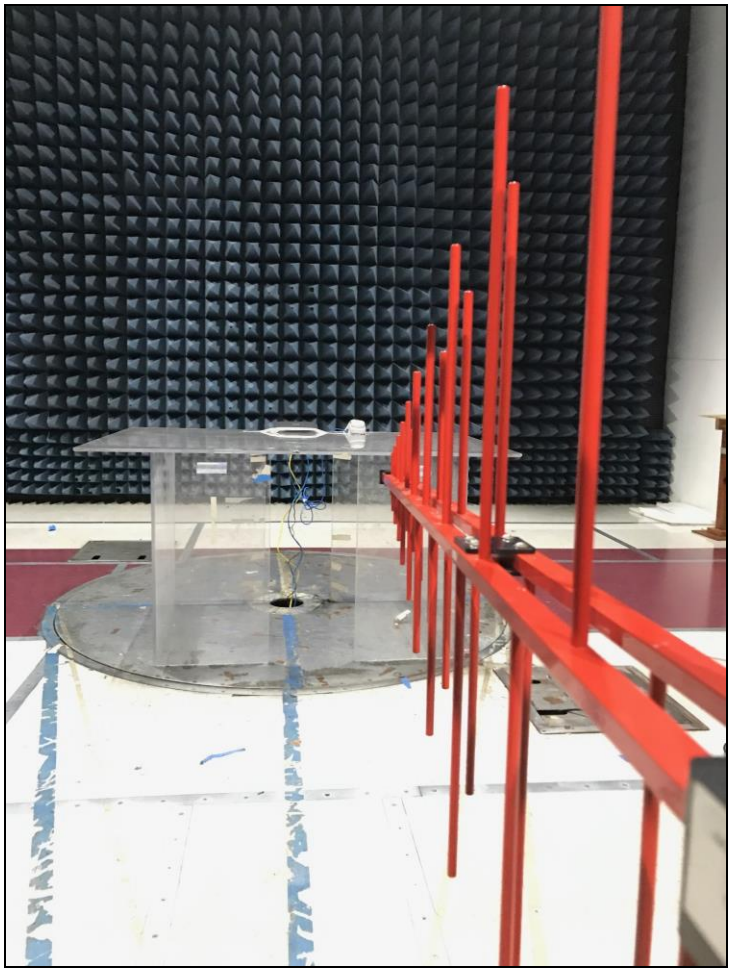


Plot 7. Radiated Emissions, Ooma Genwelled Power Adapter, 30 MHz – 1 GHz

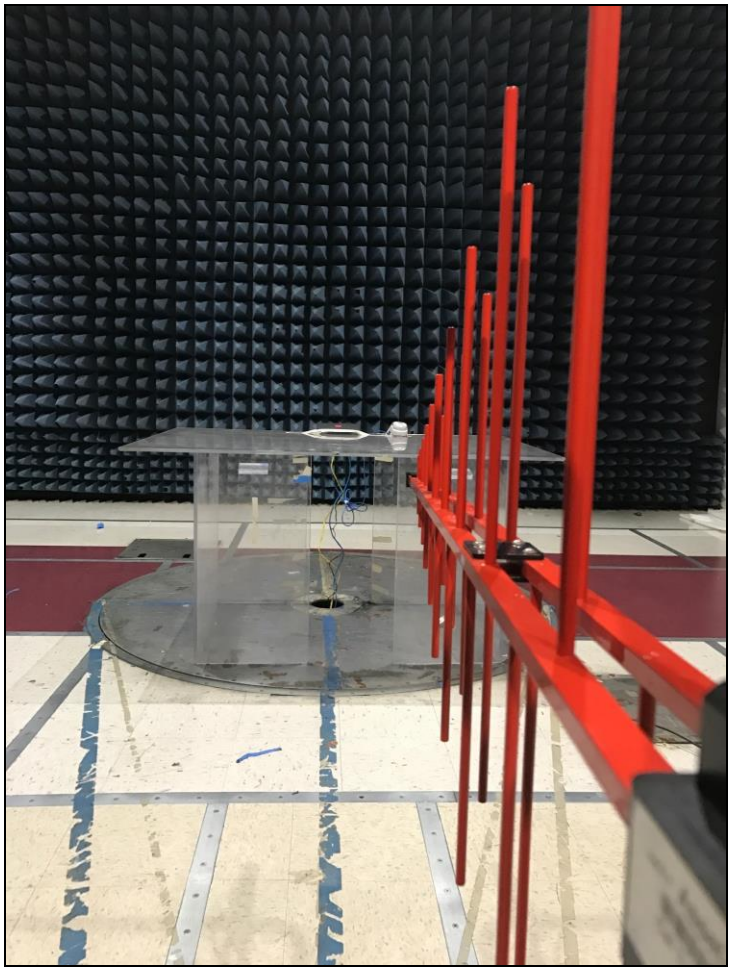


Plot 8. Radiated Emissions, Ooma Genwelled Power Adapter, 1 GHz – 18 GHz

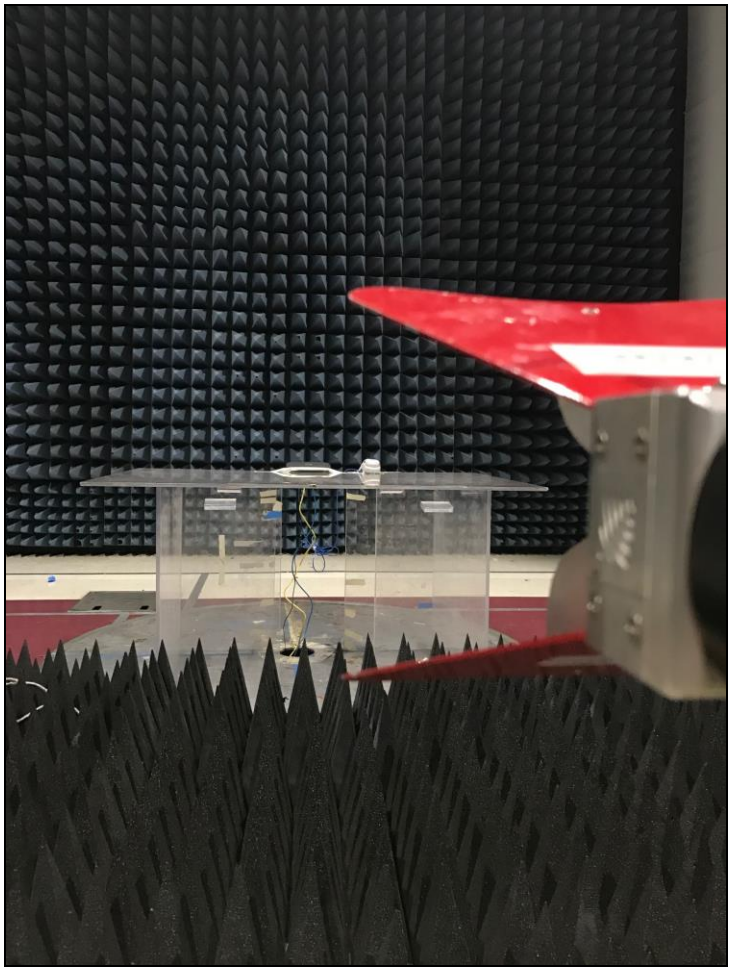
Radiated Emission Limits Test Setup



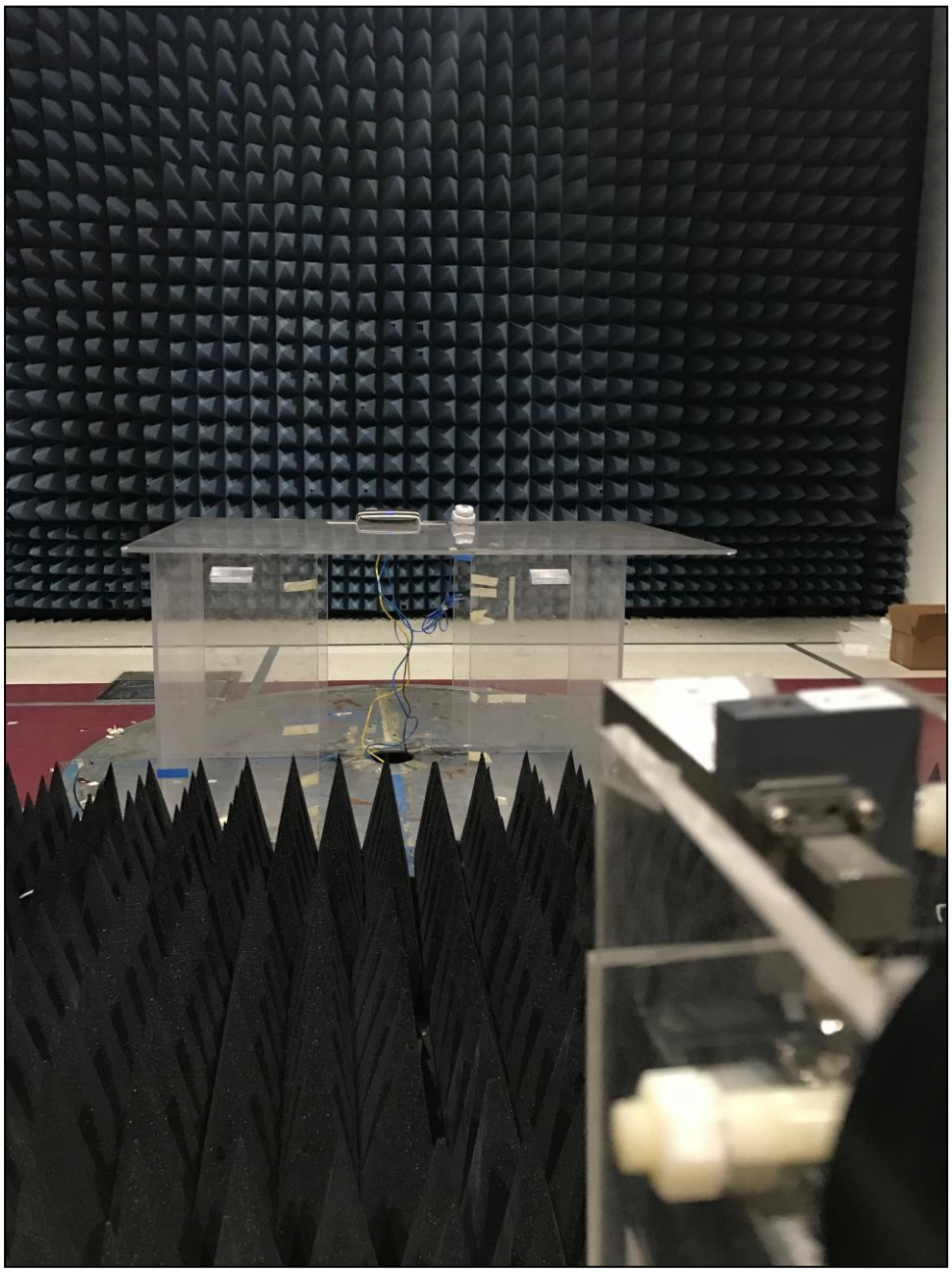
Photograph 3. Radiated Emission, Test Setup, Ooma Amigo Power Adapter, 30 MHz – 1 GHz



Photograph 4. Radiated Emission, Test Setup, Ooma Genwelled Power Adapter, 30 MHz – 1 GHz



Photograph 5. Radiated Emission, Test Setup, TELOAIR105, 1 GHz – 18 GHz



Photograph 6. Radiated Emission, Test Setup, TELOAIR105, 18 GHz – 40 GHz

IV. Electromagnetic Compatibility Criteria for Intentional Radiators

Electromagnetic Compatibility Criteria for Intentional Radiators

§15.315 Conducted Emissions Voltage

Test Requirement(s): **§15.315 Conducted limits** - An unlicensed PCS device that is designed to be connected to the public utility (AC) power line must meet the limits specified in §15.207.

§ 15.207 (a): For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 Σ line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency range (MHz)	§ 15.207(a), Conducted Limit (dBμV)	
	Quasi-Peak	Average
* 0.15- 0.45	66 - 56	56 - 46
0.45 - 0.5	56	46
0.5 - 30	60	50

Table 14. Conducted Limits for Intentional Radiators from FCC Part 15 § 15.207(a)

Test Procedure: The EUT was placed on a 0.8 m-high wooden table inside a screen room. The EUT was situated such that the back of the EUT was 0.4 m from one wall of the vertical ground plane, and the remaining sides of the EUT were no closer than 0.8 m from any other conductive surface. The EUT was powered from a 50 Ω/50 μH Line Impedance Stabilization Network (LISN). The EMC receiver scanned the frequency range from 150 kHz to 30 MHz. Conducted Emissions measurements were made in accordance with *ANSI C63.4-2014 "Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40 GHz"*. The measurements were performed over the frequency range of 0.15 MHz to 30 MHz using a 50 Ω/50 μH LISN as the input transducer to an EMC/field intensity meter. For the purpose of this testing, the transmitter was turned on. Scans were performed with the transmitter on.

Test Results: The EUT was compliant with this requirement. Measured emissions were below applicable limits.

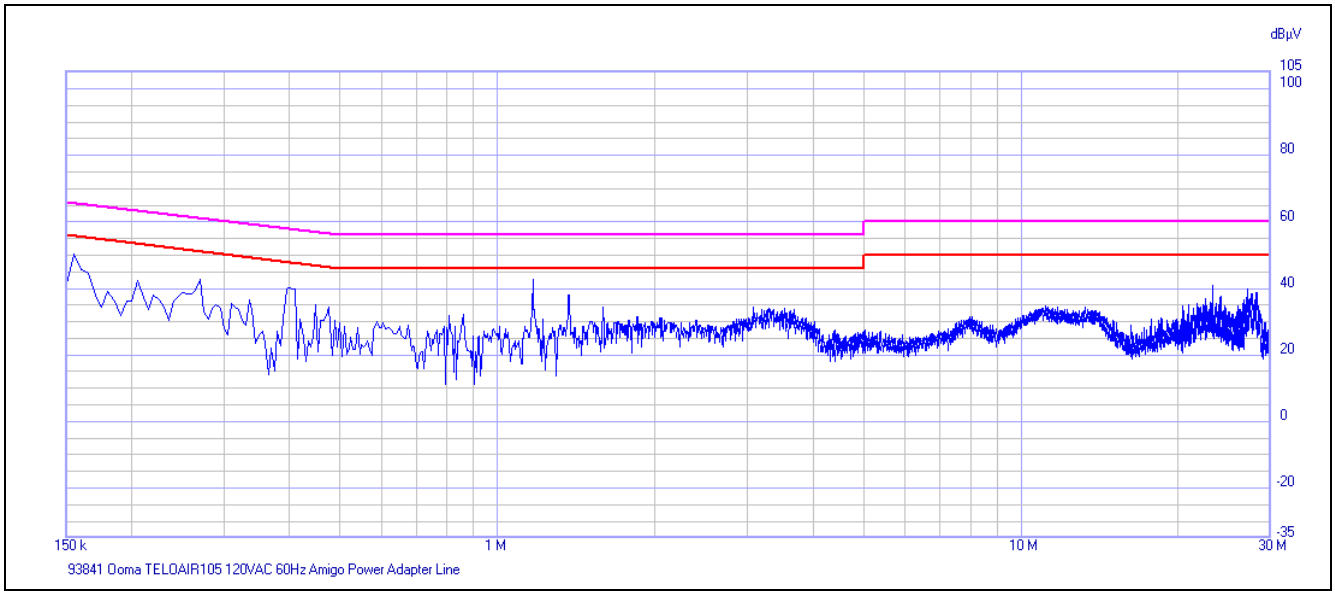
Test Engineer(s): Juan Velasquez

Test Date(s): 03/02/17

§15.315 – Conducted Emissions Test Results, Ooma Amigo Power Adapter

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
Line	0.155	48.03	65.728	-17.698	Pass	37.06	55.728	-18.668	Pass
Line	0.205	38.4	63.413	-25.013	Pass	31.68	53.413	-21.733	Pass
Line	0.27	38.35	61.131	-22.781	Pass	34.82	51.131	-16.311	Pass
Line	0.4	39.07	57.876	-18.806	Pass	37.71	47.876	-10.166	Pass
Line	1.17	42.92	56	-13.08	Pass	39.7	46	-6.3	Pass
Line	23.125	38.51	60	-21.49	Pass	34.34	50	-15.66	Pass

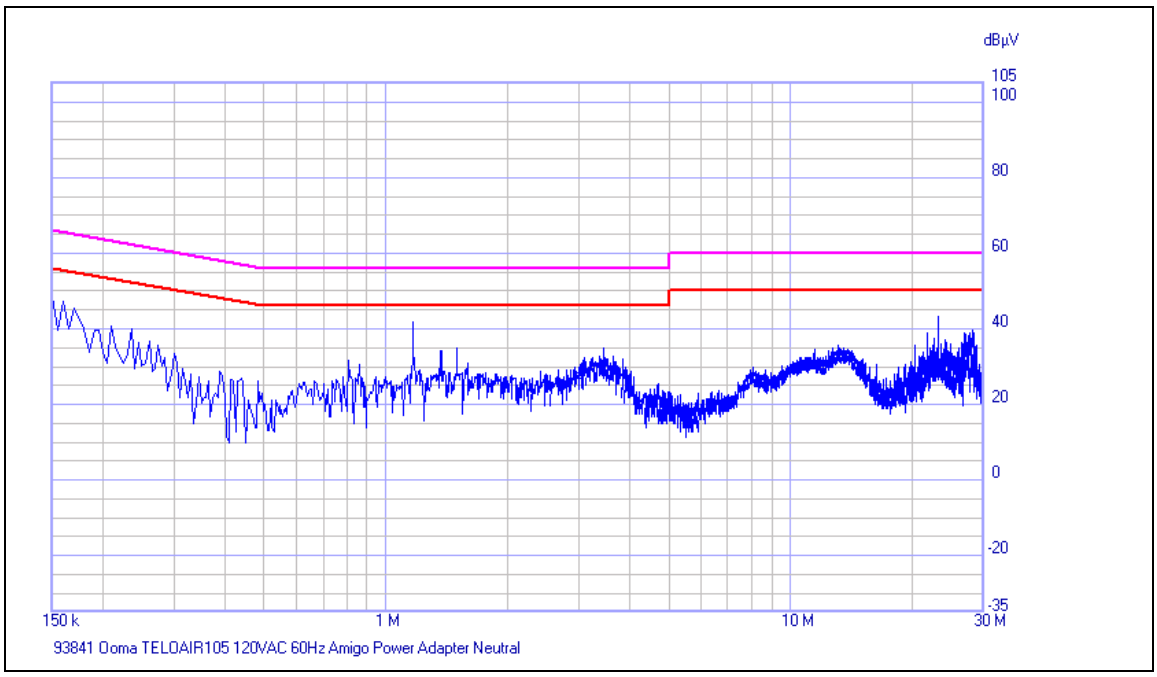
Table 15. Conducted Emissions, §15.315, Phase Line, Ooma Amigo Power Adapter



Plot 9. Conducted Emissions, §15.315, Phase Line, Ooma Amigo Power Adapter

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
Neutral	0.15	46.71	66	-19.29	Pass	36.12	56	-19.88	Pass
Neutral	0.16	44.69	65.465	-20.775	Pass	34.49	55.465	-20.975	Pass
Neutral	0.21	36.51	63.213	-26.703	Pass	26.52	53.213	-26.693	Pass
Neutral	1.17	42.68	56	-13.32	Pass	39.83	46	-6.17	Pass
Neutral	23.13	39.3	60	-20.7	Pass	35.52	50	-14.48	Pass
Neutral	0.17	42.06	64.963	-22.903	Pass	32.23	54.963	-22.733	Pass

Table 16. Conducted Emissions, §15.315, Neutral Line, Ooma Amigo Power Adapter

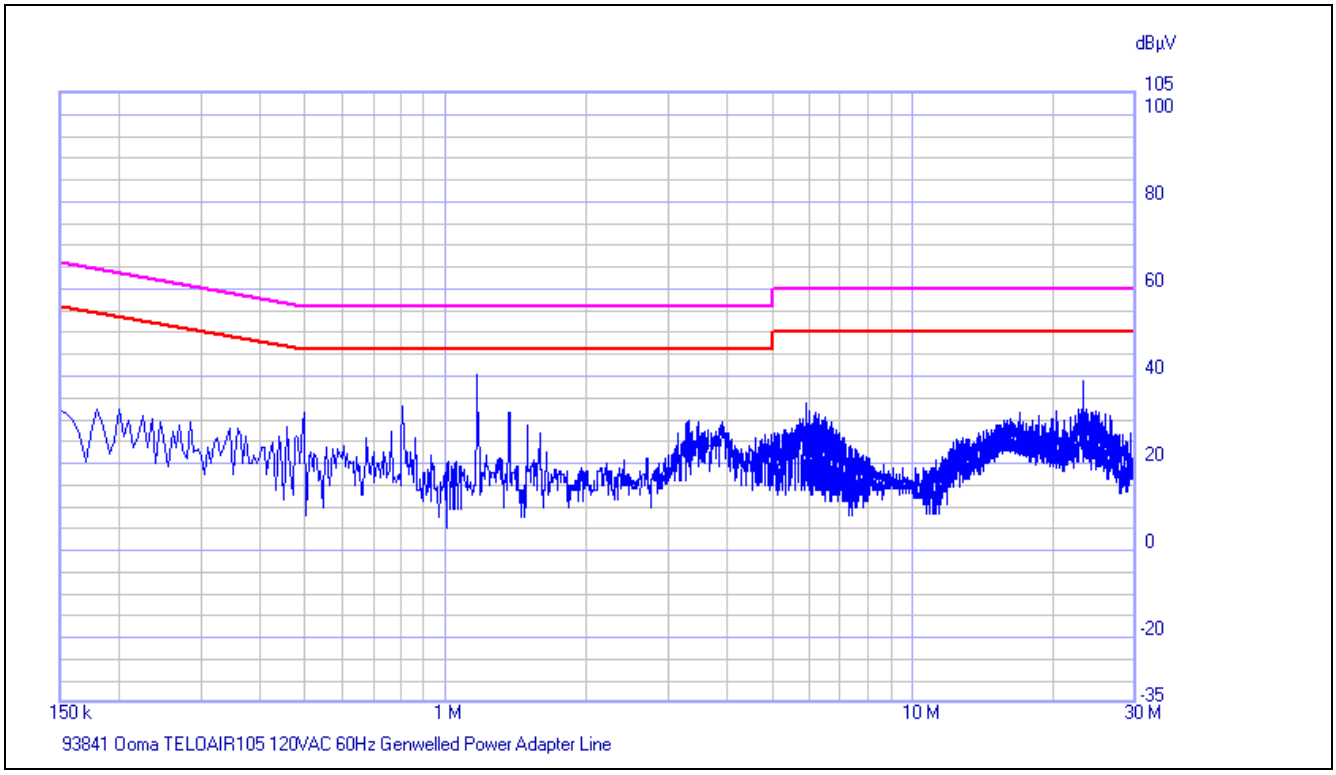


Plot 10. Conducted Emissions, §15.315, Ooma Amigo Power Adapter

§15.315 – Conducted Emissions Test Results, Ooma Genwelled Power Adapter

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
Line	0.18	29.84	64.49	-34.65	Pass	19.72	54.49	-34.77	Pass
Line	0.81	31.25	56	-24.75	Pass	27.6	46	-18.4	Pass
Line	1.17	42.16	56	-13.84	Pass	38.44	46	-7.56	Pass
Line	5.905	28.68	60	-31.32	Pass	18.59	50	-31.41	Pass
Line	22.58	32.52	60	-27.48	Pass	28.25	50	-21.75	Pass
Line	23.13	37.03	60	-22.97	Pass	33.59	50	-16.41	Pass

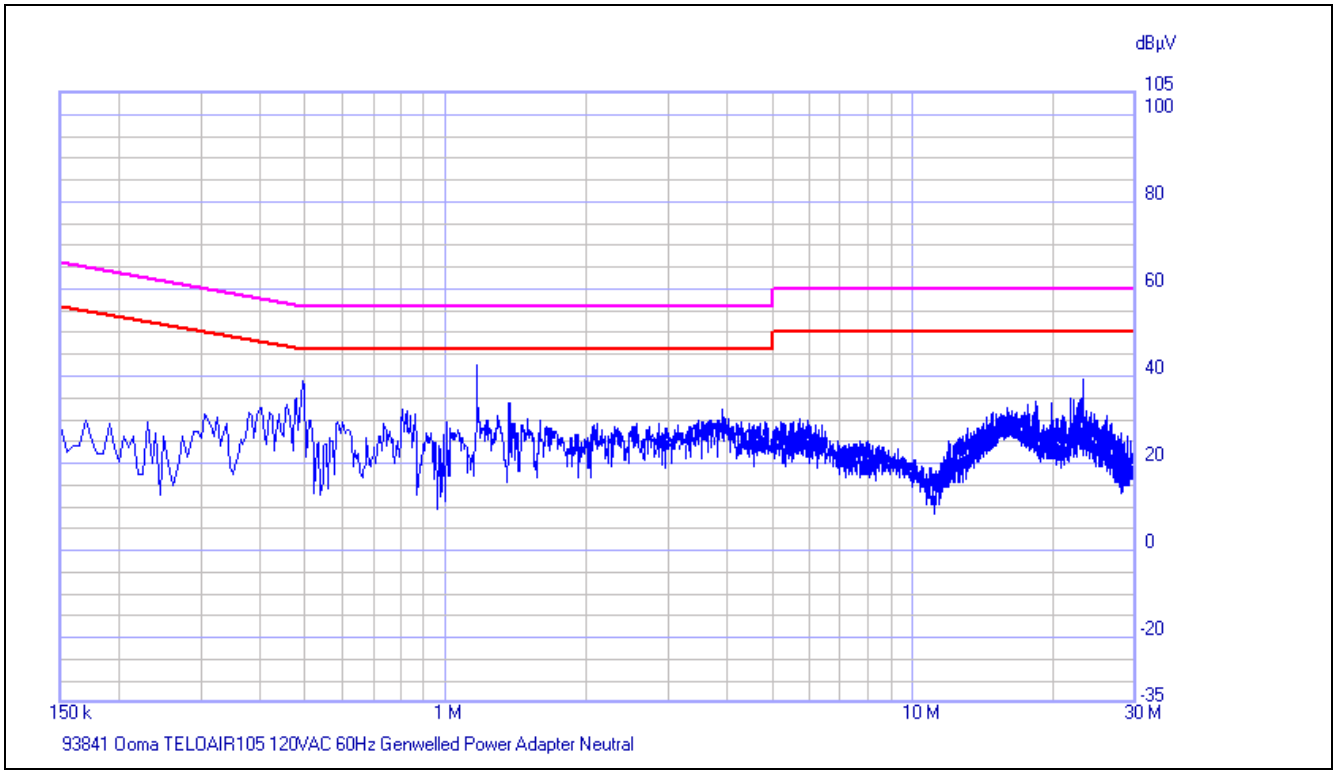
Table 17. Conducted Emissions, §15.315, Phase Line, Ooma Genwelled Power Adapter



Plot 11. Conducted Emissions, §15.315, Phase Line, Ooma Genwelled Power Adapter

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
Neutral	0.48	34.88	56.349	-21.469	Pass	33.05	46.349	-13.299	Pass
Neutral	0.495	40.23	56.086	-15.856	Pass	38.74	46.086	-7.346	Pass
Neutral	1.17	41.42	56	-14.58	Pass	37.86	46	-8.14	Pass
Neutral	21.665	32.83	60	-27.17	Pass	29.19	50	-20.81	Pass
Neutral	22.885	33.52	60	-26.48	Pass	29.72	50	-20.28	Pass
Neutral	23.13	37.43	60	-22.57	Pass	34.13	50	-15.87	Pass

Table 18. Conducted Emissions, §15.315, Neutral Line, Ooma Genwelled Power Adapter



Plot 12. Conducted Emissions, §15.315, Neutral Line, Ooma Genwelled Power Adapter

Photograph 7. Conducted Emissions, §15.315, Test Setup, Ooma Amigo Power Adapter

Photograph 8. Conducted Emissions, §15.315, Test Setup, Ooma Genwelled Power Adapter

Photograph 9. Conducted Emissions, §15.315, Test Setup, Micro-Ohmmeter

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.319(i) RF Exposure

RF Exposure Requirements: **§1.1307(b)(1) and §1.1307(b)(2):** Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

RF Radiation Exposure Limit: **§1.1310:** As specified in this section, the Maximum Permissible Exposure (MPE) Limit shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in Sec. 1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of Sec. 2.1093 of this chapter.

MPE Limit: EUT's operating frequencies @ 1921.536-1928.448 MHz; **Limit for Uncontrolled exposure: 1 mW/cm^2 or 10 W/m^2**

Equation from page 18 of OET 65, Edition 97-01

$$S = PG / 4\pi R^2 \quad \text{or} \quad R = \sqrt{(PG / 4\pi S)}$$

where, S = Power Density (mW/cm^2)
P = Power Input to antenna (mW)
G = Antenna Gain (numeric value)
R = Distance (cm)

Test Results:

FCC									
Frequency (MHz)	Con. Pwr. (dBm)	Con. Pwr. (mW)	Ant. Gain (dBi)	Ant. Gain numeric	Pwr. Density (mW/cm^2)	Limit (mW/cm^2)	Margin	Distance (cm)	Result
2437	28.75	749.894	3	1.995	0.29767	1	0.70233	20	Pass

Table 19. MPE, 2.4 GHz, Wi-Fi

FCC									
Frequency (MHz)	Con. Pwr. (dBm)	Con. Pwr. (mW)	Ant. Gain (dBi)	Ant. Gain numeric	Pwr. Density (mW/cm^2)	Limit (mW/cm^2)	Margin	Distance (cm)	Result
5200	17.7	58.884	4.8	3.02	0.03538	1	0.96462	20	Pass

Table 20. MPE, 5 GHz UNII-1, Wi-Fi

FCC									
Frequency (MHz)	Con. Pwr. (dBm)	Con. Pwr. (mW)	Ant. Gain (dBi)	Ant. Gain numeric	Pwr. Density (mW/cm^2)	Limit (mW/cm^2)	Margin	Distance (cm)	Result
5260	19.84	96.383	4.8	3.02	0.05791	1	0.94209	20	Pass

Table 21. MPE, 5 GHz UNII-2A, Wi-Fi

FCC									
Frequency (MHz)	Con. Pwr. (dBm)	Con. Pwr. (mW)	Ant. Gain (dBi)	Ant. Gain numeric	Pwr. Density (mW/cm^2)	Limit (mW/cm^2)	Margin	Distance (cm)	Result
5580	19.08	80.91	4.8	3.02	0.04861	1	0.95139	20	Pass

Table 22. MPE, 5 GHz UNII-2B, Wi-Fi

FCC									
Frequency (MHz)	Con. Pwr. (dBm)	Con. Pwr. (mW)	Ant. Gain (dBi)	Ant. Gain numeric	Pwr. Density (mW/cm^2)	Limit (mW/cm^2)	Margin	Distance (cm)	Result
5785	18.3	67.608	4.8	3.02	0.04062	1	0.95938	20	Pass

Table 23. MPE, 5 GHz UNII-3, Wi-Fi

FCC									
Frequency (MHz)	Con. Pwr. (dBm)	Con. Pwr. (mW)	Ant. Gain (dBi)	Ant. Gain numeric	Pwr. Density (mW/cm^2)	Limit (mW/cm^2)	Margin	Distance (cm)	Result
2402	12.15	16.406	3	1.995	0.00651	1	0.99349	20	Pass

Table 24. MPE, BLE

FCC									
Frequency (MHz)	Con. Pwr. (dBm)	Con. Pwr. (mW)	Ant. Gain (dBi)	Ant. Gain numeric	Pwr. Density (mW/cm^2)	Limit (mW/cm^2)	Margin	Distance (cm)	Result
1928	20.3	107.152	3.5	2.239	0.04772	1	0.95228	20	Pass

Table 25. MPE, DECT

Pwr Density(mW/cm^2):

2.4G Wi-Fi + DECT = 0.29767 + 0.04772 = 0.34539 < 1

5G UNII-1 Wi-Fi + DECT = 0.03538 + 0.04772 = 0.0831 < 1

5G UNII-2A Wi-Fi + DECT = 0.05791 + 0.04772 = 0.10563 < 1

5G UNII-2B Wi-Fi + DECT = 0.04861 + 0.04772 = 0.09633 < 1

5G UNII-3 Wi-Fi + DECT = 0.04062 + 0.04772 = 0.08834 < 1

BT + DECT = 0.00651 + 0.04772 = 0.05423 < 1

IV. Test Equipment

Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2005.

MET Asset #	Equipment	Manufacturer	Model	Last Cal Date	Cal Due Date
1S3916	SPIKEGUARD	FCC	FCC-450B-2.4-N	SEE NOTE	
1S2677	LISN, DUAL-LINE V-NETWORK	TESEQ	NNB 51	6/27/2016	6/27/2017
1U0304	EMI RECEIVER	NARDA	PMM 9010	1/24/2017	1/24/2018
1S2488	SCREEN ROOM	UNIVERSAL	CUSTOM MADE	NOT REQUIRED	
1S2399	TURNTABLE CONTROLLER	SUNOL SCIENCE	SC99V	NOT REQUIRED	
1S2482	5 METER CHAMBER (NSA)	PANASHIELD	5 METER SEMI-ANECHOIC CHAMBER	NOT REQUIRED	
1S3928	EMI TESTER RECEIVER	ROHDE & SCHWARZ	ESR26	10/28/2016	10/28/2017
1S2587	PREAMPLIFIER	AML COMMUNICATIONS	AML0126L3801	SEE NOTE	
1S3830	BICONILOG ANTENNA	SUNOL SCIENCES CORPORATION	JB3	8/3/2016	8/3/2018
1S2603	DOUBLE RIDGED WAVEGUIDE HORN	ETS-LINDGREN	3117	8/9/2016	8/9/2018
1S3962	SPECTRUM ANALYZER (PSA)	KEYSIGHT/AGILENT	E4448A	3/4/2016	4/4/2017
1S3818	DRG HORN ANTENNA	A.H. SYSTEMS, INC.	SAS-574	8/16/2016	8/16/2018
1S3864	TABLE TOP AMPLIFIER	MITEQ	TTA1840-35-HG	SEE NOTE	

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing

V. Certification & User's Manual Information

Certification & User's Manual Information

A. Certification Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart I — Marketing of Radio frequency devices:

§ 2.801 Radio-frequency device defined.

As used in this part, a radio-frequency device is any device which in its operation is capable of Emitting radio-frequency energy by radiation, conduction, or other means. Radio- frequency devices include, but are not limited to:

(a) The various types of radio communication transmitting devices described throughout this chapter.

(b) The incidental, unintentional and intentional radiators defined in Part 15 of this chapter.

(c) The industrial, scientific, and medical equipment described in Part 18 of this chapter.

(d) Any part or component thereof which in use emits radio-frequency energy by radiation, conduction, or other means.

§ 2.803 Marketing of radio frequency devices prior to equipment authorization.

(a) Except as provided elsewhere in this chapter, no person shall sell or lease, or offer for sale or lease (including advertising for sale or lease), or import, ship or distribute for the purpose of selling or leasing or offering for sale or lease, any radio frequency device unless:

(1) In the case of a device subject to certification, such device has been authorized by the Commission in accordance with the rules in this chapter and is properly identified and labeled as required by §2.925 and other relevant sections in this chapter; or

(2) In the case of a device that is not required to have a grant of equipment authorization issued by the Commission, but which must comply with the specified technical standards prior to use, such device also complies with all applicable administrative (including verification of the equipment or authorization under a Declaration of Conformity, where required), technical, labeling and identification requirements specified in this chapter.

(d) Notwithstanding the provisions of paragraph (a) of this section, the offer for sale solely to business, commercial, industrial, scientific or medical users (but not an offer for sale to other parties or to end users located in a residential environment) of a radio frequency device that is in the conceptual, developmental, design or pre-production stage is permitted prior to equipment authorization or, for devices not subject to the equipment authorization requirements, prior to a determination of compliance with the applicable technical requirements *provided* that the prospective buyer is advised in writing at the time of the offer for sale that the equipment is subject to the FCC rules and that the equipment will comply with the appropriate rules before delivery to the buyer or to centers of distribution.

(e)(1) Notwithstanding the provisions of paragraph (a) of this section, prior to equipment authorization or determination of compliance with the applicable technical requirements any radio frequency device may be operated, but not marketed, for the following purposes and under the following conditions:

(i) Compliance testing;

(ii) Demonstrations at a trade show provided the notice contained in paragraph (c) of this section is displayed in a conspicuous location on, or immediately adjacent to, the device;

(iii) Demonstrations at an exhibition conducted at a business, commercial, industrial, scientific or medical location, but excluding locations in a residential environment, provided the notice contained in paragraphs (c) or (d) of this section, as appropriate, is displayed in a conspicuous location on, or immediately adjacent to, the device;

(iv) Evaluation of product performance and determination of customer acceptability, provided such operation takes place at the manufacturer's facilities during developmental, design or pre-production states; or

(v) Evaluation of product performance and determination of customer acceptability where customer acceptability of a radio frequency device cannot be determined at the manufacturer's facilities because of size or unique capability of the device, provided the device is operated at a business, commercial, industrial, scientific or medical user's site, but not at a residential site, during the development, design or pre-production stages.

(e)(2) For the purpose of paragraphs (e)(1)(iv) and (e)(1)(v) of this section, the term *manufacturer's facilities* includes the facilities of the party responsible for compliance with the regulations and the manufacturer's premises, as well as the facilities of other entities working under the authorization of the responsible party in connection with the development and manufacture, but not the marketing, of the equipment.

(f) For radio frequency devices subject to verification and sold solely to business, commercial, industrial, scientific and medical users (excluding products sold to other parties or for operation in a residential environment), parties responsible for verification of the devices shall have the option of ensuring compliance with the applicable technical specifications of this chapter at each end user's location after installation, provided that the purchase or lease agreement includes a proviso that such a determination of compliance be made and is the responsibility of the party responsible for verification of the equipment.

Certification & User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart J — Equipment Authorization Procedures:

§ 2.901 Basis and Purpose

(a) In order to carry out its responsibilities under the Communications Act and the various treaties and international regulations, and in order to promote efficient use of the radio spectrum, the Commission has developed technical standards for radio frequency equipment and parts or components thereof. The technical standards applicable to individual types of equipment are found in that part of the rules governing the service wherein the equipment is to be operated.[1] *In addition to the technical standards provided, the rules governing the service may require that such equipment be verified by the manufacturer or importer*, be authorized under a Declaration of Conformity, or receive an equipment authorization from the Commission by one of the following procedures: certification or registration.

(b) The following sections describe the verification procedure, the procedure for a Declaration of Conformity, and the procedures to be followed in obtaining certification from the Commission and the conditions attendant to such a grant.

§ 2.907 Certification.

(a) Certification is an equipment authorization issued by the Commission, based on representation and test data submitted by the applicant.

(b) Certification attaches to all units subsequently marketed by the grantee which are identical (see Section 2.908) to the sample tested except for permissive changes or other variations authorized by the Commission pursuant to Section 2.1043.

[1] In this case, the equipment is subject to the rules of Part 15. More specifically, the equipment falls under Subpart B (of Part 15), which deals with unintentional radiators.

Certification & User's Manual Information

§ 2.948 Description of measurement facilities.

(a) Each party making measurements of equipment that is subject to an equipment authorization under Part 15 or Part 18 of this chapter, regardless of whether the measurements are filed with the Commission or kept on file by the party responsible for compliance of equipment marketed within the U.S. or its possessions, shall compile a description of the measurement facilities employed.

(1) If the measured equipment is subject to the verification procedure, the description of the measurement facilities shall be retained by the party responsible for verification of the equipment.

(i) If the equipment is verified through measurements performed by an independent laboratory, it is acceptable for the party responsible for verification of the equipment to rely upon the description of the measurement facilities retained by or placed on file with the Commission by that laboratory. In this situation, the party responsible for the verification of the equipment is not required to retain a duplicate copy of the description of the measurement facilities.

(ii) If the equipment is verified based on measurements performed at the installation site of the equipment, no specific site calibration data is required. It is acceptable to retain the description of the measurement facilities at the site at which the measurements were performed.

(2) If the equipment is to be authorized by the Commission under the certification procedure, the description of the measurement facilities shall be filed with the Commission's Laboratory in Columbia, Maryland. The data describing the measurement facilities need only be filed once but must be updated as changes are made to the measurement facilities or as otherwise described in this section. At least every three years, the organization responsible for filing the data with the Commission shall certify that the data on file is current.

Certification & User's Manual Information

Label and User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart A — General:

§ 15.19 Labeling requirements.

(a) In addition to the requirements in Part 2 of this chapter, a device subject to certification or verification shall be labeled as follows:

(1) Receivers associated with the operation of a licensed radio service, e.g., FM broadcast under Part 73 of this chapter, land mobile operation under Part 90, etc., shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.

(2) A stand-alone cable input selector switch, shall bear the following statement in a conspicuous location on the device:

This device is verified to comply with Part 15 of the FCC Rules for use with cable television service.

(3) All other devices shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

(4) Where a device is constructed in two or more sections connected by wires and marketed together, the statement specified under paragraph (a) of this section is required to be affixed only to the main control unit.

(5) When the device is so small or for such use that it is not practicable to place the statement specified under paragraph (a) of this section on it, the information required by this paragraph shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed. However, the FCC identifier or the unique identifier, as appropriate, must be displayed on the device.

§ 15.21 Information to user.

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Verification & User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart B — Unintentional Radiators:

§ 15.105 Information to the user.

(a) For a Class A digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at own expense.

(b) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

– Reorient or relocate the receiving antenna.

– Increase the separation between the equipment and receiver.

– Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

– Consult the dealer or an experienced radio/TV technician for help.

B. ICES-003 Procedural & Labeling Requirements

The manufacturer, importer or supplier shall meet the labelling requirements set out in this section for every ITE unit:

- (i) Prior to marketing in Canada, for ITE manufactured in Canada, and;
- (ii) Prior to importation into Canada, for imported ITE.

The presence of the label on the ITE represents the manufacturer's or importer's Self-Declaration of Compliance (SDoC) to Industry Canada ICES-003. Each unit of an ITE model shall bear a label indicating the model's compliance with ICES-003.

The label shall be permanently affixed to the ITE or displayed electronically and its text must be clearly legible. When the dimension of the device is too small or it is otherwise not practical to place the label on the ITE, the label shall be placed in a prominent location in the user manual supplied with the ITE. The user manual may be in an electronic format and must be readily available.

Labeling Requirements:

Industry Canada ICES-003 Compliance Label:

CAN ICES-3 (*)/NMB-3(*)

* Insert either "A" or "B" but not both to identify the applicable Class of ITE

End of Report

