



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

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February 12, 2018

Ooma, Inc.
1880 Embarcadero Road
Palo Alto, CA 94303

Dear Ge Zhao,

Enclosed is the EMC Wireless test report for compliance testing of the Ooma, Inc., Telo Linx3 as tested to the requirements of Title 47 CFR 2015 edition for Part 15, Subpart D 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.

Joel Huna
Documentation Department

Reference: (\Ooma, Inc.\EMCS95585-FCC15D Rev. 3)

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Electromagnetic Compatibility Criteria Test Report

for the

**Ooma, Inc.
Model Telo Linx3**

Tested under
the FCC Rules contained in
Title 47 of the CFR, Part 15. Subpart D
for Intentional Radiators

MET Report: EMCS95585-FCC15D Rev. 3

February 12, 2018

Prepared For:

**Ooma, Inc.
1880 Embarcadero Road
Palo Alto, CA 94303**

Prepared By:
MET Laboratories, Inc.
914 West Patapsco Avenue, Baltimore, MD 2130

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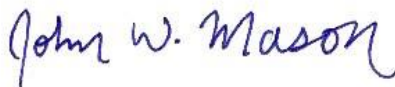


James Borrott, Project Engineer
Electromagnetic Compatibility Lab



Joel Huna
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 Subpart D, of the FCC Rules under normal use and maintenance.



John Mason,
Director, Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
Ø	December 5, 2017	Initial Issue.
1	December 20, 2017	Updated FCC ID.
2	February 1, 2018	TCB Corrections.
3	February 12, 2018	TCB Corrections.

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List of Terms and Abbreviations

AC	Alternating Current
ACF	Antenna Correction Factor
Cal	Calibration
<i>d</i>	Measurement Distance
dB	Decibels
dBμA	Decibels above one microamp
dBμV	Decibels above one microvolt
dBμA/m	Decibels above one microamp per meter
dBμV/m	Decibels above one microvolt per meter
DC	Direct Current
E	Electric Field
DSL	Digital Subscriber Line
ESD	Electrostatic Discharge
EUT	Equipment Under Test
<i>f</i>	Frequency
FCC	Federal Communications Commission
GRP	Ground Reference Plane
H	Magnetic Field
HCP	Horizontal Coupling Plane
Hz	Hertz
IEC	International Electrotechnical Commission
kHz	kilohertz
kPa	kilopascal
kV	kilovolt
LISN	Line Impedance Stabilization Network
MHz	Megahertz
μH	microhenry
μ	microfarad
μs	microseconds
NEBS	Network Equipment-Building System
PRF	Pulse Repetition Frequency
RF	Radio Frequency
RMS	Root-Mean-Square
TWT	Traveling Wave Tube
V/m	Volts per meter
VCP	Vertical Coupling Plane

I. Executive Summary

A. Purpose of Test

An EMC evaluation was performed to determine compliance of the Ooma, Inc. Telo Linx3, with the requirements of Part 15 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 Telo Linx3. 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 Telo Linx3, 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 D, in accordance with Ooma, Inc., purchase order number 9656.

Requirement	FCC Part	Test Procedure (Section numbers refer to ANSI C63.17 unless otherwise noted)	Result
Emission Bandwidth	15.303(c) & 15.323 (a)	6.1.3	Compliant
Conducted Emissions	15.315 & 15.207	ANSI C63.4	Compliant
Antenna Requirements	15.317 & 15.203	Declaration	Compliant
Use digital modulation	15.319 (b)	6.1.4	Compliant
Peak transmit power	15.303(f) & 15.319 (c)	6.1.2	Compliant
Power spectral density	15.319 (d) & 15.107	6.1.5	Compliant
Power adjustment for antenna gain	15.319 (e)	4.3.1	Compliant
Automatically discontinue transmission	15.319 (f)	--	Compliant
RF Exposure	15.319 (i) & 1.1307(b), 2.1091 and 2.1093	ANSI/IEEE C95.1	Compliant
Monitoring time	15.323 (c)(1)	7.3.4	Compliant
Monitoring threshold	15.323 (c)(2)	7.3	Compliant
Duration of transmission	15.323 (c)(3)	8.2.2	Compliant
Channel Acknowledgement	15.323 (c)(4)	8.1.1 & 8.1.2	Compliant
Channel confirmation	15.323 (c)(5.2)	7.3.3 & 7.3.4	Compliant
Power accuracy	15.323 (c)(5.3)	7.3.3	Compliant
Segment occupancy	15.323 (c)(5.4)	Declaration	Compliant
Random waiting	15.323 (c)(6)	8.1.3	Not Applicable
Monitoring bandwidth	15.323 (c)(7)	7.4	Compliant
Monitoring reaction time	15.323 (c)(1)	7.5	Compliant
Monitoring antenna	15.323 (c)(8)	4	Compliant
Monitoring threshold relaxation	15.323 (c)(9)	4	Compliant

Requirement	FCC Part	Test Procedure (Section numbers refer to ANSI C63.17 unless otherwise noted)	Result
Duplex connections	15.323 (c)(10)	8.3	Not Applicable
Alternate monitoring interval	15.323 (c)(11)	8.4	Not Applicable
Fair access	15.323 (c)(12)	Declaration	Compliant
Frame period	15.323 (e)	6.2.2 & 6.2.3	Compliant
Frequency stability	15.323 (f)	6.2.1	Compliant
Radiated Out of Band Emissions	15.309 (b) & FCC Part 15 Subpart B, 15.109 and 15.209	--	Compliant

Table 1. Executive Summary of EMC Part 15 Subpart D Compliance Testing

II. Equipment Configuration

A. Overview

MET Laboratories, Inc. was contracted by Ooma, Inc. to perform testing on the Telo Linx3, under Ooma, Inc.'s purchase order number 9656.

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., Telo Linx3.

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

Model(s) Tested:	Telo Linx3	
Model(s) Covered:	Telo Linx3	
EUT Specifications:	Primary Power: 110 VAC 50 Hz	
	FCC ID: XFT-TELOLINX3	
	Operating Mode:	DECT wireless technology based module
	Type of Modulations:	GFSK
	Emission Designators:	G1Q
	Equipment Code:	PUB
	EUT power:	20.05 dBm
	EUT Frequency Ranges:	1920-1930 MHz
	Time Slot Length	24/10[ms] (1 frame= 10ms, 24 slots per frame)
	Slots per Frame	24
	Number of Channels	5
Analysis:	The results obtained relate only to the item(s) tested.	
Environmental Test Conditions:	Temperature: 15-35° C	
	Relative Humidity: 30-60%	
	Barometric Pressure: 860-1060 mbar	
Evaluated by:	James Borrott	
Report Date(s):	February 12, 2018	

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
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
ANSI C63.17:2013	American National Standard Methods of Measurement of the Electromagnetic and Operational Compatibility of Unlicensed Personal Communications Services (UPCS) Devices
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

The Telo Linx3, Equipment Under Test (EUT), provides extension to Telo VOIP service using DECT wireless technology. It basically acts as a DECT portable part while providing dial-tone on its RJ11 jack. It has built in AC power supply and have 2 18650 Li-ion rechargeable battery to keep the unit running when there is a AC power failure.

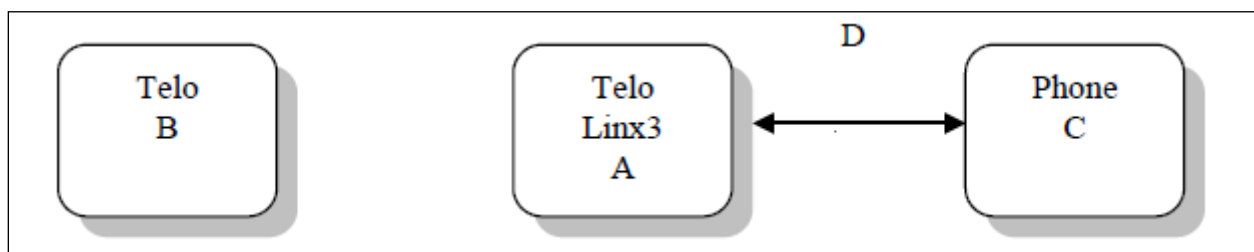


Figure 1. Block Diagram of Test Configuration

Channel No.	Frequency(MHz)
0	1928.448
1	1926.720
2	1924.992
3	1923.264
4	1921.536

Table 2. Frequency List

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	Slot #	Name / Description	Model Number	Part Number	Serial Number	Rev. #
A		Telo Linx3	Telo Linx3	140-0176-300	HB1519SB0753	Rev.1

Table 3. Equipment Configuration

F. Support Equipment

Support equipment necessary for the operation and testing of the EUT is included in the following list.

Ref. ID	Name / Description	Manufacturer	Model Number
B	Telo	Ooma.Inc	Ooma Telo
C	Phone Handset	ATT&T	210

Table 4. Support Equipment

G. Ports and Cabling Information

Ref. ID	Port Name on EUT	Cable Description	Qty.	Length (m)	Shielded (Y/N)	Termination Point
D	RJ11	Phone Cable	1		N	

Table 5. Ports and Cabling Information

H. Mode of Operation

Telo Linx3 must be bonded to Telo. Connect a phone handset to RJ11 jack and plug to AC outlet. The unit will connect to Telo and allow to make and receive phone calls via the attached phone set.

I. Method of Monitoring

Attach a phone handset and listen for dialtone. If you hear dialtone, then the unit is operating as intended.

J. Modifications

a) Modifications to EUT

No modifications were made to the EUT.

b) Modifications to Test Standard

No modifications were made to the standard.

K. 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 Intentional Radiators

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.203 Antenna Requirement

Test Requirement: **§ 15.203:** An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

The structure and application of the EUT were analyzed to determine compliance with Section 15.203 of the Rules. Section 15.203 states that the subject device must meet at least one of the following criteria:

- a.) Antenna must be permanently attached to the unit.
- b.) Antenna must use a unique type of connector to attach to the EUT.
- c.) Unit must be professionally installed. Installer shall be responsible for verifying that the correct antenna is employed with the unit.

Results: The EUT as tested is compliant the criteria A of §15.203. The antenna is permanently attached to the unit.

Test Engineer(s): James Borrott

Test Date(s): October 18, 2017

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.315 & 15.207 Conducted Emissions

Test Requirement(s): § 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 μ H/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 (dB μ V)	
	Quasi-Peak	Average
* 0.15- 0.45	66 - 56	56 - 46
0.45 - 0.5	56	46
0.5 - 30	60	50

Table 6. 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 μ H 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 μ H 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.

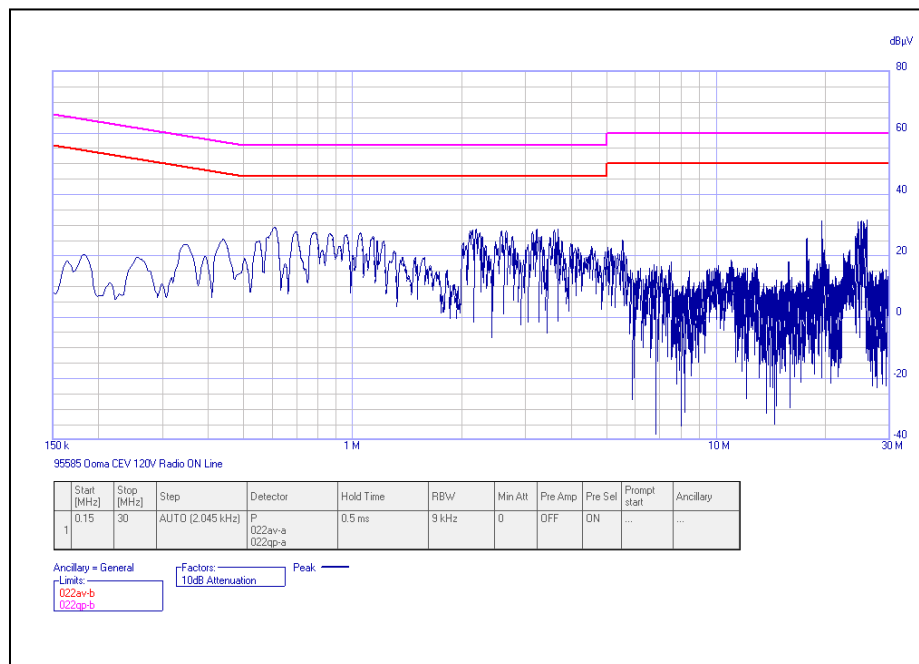
Results: The EUT as tested is compliant the requirements of this section.

Test Engineer(s): James Borrott

Test Date(s): August 1, 2017

Line	Freq (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
Line	0.610125	38.23	56	-17.77	Pass	21.7	46	-24.3	Pass
Line	3.20114	24.85	56	-31.15	Pass	10.09	46	-35.91	Pass
Line	19.4139	16.61	60	-43.39	Pass	2.73	50	-47.27	Pass
Line	25.01106	26.23	60	-33.77	Pass	14.38	50	-35.62	Pass
Line	25.83725	14.54	60	-45.46	Pass	1.51	50	-48.49	Pass
Line	24.45074	26.85	60	-33.15	Pass	13.13	50	-36.87	Pass

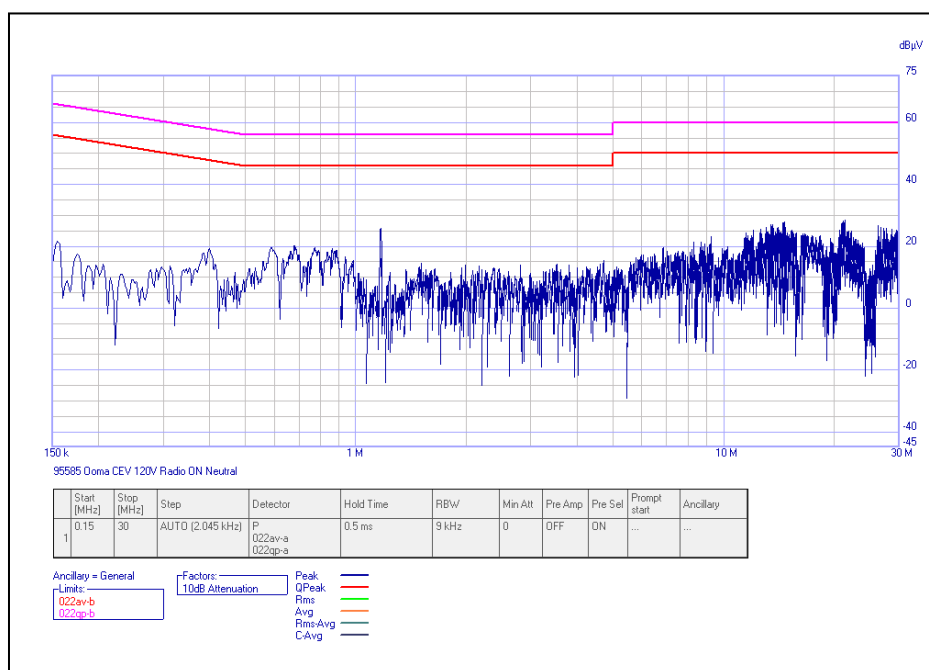
Table 7. Conducted Emissions, Line, Test Results



Plot 1. Conducted Emissions, Line, Test Results

Line	Freq (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
Neutral	1.170455	32.19	56	-23.81	Pass	27.76	46	-18.24	Pass
Neutral	12.54883	24.82	60	-35.18	Pass	11.27	50	-38.73	Pass
Neutral	14.55907	23.93	60	-36.07	Pass	10.61	50	-39.39	Pass
Neutral	21.23599	24.46	60	-35.54	Pass	11.53	50	-38.47	Pass
Neutral	26.09082	23.96	60	-36.04	Pass	9.75	50	-40.25	Pass
Neutral	29.948	23.99	60	-36.01	Pass	11.23	50	-38.77	Pass

Table 8. Conducted Emissions, Neutral, Test Results



Plot 2. Conducted Emissions, Neutral, Test Results

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.319(b) Modulation Techniques

Test Requirement: § 15.319: All transmissions must use only digital modulation techniques.

Test Procedure: Attestation of manufacturer supported by reference to relevant DECT specifications.

Attestation: This device is compliant with the DECT standards described in FCC Part 15 D. DECT transmissions are MC/TDMA/TDD (Multi carrier / Time Division Multiple Access / Time Division Duplex) using Digital GFSK modulation. For further details see operational description or relevant portions of the DECT standards.

Results: The EUT as tested is compliant the criteria of §15.319(b).

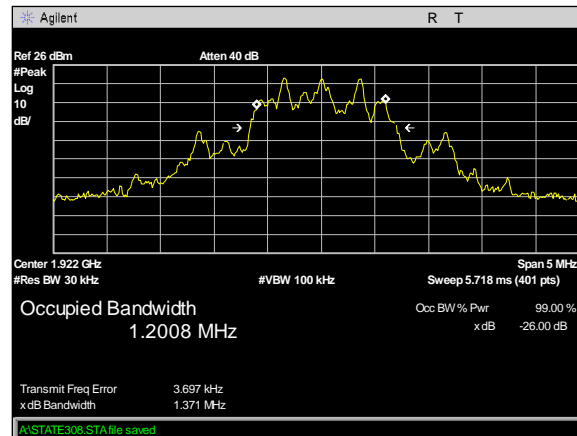
Test Engineer(s): James Borrott

Test Date(s): October 19, 2017

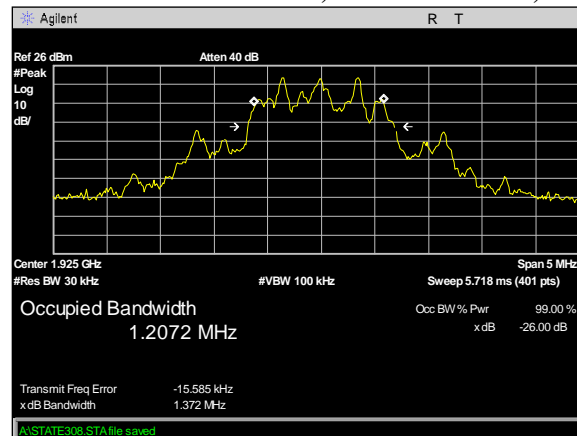
Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.323(a) Emission Bandwidth

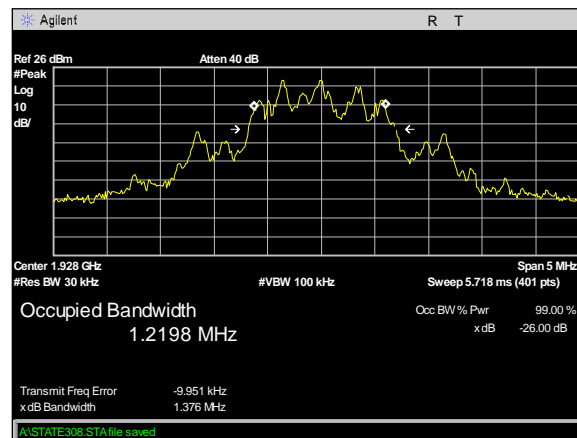
Test Criteria:	§ 15.323(a): For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Compliance with the emissions limits is based on the use of measurement instrumentation employing a peak detector function with an instrument resolutions bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.
Test Procedure:	Operation shall be contained within the 1920-1930 MHz band. The emission bandwidth shall be less than 2.5 MHz. The power level shall be as specified in §15.319(c), but in no event shall the emission bandwidth be less than 50 kHz.
Test Results	The EUT was compliant with this requirement.
Test Engineer(s):	James Borrott
Test Date(s):	October 18, 2017



Plot 3. Emission Bandwidth, 26 dB Bandwidth, Low,



Plot 4. Emission Bandwidth, 26 dB Bandwidth, Mid,



Plot 5. Emission Bandwidth, 26 dB Bandwidth, High,

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.319(c) Peak Transmit Power

Test Criteria: §15.319(c): The peak transmit power shall not exceed 100 microwatts multiplied by the square root of the emission bandwidth in hertz. Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement for the emission in question over the full bandwidth of the channel.

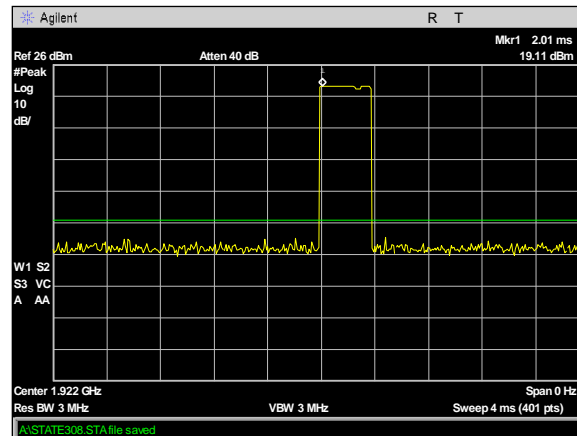
Test Procedure: Testing to ANSI C63.17-2013 Clause 6.1.2, which provides the test methodology for this provision. The EUT is controlled from a personal computer and set into continuous transmission mode.

Test Results: Equipment is compliant with the Peak Transmit Output limits of § 15.319(c).

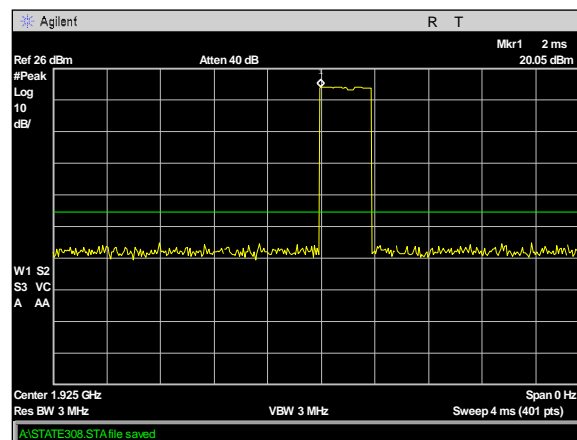
Peak Transmit Power Limit= $5\text{Log}(1.372 \exp 6) - 10\text{dBm}$
20.687dBm

Test Engineer(s): James Borrott

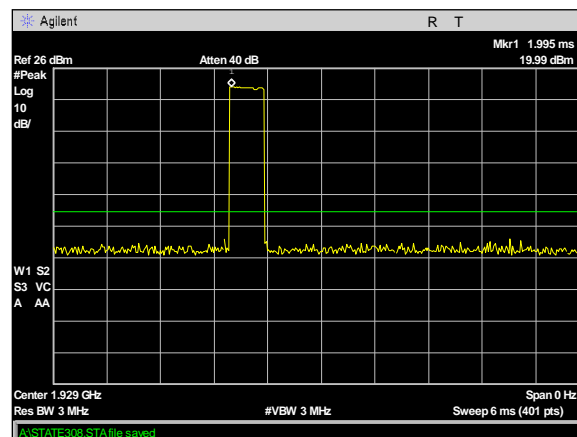
Test Date(s): October 18, 2017



Plot 6. Peak Transmit Power, Low Channel



Plot 7. Peak Transmit Power, Mid Channel

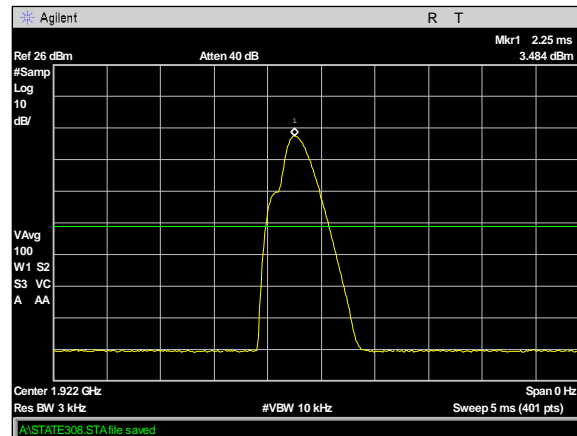


Plot 8. Peak Transmit Power, High Channel

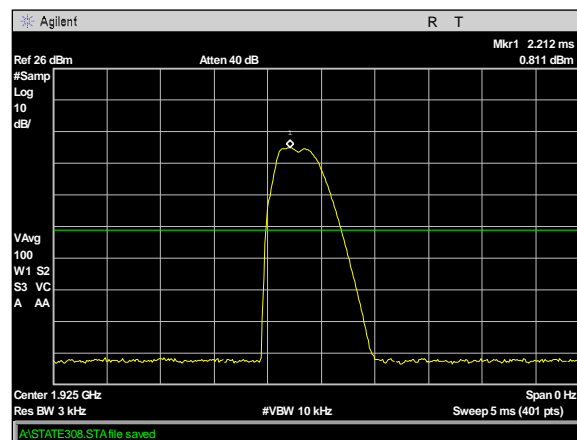
Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.319(d) Power Spectral Density

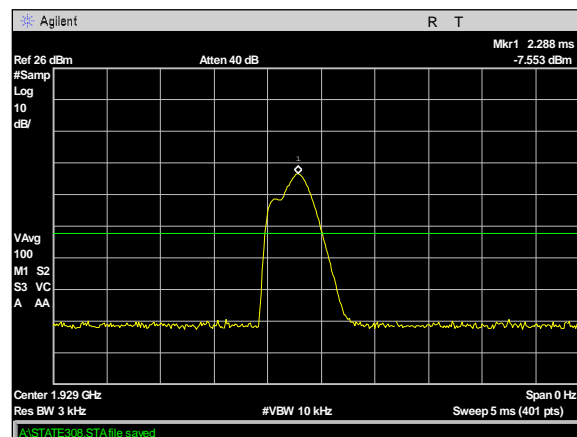
Test Criteria:	§15.319(d): Power spectral density shall not exceed 3 milliwatts in any 3 kHz bandwidth as measured with a spectrum analyzer having a resolution bandwidth of 3 kHz.
Test Procedure:	Testing to ANSI C63.17-2013 Clause 6.1.5, which provides the test methodology for this provision.
Test Results:	Equipment was found compliant with the Power Spectral Density limits of § 15.319(d) .
Test Engineer(s):	James Borrott
Test Date(s):	October 18, 2017



Plot 9. Power Spectral Density, Low Channel



Plot 10. Power Spectral Density, Mid Channel



Plot 11. Power Spectral Density, High Channel

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.319(e) Power Adjustment for Antenna Gain

Test Criteria:	§15.319(e): The peak transmit power shall be reduced by the amount in decibels that the maximum directional gain of the antenna exceeds 3 dBi.
Test Procedure:	Testing to ANSI C63.17-2013 Clause 4.3.1, which provides the test methodology for this provision.
Test Results:	<p>Equipment Employs a 2.5 dBi Antenna. Max output power allowed with this gain by the EUT is 20.67dBm. The Max output power does not need to be reduced.</p> <p>The Output Power was found to be compliant with the Power Adjustment for Antenna Gain requirements of §15.319(e). Antenna Gain is 3 dBi; no adjustments needed.</p>
Test Engineer(s):	James Borrott
Test Date(s):	October 19, 2017

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.319(f) Automatically Discontinue Transmission

Test Criteria: §15.319(f): The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude transmission of control and signaling information or use of repetitive codes used by certain digital technologies to complete frame or burst intervals.

Test Results: Equipment was found compliant with the Automatic Discontinuance of transmission in accordance with §15.319(f).

Test Engineer: James Borrott

Test Date: October 20, 2017

	Test	Reaction of EUT	Result
1	Remove Power from Companion Device	A	Pass
2	Switch off the companion device	NA 1	Pass
3	Terminate call at the companion device	A	Pass
4	Switch off the EUT	A	Pass
5	Terminate call at the EUT	A	Pass

Table 9. Automatic Discontinuance of Transmission, Test Results

NA 1 - Companion Device does not have an on/off switch.

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.

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
1924.992	20.05	101.158	3	1.995	0.04015	1	0.95985	20	Pass

Table 10. RF Exposure

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.323(c)(7) Monitoring Reaction Time

Test Criteria: §15.323 (c)(7) If a signal is detected that is 6 dB or more above the applicable threshold level, the maximum reaction time shall be $35 \times \text{SQRT}(1.25/\text{emission bandwidth in MHz})$ microseconds but shall not be required to be less than 35 microseconds.

Test Procedure: Testing to ANSI C63.17-2013 Clause 7.5, which provides the test methodology for this provision..

Test Results: The EUT was found to be compliant with the requirements of this section.

Test Engineer(s): James Borrott

Test Date(s): October 25, 2017

Test Equation(us)	Pulse Width(us)	Interferer Level(dBm)	Connection Made	Pass/Fail
$50\sqrt{(1.25/B)}$	50	Tl+Um	No	Pass
$35\sqrt{(1.25/B)}$	35	Tl+Um+6	No	Pass
Note:	1.Tl is the calculated threshold. 2.Um is Margin of uncertainty in threshold measurements(6 dB)			

Table 11. Monitoring of Intended Transmit Window and Maximum Reaction Time, Test Results

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.323(c)(2); (c)(9) Monitoring Threshold

Test Criteria: §15.323 (c)(2). The monitoring threshold must not be more than 30 dB above the thermal noise power for a bandwidth equivalent to the emission bandwidth used by the device.

§15.323 (c)(9). Devices that have a power output lower than the maximum permitted under this subpart may increase their monitoring detection threshold by one decibel for each one decibel that the transmitter power is below the maximum permitted.

Test Procedure: Testing to ANSI C63.17-2013 Clause 7.3, which provides the test methodology for this provision. The Clause states that the lower threshold is for devices that do not use the LIC procedure. The equation for the lower monitoring threshold is given in ANSI C63.17 Clause 4.3.4.

Test Results: The EUT is compliant with this requirement.

Test Engineer(s): James Borrott

Test Date(s): October 25, 2017

Lower Threshold		
B	1.372	MHz
MI	30	dB
Peut	20.05	dBm
Tl =	-81.996	dBm
Upper Threshold		
B	1.372	MHz
Mu	50	dB
Peut	20.05	dBm
Tu =	-61.996	dBm

Table 12. Monitoring Threshold, Test Results

Monitor threshold	Measured Threshold level (dBm)	Limit(dBm)
Lower Threshold	-89.4	-81.996
Upper Threshold	-69.4	-61.996

Table 13. Monitoring Threshold, Test Limits

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.323(c)(3) Duration of Transmission

Test Criteria: §15.323 (c)(3) If no signal above the threshold level is detected, transmission may commence and continue with the same emission bandwidth in the monitored time and spectrum windows without further monitoring. However, occupation of the same combined time and spectrum windows by a device or group of cooperating devices continuously over a period of time longer than 8 hours is not permitted without repeating the access criteria.

Test Procedure: Testing to ANSI C63.17-2013 Clause 4, which provides the test methodology for this provision. A communication link is established between BS and MS in a conducted mode and in a room without other US DECT devices to prevent influence from other transmissions. According to FCC Part 15.323(c)(3), the access criteria have to be verified at least every 8 hours. The following test is performed:

Test Results: The equipment was found to be compliant with the requirements of this section.

Test Engineer: James Borrott

Test Date: November 7, 2017

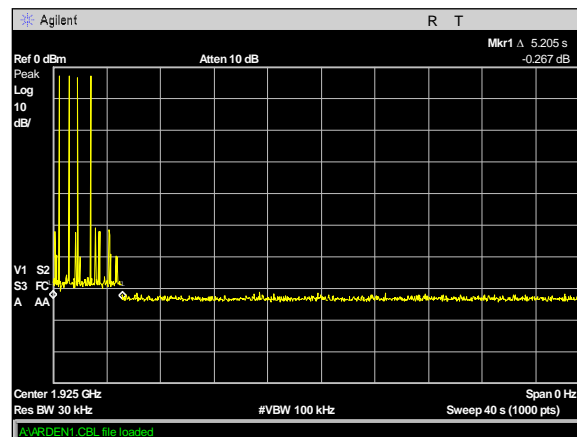
Maximum Transmission Time	Maximum Transmission Time Limit	Pass/Fail
<4.5 Hours	<8 hours	Pass

Table 14. Duration of Transmission, Test Results

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.323(c)(4) Connection Acknowledgment

Test Criteria:	§15.323 (c)(4) Once access to specific combined time and spectrum windows is obtained an acknowledgment from a system participant must be received by the initiating transmitter within one second or transmission must cease. Periodic acknowledgments must be received at least every 30 seconds or transmission must cease. Channels used exclusively for control and signaling information may transmit continuously for 30 seconds without receiving an acknowledgment, at which time the access criteria must be repeated.
Test Procedure:	Testing to ANSI C63.17-2013 Clause 8.2.1, which provides the test methodology for this provision. This subclause tests the EUT response to the lack of initial or continuing acknowledgements from the companion device under conditions where acknowledged transmissions are expected.
Test Results:	The EUT was compliant with this requirement.
Test Engineer(s):	James Borrott
Test Date(s):	October 20, 2017



Plot 12. Connection Acknowledgment

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.323(c)(5) Selected Channel Confirmation, Power Accuracy, Segment Occupancy

Test Criteria:

§15.323 (c)(5) If access to spectrum is not available as determined by the above, and a minimum of 40 duplex system access channels are defined for the system, the time and spectrum windows with the lowest power level below a monitoring threshold of 50 dB above the thermal noise power determined for the emission bandwidth may be accessed. A device utilizing the provisions of this paragraph must have monitored all access channels defined for its system within the last 10 seconds and must verify, within the 20 milliseconds (40 milliseconds for devices designed to use a 20 milliseconds frame period) immediately preceding actual channel access that the detected power of the selected time and spectrum windows is no higher than the previously detected value. The power measurement resolution for this comparison must be accurate to within 6 dB. No device or group of co-operating devices located within 1 meter of each other shall during any frame period occupy more than 6 MHz of aggregate bandwidth, or alternatively, more than one third of the time and spectrum windows defined by the system.

Test Procedure:

Testing to ANSI C63.17-2013 Clause 7.3.2. & 7.3.3, which provides the test methodology for this provision. The current product offers 12 duplex channels per frequency channel and therefore 12x5=60 duplex channels in total. Hence Part §15.323(c)(5) applies. The equation for the upper monitoring threshold is given in ANSI C63.17 Clause 4.3.3.

Max measured interference level (dBm) = -85.02 dBm

Test a)

Interference is applied on f1 at a level of $T_u + U_m$. Verify a connection is established on f2.

Test b)

Interference is applied on f2 at a level of $T_u + U_m$ and immediately removed from f1 and the EUT is immediately caused to attempt transmission. In this case the EUT should transmit on f1.

Test Results:

The EUT was compliant with this requirement.

Test Engineer(s):

James Borrott

Test Date(s):

October 25, 2017

Test	Transmit on f1	Transmit on f2	Wanted Transmit Channel	Pass/Fail
a	No	Yes	f2	Pass
b	Yes	No	f1	Pass
Note:	1. f1: 1926.725MHz f2: 1928.450MHz			

Table 15. Selected Channel Confirmation, Test Results

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.323(c)(6) Random Waiting

Test Criteria: §15.323 (c)(6)) If the selected combined time and spectrum windows are unavailable, the device may either monitor and select different windows or seek to use the same windows after waiting an amount of time, randomly chosen from a uniform random distribution between 10 and 150 milliseconds, commencing when the channel becomes available.

Test Procedure: Testing to ANSI C63.17-2013 Clause 8.1.3, which provides the test methodology for this provision.

Test B)

Activate the EUT with no interference present. The EUT must transmit on f1. Then apply CW interference on f1. The interference level shall be at TL + UM. The EUT must stop transmitting within 30 s.

Test C)

Cancel the interference. Measure the time interval between the end of the interference transmission and the beginning of transmission by the EUT.

Test Results: The EUT was found to be not applicable with the requirements of this standard. The Manufacturer declared that this provision is not utilized by the EUT.

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.323(c)(7) Monitoring Bandwidth

Test Criteria: §15.323 (c)(7) The monitoring system bandwidth must be equal to or greater than the emission bandwidth of the intended transmission and have a maximum reaction time less than $50 \times \text{SQRT}(1.25 / \text{emission bandwidth in MHz})$ microseconds for signals at the applicable threshold level but shall not be required to be less than 50 microseconds. If a signal is detected that is 6 dB or more above the applicable threshold level, the maximum reaction time shall be $35 \times \text{SQRT}(1.25 / \text{emission bandwidth in MHz})$ microseconds but shall not be required to be less than 35 microseconds.

Test Procedure: Testing to ANSI C63.17-2013 Clause 7.4, which provides the test methodology for this provision.

Test Results: The EUT was found compliant to this requirement.

Monitoring BW: Per Manufacturer the monitoring is made through the radio receiver used by the EUT for communication, the intended bandwidth requirement on the monitoring system is met.

Monitoring Reaction Time: The Manufacturer declares that this provision is not utilized by the EUT.

Test Engineer(s): James Borrott

Test Date(s): October 19, 2017

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.323(c)(8) **Monitoring Antenna**

Test Criteria:	§15.323 (c)(8)) Transmission is intended to occupy. The following criteria must be met: (8) The monitoring system shall use the same antenna used for transmission, or an antenna that yields equivalent reception at that location.
Test Procedure:	Testing to ANSI C63.17-2013 Clause 4, which provides the test methodology for this provision.
Attestation:	The EUT was found to be compliant with the requirements of this section. The same antenna is used for monitoring and transmission.
Test Engineer(s):	James Borrott
Test Date(s):	October 19, 2017

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.323(c)(10) Duplex Connections

Test Criteria: §15.323 (c)(10) An initiating device may attempt to establish a duplex connection by monitoring both its intended transmit and receive time and spectrum windows. If both the intended transmit and receive time and spectrum windows meet the access criteria, then the initiating device can initiate a transmission in the intended transmit time and spectrum window. If the power detected by the responding device can be decoded as a duplex connection signal from the initiating device, then the responding device may immediately begin transmitting on the receive time and spectrum window monitored by the initiating device.

Test Procedure: Testing to ANSI C63.17-2013 Clause 8.3, which provides the test methodology for this provision. The MS is the initiating device and the BS is the companion device.

Test b)

The system is restricted to operation on one frequency(1924.992 MHz) using administration. Verify that a connection between the EUT and its companion device aca n be made.

Test c) & d)

Apply interference at TL + UM per carrier to the EUT on the enabled carrier(s) on all of its receive time/spectrum windows except one, which has interference at least 10 dB below TL.

Apply interference at TL + UM to the EUT on all transmit time/spectrum windows on the enabled carrier(s). Ensure that the interference levels at the companion device are at least 10 dB below TL for all time/spectrum windows. The EUT should not establish a connection.

Test e) & f)

If a connection exists, terminate it. Apply interference at TL + UM to the EUT on the enabled carrier(s) on all of its transmit time/spectrum windows except one, which has interference at least 10 dB below TL. Apply interference at TL + UM to the EUT on all receive time/spectrum windows on the enabled carrier(s). Ensure that the interference level at the companion device is at least 10 dB below TL for all time/spectrum windows. The EUT should not establish a connection.

Test Results: The EUT was found to be not applicable with the requirements of this section. The Manufacturer declared that this provision is not utilized by the EUT.

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.323(c)(11) **Alternative Monitoring Interval For Co-Located Devices**

Test Criteria:	§15.323 (c)(11) An initiating device that is prevented from monitoring during its intended transmit window due to monitoring system blocking from the transmissions of a co-located (within one meter) transmitter of the same system, may monitor the portions of the time and spectrum windows in which they intend to receive over a period of at least 10 milliseconds. The monitored time and spectrum window must total at least 50 percent of the 10 millisecond frame interval and the monitored spectrum must be within the 1.25 MHz frequency channel(s) already occupied by that device or co-located co-operating devices. If the access criteria is met for the intended receive time and spectrum window under the above conditions, then transmission in the intended transmit window by the initiating device may commence.
Test Procedure:	Testing to ANSI C63.17-2013 Clause 8.4, which provides the test methodology for this provision. The MS is initiating device and the BS is the companion device.
Test Results:	The EUT was found not applicable with the requirements of this requirement. The Manufacturer declared that this provision is not utilized by the EUT.

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.323(c)(12) Fair Access

Test Criteria:	§15.323 (c)(12) The provisions of (c)(10) or (c)(11) of this section shall not be used to extend the range of spectrum occupied over space or time for the purpose of denying fair access to spectrum to other devices.
Test Procedure:	The manufacturer supplies an attestation.
Attestation:	The manufacturer declares that the EUT does not work in a mode which denies fair access to spectrum for other devices.

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.323(d)(1) Spurious Emissions

Test Criteria: §15.323(d)(1): Out of Band Emissions

Emissions shall be attenuated below a reference power of 112 milliwatts as follows: 30 dB between the band edge and 1.25 MHz above or below the band; 50 dB between 1.25 and 2.5 MHz above or below the band; and 60 dB at 2.5 MHz or greater above or below the band.

§15.323(d)(2): In-Band Emissions

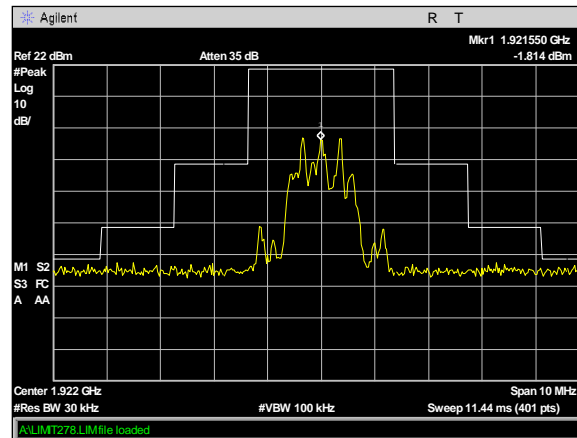
Emissions inside the band must comply with the following emission mask: In the bands between 1B and 2B measured from the center of the emission bandwidth, the total power emitted by the device shall be at least 30 dB below the transmit power permitted for that device; in the bands between 2B and 3B measured from the center of the emission bandwidth, the total power emitted by an intentional radiator shall be at least 50 dB below the transmit power permitted for that radiator; in the bands between 3B and the band edge, the total power emitted by an intentional radiator in the measurement bandwidth shall be at least 60 dB below the transmit power permitted for that radiator. "B" is defined as the emission bandwidth of the device in hertz. Compliance with the emission limits is based on the use of measurement instrumentation employing peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

Test Procedure: For both in and out of band emissions the EUT was connected directly to a spectrum analyzer. The RBW of the spectrum analyzer was set to a minimum 1% of the emission band width.

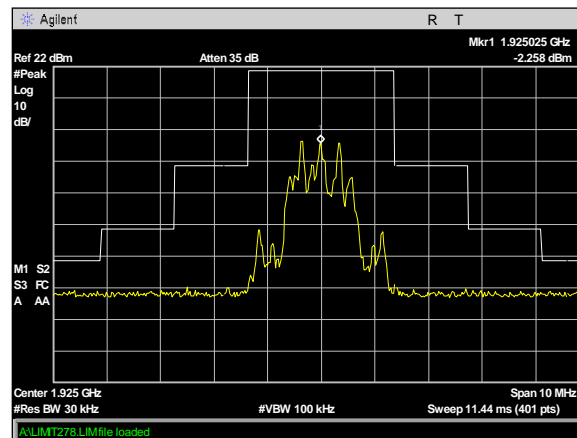
Test Results: Equipment compliant with the Spurious Emission limits of § 15.323(d)(1).

Test Engineer(s): James Borrott and Jun Qi

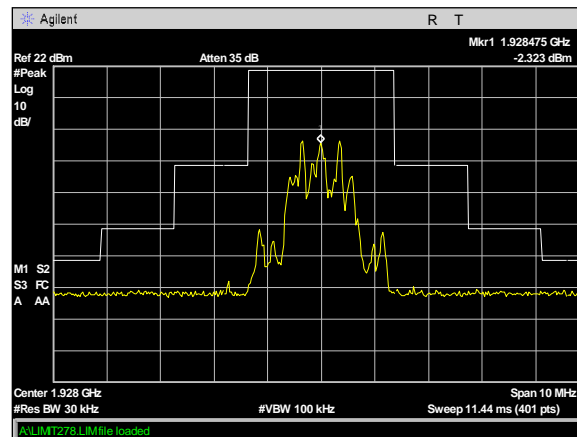
Test Date(s): October 19 and August 1, 2017



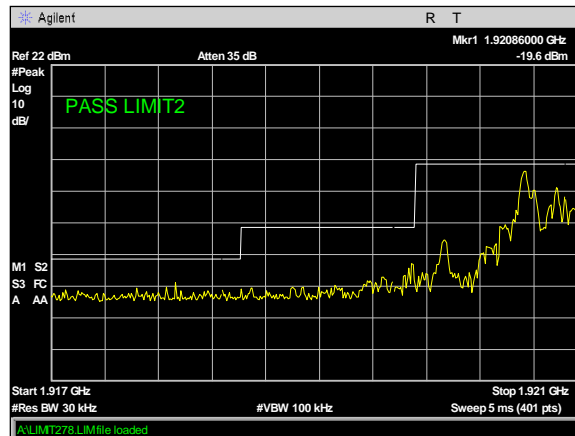
Plot 13. In-Band Unwanted Emissions, Low Channel



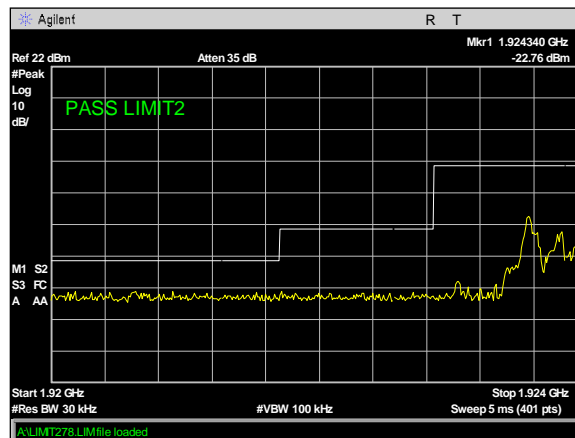
Plot 14. In-Band Unwanted Emissions, Mid Channel



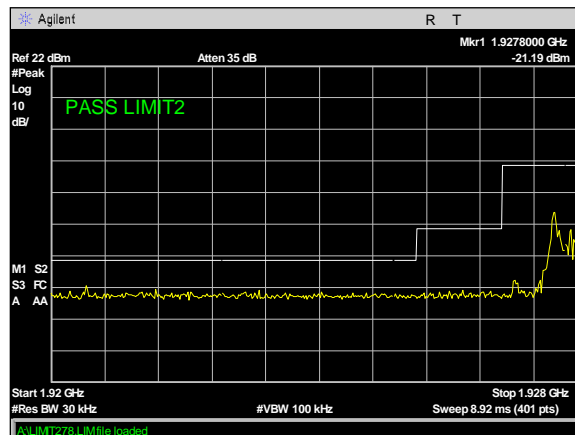
Plot 15. In-Band Unwanted Emissions, High Channel



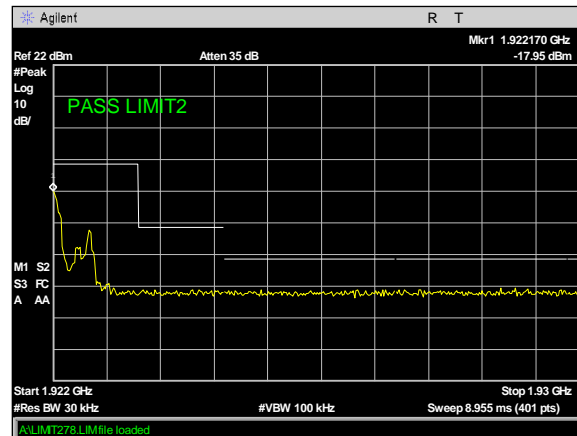
Plot 16. Spurious Emissions, Low Edge, Channel Low,



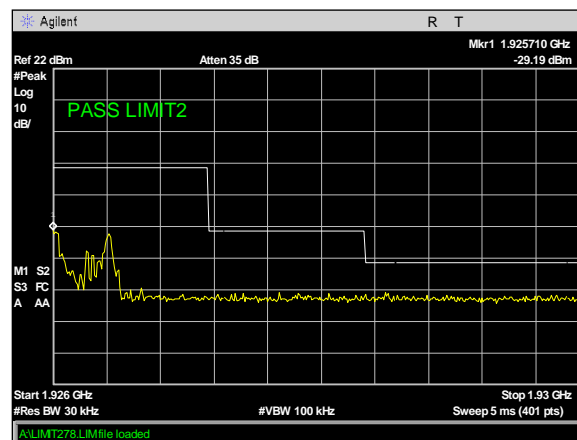
Plot 17. Spurious Emissions, Low Edge, Channel Mid,



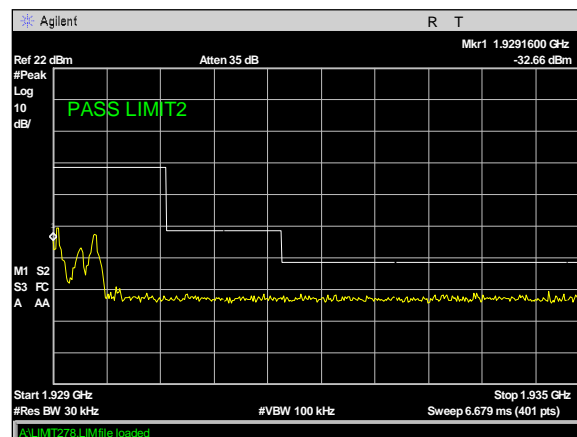
Plot 18. Spurious Emissions, Low Edge, Channel High,



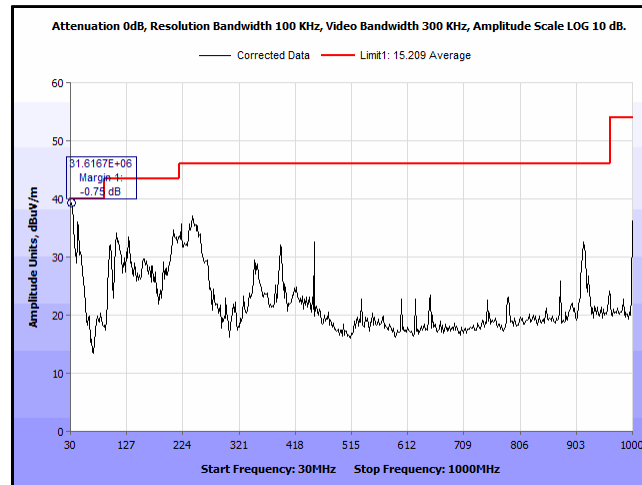
Plot 19. Spurious Emissions, High Edge, Channel Low



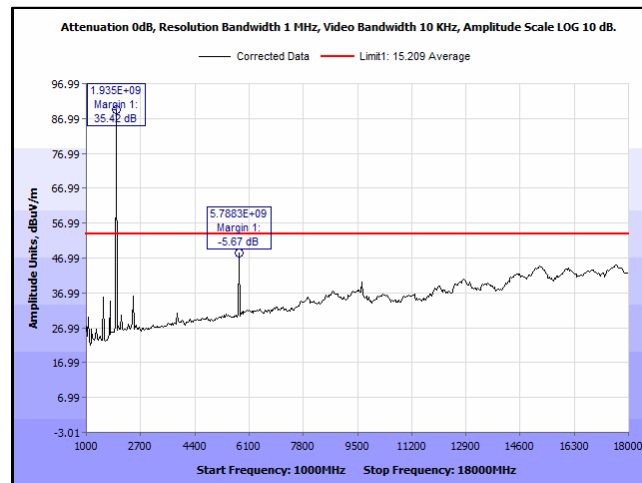
Plot 20. Spurious Emissions, High Edge, Channel Mid



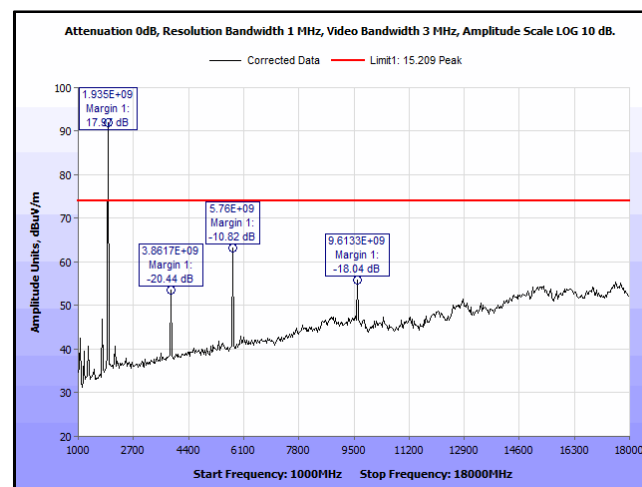
Plot 21. Spurious Emissions, High Edge, Channel High



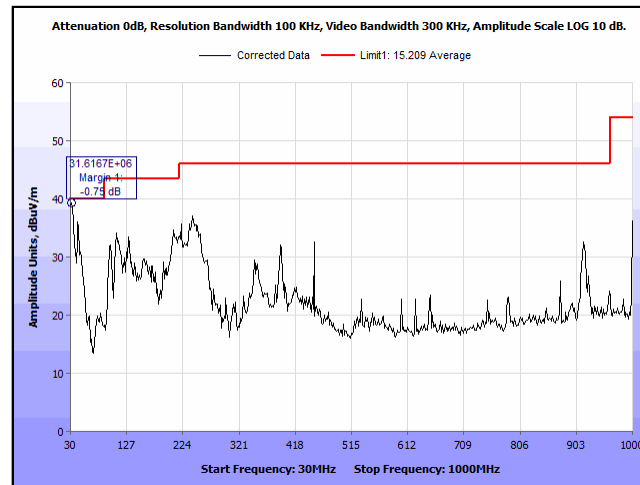
Plot 22. Spurious Emissions, 30 MHz – 1 GHz



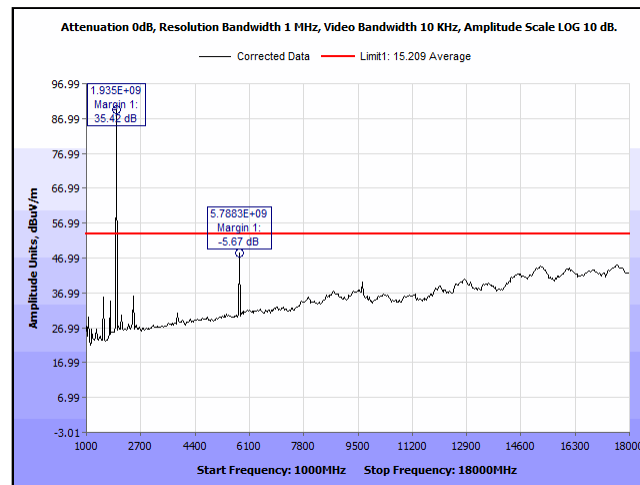
Plot 23. Spurious Emissions, 1 – 18 GHz, Average



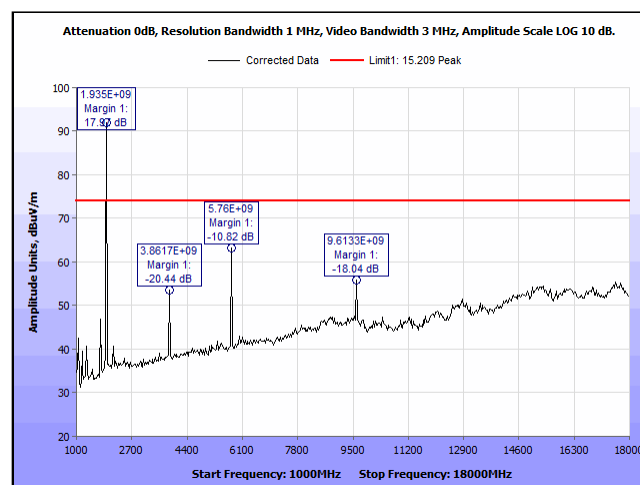
Plot 24. Spurious Emissions, 1 - 18 GHz, Peak



Plot 25. Radiated Spurious Emissions, 30 MHz – 1 GHz



Plot 26. Radiated Spurious Emissions, 1 GHz – 18 GHz, Average



Plot 27. Radiated Spurious Emissions, 1 GHz – 18 GHz, Peak

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.323(e) Frame Period

Test Criteria: §15.323 (e) The frame period (a set of consecutive time slots in which the position of each time slot can be identified by reference to a synchronizing source) of an intentional radiator operating in these sub-bands shall be 20 milliseconds or 10 milliseconds/X where X is a positive whole number. Each device that implements time division for the purposes of maintaining a duplex connection on a given frequency carrier shall maintain a frame repetition rate with a frequency stability of at least 50 parts per million (ppm). Each device which further divides access in time in order to support multiple communication links on a given frequency carrier shall maintain a frame repetition rate with a frequency stability of at least 10 ppm.

Timing Jitter

§ 15.323 (e) Specific requirements for isochronous devices operating in the 1920–1930 MHz sub-band. The jitter (time-related, abrupt, spurious variations in the duration of the frame interval) introduced at the two ends of such a communication link shall not exceed 25 microseconds for any two consecutive transmissions. Transmissions shall be continuous in every time and spectrum window during the frame period defined for the device.

Test Procedure: The manufacturer supplies an attestation.

Test Results: The EUT was found to be compliant with the requirements of this section.

Test Engineer(s): James Borrott

Test Date(s): October 24, 2017

Mean Frame Repetition (Hz)	Standard Deviation (Hz)	Frame Repetition Stability (ppm)	Limit (PPM)	Result
99.3932	0.0000416	1.255937	10	Pass

Frame Period, Test Results

Sample Calculation

Frame Repetition Stability = (3 x Standard Deviation) / Frame Rate) * 10⁶

Frame Rate = 1 / 10.061054880ms = 99.3932Hz

Measurement recorded:

Mean Frame rate = 1 / 10.061054880ms = 99.3932Hz

The following timing jitter was recorded:

Measured Max Jitter (µsec)	Limit (µsec)	Results
0.2	25	Pass

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.323(f) Frequency Stability

Test Criteria: §15.323 (f) The frequency stability of the carrier frequency of the intentional radiator shall be maintained within ± 10 ppm over 1 hour or the interval between channel access monitoring, whichever is shorter. The frequency stability shall be maintained over a temperature variation of -20° to $+50^{\circ}$ C at normal supply voltage and over a variation in the primary supply voltage of 85% to 115% of the rated supply voltage at a temperature of 20° C. For equipment that is capable only of operating from a battery, the frequency stability tests shall be performed using a new battery without any further requirement to vary supply voltage.

Test Procedure: The EUT was placed in the Environmental Chamber and support equipment are outside the chamber on a table. A CW signal was injected into the EUT at the appropriate RF level. The frequency counter option on the Spectrum Analyzer was used to measure frequency deviations. The frequency drift was investigated for every 10° C increment until the unit is stabilized then recorded the reading in tabular format with the temperature range of -20° to $+50^{\circ}$ C.

Voltage supplied to EUT is 120 VAC reference temperature was done at 20° C. The voltage was varied by ± 15 % of nominal

Test Results: The EUT was compliant with this requirement. Customer states that operating temperatures for this device are from 0-40 C.

Test Engineer(s): James Borrott

Test Date(s): October 30, 2017

Temperature (C)				
(Low Channel)				
Reference Frequency	Voltage (AC)	Temperature (C)	Frequency (MHz)	PPM
	120.00	50	1921.208250	3.318
	120.00	20	1921.201875	0.000
1921.201875	120.00	-20	1921.209375	3.904
(Mid Channel)				
Reference Frequency	Voltage (AC)	Temperature (C)	Frequency (MHz)	PPM
	120.00	50	1924.662125	2.078
	120.00	20	1924.658125	0.000
1924.658125	120.00	-20	1924.665625	3.897
(High Channel)				
Reference Frequency	Voltage (AC)	Temperature (C)	Frequency (MHz)	PPM
	120.00	50	1928.119375	2.593
	120.00	20	1928.114375	0.000
1928.114375	120.00	-20	1928.121875	3.890

Table 16. Frequency Stability, Temperature, Test Results

Voltage (AC)				
(Low Channel)				
	Voltage (AC)	Temperature (C)	Frequency (MHz)	PPM
Reference Frequency	102.00	20	1921.203125	0.651
	120.00	20	1921.201875	0.000
1921.201875	138.00	20	1921.203750	0.976
(Mid Channel)				
	Voltage (AC)	Temperature (C)	Frequency (MHz)	PPM
Reference Frequency	102.00	20	1924.659375	0.649
	120.00	20	1924.658125	0.000
1924.658125	138.00	20	1924.660625	1.299
(High Channel)				
	Voltage (AC)	Temperature (C)	Frequency (MHz)	PPM
Reference Frequency	102.00	20	1928.115625	0.648
	120.00	20	1928.114375	0.000
1928.114375	138.00	20	1928.115625	0.648

Table 17. Frequency Stability, Voltage, Test Results

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
1S3809	EMI Receiver	Narda Safety Test Solutions	PMM 9010F	2/2/2017	2/2/2018
1S3916	Spikeguard	FCC	FCC-450B-2.4-N	See Note	
1S3943	Digital Barometer	Control Company	6530	12/29/2015	12/29/2017
1S2691	Dual-line V-LISN	Teseq	NNB-51	2/24/2017	2/24/2018
1U0258	Spectrum Analyzer	Agilent Technologies	E4407B	02/03/2017	02/03/2018
1S2603	Double Ridged Waveguide Horn	ETS-Lindgren	3117	08/09/2016	08/09/2018

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 user's 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.

End of Report