
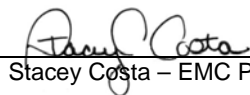




Test Report



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS

Report No	EL0055-3 Issue 2
Client	Sonos Mark Keefe
Address	25 First Street Suite 300 Cambridge, MA 02141
Phone	617-225-2110
Items tested	Play: 3
Standards	ICES-003 Issue 4, FCC 47 CFR Part 15
Test Dates	January 31 and February 3, 2011
Results	As detailed within this report
Prepared by	 Karl Klemm – Test Engineer
Authorized by	 Stacey Costa – EMC Project Manager
Issue Date	<u>6/3/2011</u>
Conditions of Issue	This Test Report is issued subject to the conditions stated in the 'Conditions of Testing' section on page 33 of this report.

Curtis-Straus LLC is accredited by the American Association for Laboratory Accreditation for the specific scope of accreditation under Certificate Number 1627-01. This report may contain data which is not covered by the A2LA accreditation.



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REV 11-MAR-10 (SC)



Summary

On January 31 to February 3, and 18, 2011 we tested the Play: 3 for compliance with the following requirements:

EMC Emissions:

- ICES-003 Issue 4 Class B Digital Apparatus emissions requirements (Canada)
- FCC 47 CFR Part 15 Class B emissions requirements (USA)

We found that the product met the above requirements without modification. Mark Keefe from Sonos was present during the testing. The test sample was received in good condition. The sample was received on January 31, 2011.

Please note that the Play: 3 is required to have only a single communications mode (wired or wireless) active at one time in order to meet the above requirements.

Issue No.	Reason for change	Date Issued
1	Original Release	June 3, 2011



Product Tested

Configuration Documentation

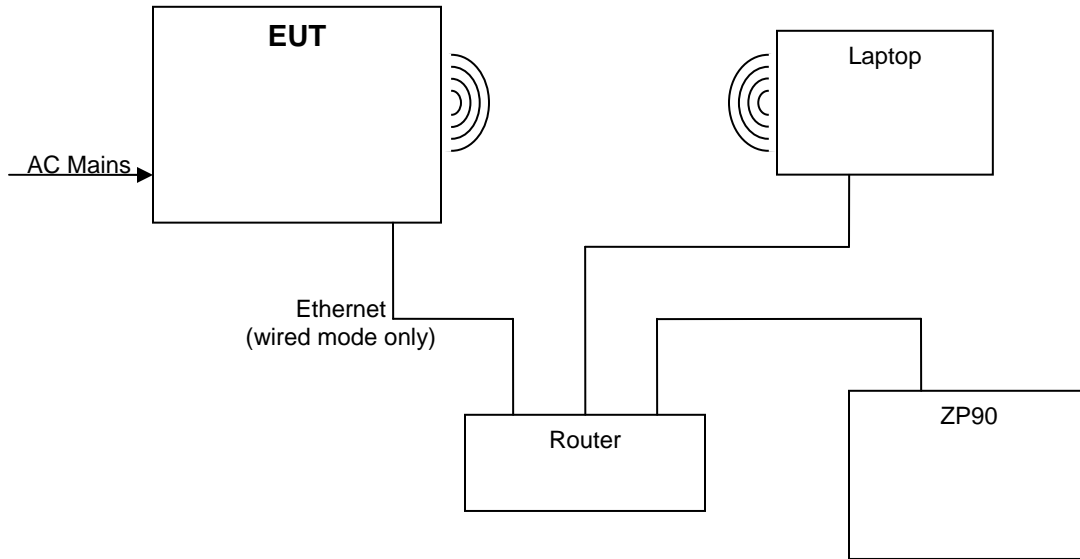
EUT Configuration										
Work Order: L0055 Company: Sonos Company Address: 25 First Street, Suite 300 Cambridge, MA 02141-1802 Contact: Mark Keefe Person Present: Mark Keefe										
EUT:			MN	PN	SN					
Play: 3				--	00E587001D6					
EUT Description: Multi-room music system EUT Max Frequency: 500MHz EUT Min Frequency: 25MHz										
Support Equipment:			MN	SN						
IBM Laptop			X32	2884A2U						
Netgear Router			FR314	00AB04B6D2						
Sonos ZonePlayer			ZP90	000E58285D98G						
EUT Ports:										
Port Label	Port Type	No. of ports	No. Populated	Cable Type	Shielded	Ferrites	Length	Max Length	In/Out NEBS Type	Unpopulated Reason
AC Power	Power AC	1	all	2-wire AC	no	none	2m	2m	in	
Ethernet	Ethernet	1	all	cat5	no	none	10m	100m	in	not used in wireless mode
Software / Operating Mode Description:										
EUT receives streaming music through an ethernet or wireless connection and plays the songs.										

Clock Frequencies

EUT Frequencies (MHz)
25
62.5
100
125
250
500



Block Diagram



Compliance Statement

TEST	RESULT	STANDARD	TEST LEVEL	MARGIN	COMMENTS
Radiated Emissions	PASS	ICES-003 Issue 4 / FCC 47 CFR Part 15	Class B	-5.0dB @ 270.9MHz	
AC Mains Conducted Emissions	PASS	ICES-003 Issue 4 / FCC 47 CFR Part 15	Class B	-3.6dB @ 2.96MHz	
Telco Line Conducted Emissions	PASS	ICES-003 Issue 4	Class B	-1.2dB @ 13.43MHz	

Modifications Required for Compliance

No modifications were required for compliance.

Note: Telco conducted emissions margin improved by 10dB operating in wired mode only.



RADIATED EMISSIONS**Test Method:**

In accordance with the following:

- ICES-003 Issue 4
- FCC 47 CFR Part 15

Results:

TEST	RESULT	TEST LEVEL	MARGIN	COMMENTS
<i>Radiated Emissions</i>	PASS	Class B	-5.0dB @ 270.9MHz	

Radiated Emissions Data Table(s):

Radiated Emissions Table												
Date: 31-Jan-11			Company: Sonos			Work Order: L0055						
Engineer: John Cushing			EUT Desc: Play: 3			EUT Operating Voltage/Frequency: 120V/60Hz						
Temp: 21.0°C			Humidity: 22%			Pressure: 1026mBar						
Frequency Range: 30-1000MHz						Measurement Distance: 3 m						
Notes: wired mode						EUT Max Freq: 500MHz						
Antenna Polarization (H/V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBµV/m)	CISPR Class B			FCC Class B		
							Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)	Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)
Wired Mode												
V	50.4	41.1	22.6	7.8	0.6	26.9	40.5	-13.6	Pass	40.0	-13.1	Pass
V	125.0	35.1	22.6	14.2	0.9	27.6	40.5	-12.9	Pass	43.5	-15.9	Pass
V	180.6	43.9	22.6	11.1	0.9	33.3	40.5	-7.2	Pass	43.5	-10.2	Pass
H	270.9	49.1	22.6	13.3	1.2	41.0	47.5	-6.5	Pass	46.0	-5.0	Pass
H	361.3	46.5	22.2	14.8	1.3	40.4	47.5	-7.1	Pass	46.0	-5.6	Pass
H	451.6	39.4	22.5	16.9	1.5	35.3	47.5	-12.2	Pass	46.0	-10.7	Pass
Wireless Mode												
V	55.25	40.1	22.6	7.2	0.6	25.3	40.5	-15.2	Pass	40.0	-14.7	Pass
V	115.7	38.0	22.6	13.6	0.8	29.8	40.5	-10.7	Pass	43.5	-13.7	Pass
V	180.6	43.0	22.6	11.1	0.9	32.4	40.5	-8.1	Pass	43.5	-11.1	Pass
V	206.0	40.4	22.6	10.6	1.1	29.5	40.5	-11.0	Pass	43.5	-14.0	Pass
H	270.9	47.6	22.6	13.3	1.2	39.5	47.5	-8.0	Pass	46.0	-6.5	Pass
H	361.3	46.6	22.2	14.8	1.3	40.5	47.5	-7.0	Pass	46.0	-5.5	Pass
Table Result: Pass by -5.0 dB Worst Freq: 270.9 MHz												
Test Site: EMI Chamber 1			Cable 1: Asset #1505			Cable 2: Asset #1507						
Analyzer: Asset #1327			Preamp: Blue			Antenna: Red-Brown						

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Spectrum Analyzers / Receivers /Preselectors SA EMI Chamber (1327)	Range 9kHz-13.2 GHz	MN E4405B	Mfr Agilent	SN MY45103416	Asset 1327	Cat I	Calibration Due 11-Mar-2011
Radiated Emissions Sites EMI Chamber 1	FCC Code 719150	IC Code 2762A-6	VCCI Code R-3032, G-106			Cat I	Calibration Due 15-Feb-2011
Preamps /Couplers Attenuators / Filters Blue	Range 0.009-2000MHz	MN ZFL-1000-LN	Mfr CS	SN N/A	Asset 759	Cat II	Calibration Due 6-Apr-2011
Antennas Red-Brown Bilog	Range 30-2000MHz	MN JB1	Mfr Sunol	SN A0032406	Asset 1218	Cat I	Calibration Due 25-Aug-2012
Meteorological Meters Temp./Humidity/Atm. Pressure Gauge CHAMBER1 Thermohyrometer		MN 7400 Perception II 35519-044	Mfr Davis Control Company	SN N/A 72457642	Asset 965 1345	Cat I II	Calibration Due 6-Apr-2011 18-Aug-2011
Cables Asset #1505 Asset #1507	Range 9kHz - 18GHz 9kHz - 26.5GHz		Mfr Florida RF Florida RF			Cat II II	Calibration Due 18-Aug-2011 18-Jan-2012

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.



Radiated Emissions Table														
Date: 31-Jan-11				Company: Sonos				Work Order: L0055						
Engineer: John Cushing				EUT Desc: Play; 3				EUT Operating Voltage/Frequency: 120V/60Hz						
Temp: 21.0°C				Humidity: 22%				Pressure: 1026mBar						
Frequency Range: 1-2GHz							Measurement Distance: 3 m							
Notes:														
Antenna Polarization (H/V)	Frequency (MHz)	Peak Reading (dBµV)	Average Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Peak Reading (dBµV/m)	Adjusted Avg Reading (dBµV/m)	CISPR Class B High Frequency - Peak			CISPR Class B High Frequency - Average		
									Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)	Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)
Wired Mode														
H	1175.0	36.5	29.3	21.2	26.1	2.5	43.9	36.7	70.0	-26.1	Pass	50.0	-13.3	Pass
Wireless Mode														
H	1175.0	36.8	29.1	21.2	26.1	2.5	44.2	36.5	70.0	-25.8	Pass	50.0	-13.5	Pass
Table Result: Pass by -13.3 dB Worst Freq: 1175.0 MHz														
Test Site: EMI Chamber 1				Cable 1: Asset #1505				Cable 2: Asset #1507						
Analyzer: Asset #1327				Preamp: Asset #1517				Antenna: Black Horn						

Rev: 28-Jan-2011

Spectrum Analyzers / Receivers / Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due
SA EMI Chamber (1327)	9kHz-13.2 GHz	E4405B	Agilent	MY45103416	1327	I	11-Mar-2011
Radiated Emissions Sites	FCC Code	IC Code	VCCI Code			Cat	Calibration Due
EMI Chamber 1	719150	2762A-6	R-3032, G-106			I	15-Feb-2011
Preamps / Couplers Attenuators / Filters	Range	MN	Mfr	SN	Asset	Cat	Calibration Due
1517 HF Preamp	1-18GHz	CS	CS	N/A	1517	II	1-Jun-2011
Antennas	Range	MN	Mfr	SN	Asset	Cat	Calibration Due
Black Horn	1-18GHz	3115	EMCO	9703-5148	56	I	6-Jul-2011
Meteorological Meters		MN	Mfr	SN	Asset	Cat	Calibration Due
Temp./Humidity/Atm. Pressure Gauge		7400 Perception II	Davis	N/A	965	I	6-Apr-2011
CHAMBER1 Thermohygrometer		35519-044	Control Company	72457642	1345	II	18-Aug-2011
Cables	Range		Mfr			Cat	Calibration Due
Asset #1505	9kHz - 18GHz		Florida RF			II	18-Aug-2011
Asset #1507	9kHz - 26.5GHz		Florida RF			II	18-Jan-2012

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

Radiated Emissions Modifications:
None



Radiated Emissions Testing Overview

REV 10-APR-09

Digital and microprocessor based devices use radio frequency (RF) digital signals for timing purposes. An unintentional consequence of this signal usage is that a certain amount of RF energy is radiated from the device into the local environment. This radiated RF energy has the potential to interfere with constructive uses of the RF spectrum such as television broadcasting, police and fire radio, and the like. In order to reduce the likelihood that a device will interfere with these services, it is required that the amplitudes of radiated RF signals from the device are kept below an allowable level.

These RF signals decrease in strength as the distance from the source increases. Thus if the potential victim of interference, e.g. a TV receiver, is far enough from the radiator, e.g. a computer, then no interference will occur. For certain environments it is appropriate to expect that potential interference victims will be located at least a minimum distance from the radiator. For the residential environment this distance is generally accepted to be 10 meters while in the commercial environment the accepted distance is 30 meters. The allowable emissions levels are therefore specified to protect equipment which is located further than that distance from the radiator. In general, radiation from the Equipment Under Test (EUT) is measured at 3 or 10 meters to insure that it is at or below allowable levels.

Measurements of the radiated energy are made by recording the field strength indicated by an antenna placed at a specific distance from the device. Most devices do not radiate the RF energy in a predictable manner. The emitted energy may vary with changes in operating mode, physical configuration, or orientation. During the measurement process these parameters are varied to confirm that the emissions will remain below the allowable levels in the range of typical installations.

The extent of annoyance experienced by a person who is being affected by interference is related to the persistence of the interfering signal. For example, a low level steady whine from a receiver is considered to be more annoying than brief, loud, intermittent pops or clicks. This “human factor” is accounted for by the use of a “quasi-peak” detector in the receiver or spectrum analyzer which measures the signal from the measurement antenna. The detector is a weighted averaging filter with a fast charge time and a slow discharge time. Thus steady continuous signals will charge the quasi-peak detector fully while intermittent signals (those with pulse repetition rates less than 1kHz) are reported at a level which can be significantly below their peak level. It should be noted that most RF signals produced by digital devices are continuous in nature and thus the quasi-peak reading will be identical to the peak signal reading. To reduce the test time, the peak emission level is recorded for continuous wave signals as it is the same as the quasi-peak signal level.

Testing is performed according to test methods from ANSI C63.4 and CISPR 22.

The test site used for measuring radiated emissions follows the format developed internationally for a weather protected Open Area Test Site (OATS). The test site used for



measuring radiated emissions above 1GHz for CISPR limits is a Free Space Open Area Test Site (FSOATS). An antenna mast is installed at the specified distance from a rotating table and is used to raise and lower the measuring antenna. The reference site is clear of reflecting objects, such as metal fences and buildings for an ellipse of twice the measurement test distance. Measuring equipment and personnel are present within the ellipse to facilitate cable manipulation, but measures are taken to minimize the effects. Often preliminary radiated emissions measurements are made at alternate test sites which do not meet the clear space reference criteria. The data collected at alternate test sites is not considered conclusive unless the alternate site also complies with a volumetric site attenuation survey performed over the area that the EUT occupies. The EUT and measuring antenna mark the two foci of the ellipse. The ground plane is made of a combination of galvanized steel sheets and tight wire mesh electrically connected along the seams. This metal ground plane extends 1 meter beyond the furthest extent of the EUT and the measuring antenna. It also covers the area between the EUT and the measuring antenna. The hardware cloth is connected to the utility ground or to stakes driven into the earth for safety. The site configuration for CISPR testing above 1GHz is a semi-anechoic chamber. The ground plane in the test volume is covered by an absorbing material between the antenna and the EUT. In the case of table top equipment, the absorbing material is also placed under the table. In the case of floor-standing equipment the absorbing material extends up from the ground plane 30cm into the test volume, and surrounds the EUT by at most 10cm from the footprint of the equipment.

In order for accurate emissions measurements to be made the test site must possess propagation characteristics which fall within accepted norms. The site has been checked for suitability using techniques specified in American National Standards Institute (ANSI) document C63.4. This document details a procedure which measures the attenuation of the site which is the chief indicator of site acceptability. The theory behind site attenuation is quite simple. A transmitting antenna is set up at a fixed location at one end of the site with a receiving antenna at the other end. If a signal of some arbitrary amplitude is fed into the transmitting antenna, a lesser amount of signal ought to be measured at the receiving antenna. This difference in signal amplitude is known as the site attenuation, which should follow a predicted curve. Data that does not correspond to the predicted site attenuation curve points to a problem with either the equipment being used or the physical characteristics of the site.

Actual emissions measurements are taken with broadband biconical-log-periodic hybrid antennas calibrated in accordance with the standard site method detailed in ANSI C63.5. Emissions are measured with the receiving antenna oriented in horizontal and vertical polarization with respect to the ground plane. If measurements are made at other than the limit distance, then the readings obtained are scaled to the limit distance using an inverse relationship. The actual test distance used is noted in the report.

The antenna mast is capable of a varying the antenna height between 1 and 4 meters above the ground plane. The receiving antenna is moved over this range at each emission frequency in order to record the maximum observed signal. The mast is non-conductive and remotely controllable. The test distance is measured from the antenna center (marked during calibration) and the periphery of the EUT.



The Equipment Under Test (EUT) is rotated in order to maximize emissions during the test. For equipment intended to operate on a tabletop or desk radiated tests are conducted on a 0.8 meter high, non-conductive platform. Larger floor standing equipment is tested on a floor mounted rotatable platform. In some cases, large equipment on its own casters may be tested without a platform.

Since radiated emissions are a function of cable placement, the cable placement is varied to encompass typical configurations that an end user might encounter to determine the configuration resulting in maximum emissions. At least one cable for each I/O port type is attached to the EUT. If peripherals or modules are available, at least one of each available type is installed and noted in the report. Excess cable length beyond one meter is bundled in the center into a 30 to 40 cm bundle. Cables requiring non-standard lead dress are recorded in the report.

Network connections are simulated if necessary. Any simulator used matches the expected real network connection in terms of both functionality and impedance. For distributed systems, the support equipment may be placed at such a distance that it does not influence the measured emissions. If this option is used, such placement is noted in the test report.

The possible operating modes of the EUT are explored to determine the configuration which maximizes emissions. Software is investigated as well as different methods of displaying data if available. Data is recorded in the worst case operating mode.

At least the six highest emissions with respect to the limit are recorded. If less than six emissions are visible above the noise floor of the instrumentation, then noise floor measurements at six representative frequencies are recorded. The test report will document if noise floor readings are reported.

FCC and European Norms Radiated Emissions Limits at 10 meters					
Frequency (MHz)	FCC Class A	FCC Class B	CISPR Class A	CISPR Class B	Frequency (MHz)
30-88	39.1	29.5	40	30	30-88
88-216	43.5	33.1	40	30	88-216
216-230	46.4	35.6	40	30	216-230
230-960	46.4	35.6	47	37	230-960
960-1000	49.5	43.5	47	37	960-1000
1000-3000	Avg: 49.5 Peak: 69.5	Avg: 43.5 Peak: 63.5	Not defined	Not defined	1000-3000
3000+	Avg: 49.5 Peak: 69.5	Avg: 43.5 Peak: 63.5	Not defined	Not defined	3000+

At the transitions, the lower limit applies.
Simple inverse scaling utilized to convert limits where appropriate.

FCC and European Norms Radiated Emissions Limits at 3 meters					
Frequency (MHz)	FCC Class A	FCC Class B	CISPR Class A	CISPR Class B	Frequency (MHz)



30-88	49.5	40	50.5	40.5	30-88
88-216	54	43.5	50.5	40.5	88-216
216-230	56.9	46	50.5	40.5	216-230
230-960	56.9	46	57.5	47.5	230-960
960-1000	60	54	57.5	47.5	960-1000
1000-3000	Avg: 60 Peak: 80	Avg: 54 Peak: 74	Avg: 56 Peak: 76	Avg: 50 Peak: 70	1000-3000
3000+	Avg: 60 Peak: 80	Avg: 54 Peak: 74	Avg: 60 Peak: 80	Avg: 54 Peak: 74	3000+
At the transitions, the lower limit applies. Simple inverse scaling utilized to convert limits where appropriate.					

The measurement range is based on the highest frequency signal present or used in the device. The following table details the frequency range of measurements performed.

Frequency range of radiated emissions measurements		
Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)	Upper frequency of measurement range (MHz)
	FCC	EU/CISPR
Below 1.705	30 (No radiated measurements)	1000
1.705-108	1000	1000
108-500	2000	2000
500-1000	5000	5000
Above 1000	5 th harmonic of the highest frequency 40 GHz whichever is lower.	5 th harmonic of the highest frequency 6 GHz whichever is lower.

The test data is derived from the voltage on the spectrum analyzer. First the reading is corrected for gain factors associated with the use of preamps and loss in the cable. A factor in dB is subtracted from the reading to account for preamp gain, while a factor in dB is added to the signal to account for cable loss. A conversion is performed from the resulting voltage to field strength by multiplying the voltage by the antenna factor. Since antenna factor is expressed as a logarithm (dB/m), this operation takes the form of an addition (to multiply logarithmic numbers, you add them together). Thus:

$$\text{Field Strength (dBuV/m)} = \text{Voltage Reading (dBuV)} - \text{Preamp Gain (dB)} + \text{Cable Loss (dB)} + \text{Antenna Factor (dB/m)}$$

When the levels of ambient radio signals such as local television stations are within 6 dB of the appropriate limit, the following steps may be taken to assure compliance:

1. The measurement bandwidth may be reduced. A check is made to see that peak readings are not affected. The use of a narrower bandwidth allows examination of emissions close to local ambient signals.



2. The antenna may be brought closer to the EUT to increase signal-to-ambient signal strength.
3. For horizontally polarized signals the axis of the test site may be rotated to discriminate against local ambients.



CONDUCTED EMISSIONS

Test Method:

In accordance with the following:

- ICES-003 Issue 4
- FCC 47 CFR Part 15

Results:

TEST	RESULT	TEST LEVEL	MARGIN	COMMENTS
<i>AC Mains Conducted Emissions</i>	PASS	Class B	-3.6dB @ 2.96MHz	

Conducted Emissions Data Table(s):

AC Mains Conducted Emissions										
Date: 31-Jan-11			Company: Sonos			Work Order: L0055				
Engineer: John Cushing			EUT Desc: Play: 3			Test Site: CEMI2				
Temp: 17.1°C			Humidity: 20%			Pressure: 1026mBar				
Notes: using wired and wireless connections simultaneously										
Measurement Device: Asset #1493 LISN					EUT Operating Voltage/Frequency: 120V/60Hz					
Range: 0.15-30MHz					Spectrum Analyzer: Black					
Frequency (MHz)	Q.P. Readings		Ave. Readings		Impedance Factor (dB)	FCC/CISPR B		FCC/CISPR B		Overall Result (Pass/Fail)
	QP1 (dBµV)	QP2 (dBµV)	AV1 (dBµV)	AV2 (dBµV)		qp Limit (dBµV)	qp Margin dB	AVE Limit (dBµV)	AVE Margin dB	
0.19	20.1	18.9	18.0	17.1	20.1	64.0	-23.8	54.0	-15.9	Pass
0.57	21.1	21.3	19.1	18.8	20.1	56.0	-14.6	46.0	-6.8	Pass
2.64	21.4	21.7	21.0	21.4	20.1	56.0	-14.2	46.0	-4.5	Pass
7.55	21.4	21.4	20.7	19.8	20.1	60.0	-18.5	50.0	-9.2	Pass
10.66	25.1	25.5	23.5	23.0	20.1	60.0	-14.4	50.0	-6.4	Pass
29.24	18.2	18.4	17.7	17.8	20.6	60.0	-21.0	50.0	-11.6	Pass

Table Result: Pass by -4.50 dB **Worst Freq:** 2.64 MHz

Rev: 28-Jan-2011

Spectrum Analyzers / Receivers /Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due
Black	9kHz-12.8GHz	8596E	Agilent	3710A00944	337	I	12-Oct-2011
LISNs/Measurement Probes	Range	MN	Mfr	SN	Asset	Cat	Calibration Due
230VAC LISN Asset 1493	10kHz-50MHz	9252-50-R-24-BNC	Solar	84714	1493	I	31-Mar-2011
Conducted Test Sites (Mains / Telco)	FCC Code	VCCI Code	Cat	Calibration Due			
CEMI 2	719150	C-3361, T-1576	III	NA			
Meteorological Meters	MN	Mfr	SN	Asset	Cat	Calibration Due	
Temp./Humidity/Atm. Pressure Gauge	7400 Perception II	Davis	N/A	965	I	6-Apr-2011	
CEMI2 Thermohygrometer	35519-044	Control Company	72436083	1336	II	18-Aug-2011	
Cables	Range	Mfr	Cat	Calibration Due			
CEMI-02	9kHz - 2GHz	C-S	II	6-Apr-2011			

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.



AC Mains Conducted Emissions										
Date: 31-Jan-11			Company: Sonos				Work Order: L0055			
Engineer: John Cushing			EUT Desc: Play: 3				Test Site: CEMI2			
Temp: 17.1°C			Humidity: 20%				Pressure: 1026mBar			
Notes: using wired and wireless connections simultaneously										
Measurement Device: Asset #1493 LISN					EUT Operating Voltage/Frequency: 230V/50Hz					
Range: 0.15-30MHz					Spectrum Analyzer: Black					
Frequency (MHz)	Q.P. Readings		Ave. Readings		Impedance Factor (dB)	FCC/CISPR B		FCC/CISPR B		Overall Result (Pass/Fail)
	QP1 (dBµV)	QP2 (dBµV)	AV1 (dBµV)	AV2 (dBµV)		qp Limit (dBµV)	qp Margin dB	AVE Limit (dBµV)	AVE Margin dB	
0.15	31.0	31.2	3.5	3.4	20.1	66.0	-14.7	56.0	-32.4	Pass
0.19	24.0	23.3	18.6	19.0	20.1	63.9	-19.8	53.9	-14.8	Pass
0.61	24.4	24.4	17.5	19.6	20.1	56.0	-11.5	46.0	-6.3	Pass
2.96	25.6	26.3	20.4	22.3	20.1	56.0	-9.6	46.0	-3.6	Pass
8.84	23.7	24.2	16.9	17.7	20.1	60.0	-15.7	50.0	-12.2	Pass
11.53	22.7	22.9	15.2	15.9	20.2	60.0	-16.9	50.0	-13.9	Pass
29.24	21.2	21.5	20.3	20.7	20.6	60.0	-17.9	50.0	-8.7	Pass
Table Result: Pass			by -3.60 dB			Worst Freq: 2.96 MHz				

Rev: 28-Jan-2011

Spectrum Analyzers / Receivers /Preselectors		Range	MN	Mfr	SN	Asset	Cat	Calibration Due
Black		9kHz-12.8GHz	8596E	Agilent	3710A00944	337	I	12-Oct-2011
LISNs/Measurement Probes		Range	MN	Mfr	SN	Asset	Cat	Calibration Due
230VAC LISN Asset 1493		10kHz-50MHz	9252-50-R-24-BNC	Solar	84714	1493	I	31-Mar-2011
Conducted Test Sites (Mains / Telco)		FCC Code	VCCI Code				Cat	Calibration Due
CEMI 2		719150	C-3361, T-1576				III	NA
Meteorological Meters		MN		Mfr	SN	Asset	Cat	Calibration Due
Temp./Humidity/Atm. Pressure Gauge		7400 Perception II		Davis	N/A	965	I	6-Apr-2011
CEMI2 Thermohygrometer		35519-044		Control Company	72436083	1336	II	18-Aug-2011
Cables		Range	Mfr				Cat	Calibration Due
CEMI-02		9kHz - 2GHz	C-S				II	6-Apr-2011

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

Conducted Emissions Modifications:
None



Line Conducted Emissions Overview:

REV 9-MAY-06

Digital and microprocessor based devices use radio frequency (RF) digital techniques for timing purposes and in applications such as switching power supplies. An unintentional consequence of this for AC powered devices is that a certain amount of the RF energy is impressed upon the AC power mains in the form of a conducted noise voltage. These conducted emissions have the potential to interfere with constructive uses of the RF spectrum such as AM radio and may also interfere with other devices attached to the same AC mains circuit. In order to reduce the likelihood that a device will interfere it is required that the conducted RF signals from the device are below an allowable level.

Testing is performed according to test methods from ANSI C63.4 and CISPR 22.

Line conducted emissions are measured from the device over the frequency range of 0.15 to 30 MHz. The EUT is powered from a Line Impedance Stabilization Network (LISN). The purpose of the LISN is to provide a calibrated impedance across which to measure the conducted emissions. The RF noise voltage produced by the EUT across the LISN is measured and compared to the limit. In order for the LISN to perform properly it is attached to a ground plane at least 2 meters by 2 meters in size. For tabletop equipment the measurement is performed with the equipment 40 cm from a vertical conducting surface bonded to a ground plane under the product. The ground plane extends 0.5 meters beyond the product and is 2.5mx3.7m in size. The vertical surface is 2.5mx2.5m.

As with radiated emissions, the “human factor” is accounted for by the use of a “quasi-peak” detector in the receiver or spectrum analyzer that measures the signal from the LISN. For certain tests (such as EN55022), both an average and a quasi-peak limit are specified. Emissions from a device must be below both limits when measured with the appropriate detector. If the emission level is below the average limit when measured with the quasi-peak detector, the EUT is presumed to pass both limits.

The possible operating modes of the EUT are explored to determine the configuration that maximizes emissions. Software is investigated as well as different methods of displaying data if available. Data is recorded in the worst case operating mode.

As of September 9, 2002, the FCC has harmonized it's conducted emission limits with CISPR. The following table displays the limits applicable to both FCC and CISPR.



Line Conducted Emissions Limits: Class A (dBµV)		
Frequency (MHz)	Quasi-Peak	Average
0.15 - 0.5	79	66
0.5 - 30	73	60
Line Conducted Emissions Limits: Class B (dBµV)		
Frequency (MHz)	Quasi-Peak	Average
0.15 - 0.5	66 - 56*	56 - 46*
0.5 - 5	56	46
5 - 30	60	50
Note 1: The lower limit applies at the transition frequencies		
*Note 2: The limit decreases linearly with the logarithm of the frequency		

At least the six highest emissions with respect to the limit are recorded. If less than six emissions are visible above the noise floor of the instrumentation, then the noise floor at six representative frequencies is recorded. The test report will document if noise floor readings are reported.

All testing is performed within the framework of a laboratory quality system modeled on ISO/IEC 17025 *General requirements for the competence of calibration and testing laboratories* and is subject to our terms and conditions. This test method is covered by our A2LA accreditation.



TELCO CONDUCTED EMISSIONS**Test Method:**

In accordance with ICES-003 Issue 4

Results:

TEST	RESULT	TEST LEVEL	MARGIN	COMMENTS
<i>Telco Line Conducted Emissions</i>	PASS	Class B	-1.2dB @ 13.43MHz	

Conducted Emissions Data Table(s):

Telco Conducted Emissions - Voltage										
Date: 03-Feb-11			Company: Sonos			Work Order: L0055				
Engineer: Disha Vachhani			EUT Desc: Play: 3			Test Site: CEM12				
Temp: 20.1°C			Humidity: 19%			Pressure: 1015mBar				
Notes: Sample 2: Ethernet - using wired, wireless not working										
Measurement Device: 2-Pair Telco ISN (Asset #746)						EUT Operating Voltage/Frequency: 230Vac, 50Hz				
Range: 0.15-30MHz						Spectrum Analyzer: Red				
Frequency (MHz)	Q.P. Readings		Ave. Readings		Impedance Factor (dB)	Telco Voltage (B)		Telco Voltage (B)		Overall Result (Pass/Fail)
	QP1 (dBµV)	QP2 (dBµV)	AV1 (dBµV)	AV2 (dBµV)		qp Limit (dBµV)	qp Margin dB	AVE Limit (dBµV)	AVE Margin dB	
0.57	46.3		35.2		9.9	74.0	-17.8	64.0	-18.9	Pass
7.93	51.1		48.9		9.9	74.0	-13.0	64.0	-5.2	Pass
9.95	52.1		49.9		9.9	74.0	-12.0	64.0	-4.2	Pass
10.25	52.7		50.6		9.9	74.0	-11.4	64.0	-3.5	Pass
10.74	51.2		48.7		9.9	74.0	-12.9	64.0	-5.4	Pass
10.80	53.4		51.4		9.9	74.0	-10.7	64.0	-2.7	Pass
11.47	52.4		50.0		9.9	74.0	-11.7	64.0	-4.1	Pass
11.90	52.5		52.1		9.9	74.0	-11.6	64.0	-2.0	Pass
12.75	52.9		51.9		9.9	74.0	-11.2	64.0	-2.2	Pass
12.82	52.6		51.7		9.9	74.0	-11.5	64.0	-2.4	Pass
13.43	53.5		52.9		9.9	74.0	-10.6	64.0	-1.2	Pass
14.16	52.2		51.1		9.9	74.0	-11.9	64.0	-3.0	Pass
14.22	52.0		51.3		9.9	74.0	-12.1	64.0	-2.8	Pass
14.28	51.9		50.7		9.9	74.0	-12.3	64.0	-3.4	Pass
16.18	51.9		51.2		9.9	74.0	-12.2	64.0	-2.9	Pass
16.24	53.2		52.6		9.9	74.0	-10.9	64.0	-1.5	Pass
18.25	51.4		50.5		9.9	74.0	-12.7	64.0	-3.6	Pass
18.31	49.4		48.8		9.9	74.0	-14.7	64.0	-5.3	Pass
21.67	49.5		48.9		9.9	74.0	-14.6	64.0	-5.2	Pass
23.13	51.3		50.4		9.9	74.0	-12.8	64.0	-3.7	Pass

Table Result: Pass by -1.20 dB **Worst Freq:** 13.43 MHz

Rev: 28-Jan-2011

Spectrum Analyzers / Receivers /Preselectors Red	Range 9kHz-1.8GHz	MN 8591E	Mfr Agilent	SN 3441A03559	Asset 24	Cat I	Calibration Due 10-Mar-2011
LISNs/Measurement Probes CISPR 22 2 Pair Telco ISN	Range 9kHz-30MHz	MN FCC-TLISN-T4	Mfr Fischer	SN 20115	Asset 746	Cat I	Calibration Due 14-Feb-2011
Conducted Test Sites (Mains / Telco) CEMI 2	FCC Code 719150	VCCI Code C-3361, T-1576				Cat III	Calibration Due NA
Meteorological Meters Weather Clock (Pressure Only) CEMI2 Thermohyrometer		MN BA928 35519-044	Mfr Oregon Scientific Control Company	SN C3166-1 72436083	Asset 831 1336	Cat I II	Calibration Due 17-Mar-2011 18-Aug-2011

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

Telco Conducted Emissions Modifications:

EUT was operating in wired mode only. With the EUT operating in wired and wireless mode simultaneously the EUT passed by -0.2dB.



EN55022 Telco Cable Conducted Current Emissions Testing Overview

REV 13-Jul-09

Digital and microprocessor based devices use radio frequency (RF) digital techniques for timing purposes and in applications such as switching power supplies. An unintentional consequence of this is that a certain amount of the RF energy is impressed upon the telecommunications cables in the form of conducted common mode noise. These conducted emissions have the potential to interfere with other devices attached to the telecommunications signal cables. In order to reduce the likelihood that a device will interfere, it is required that the conducted RF signals from the device are below an allowable level.

Telecommunications ports as defined by the EN55022 standard are any ports which are intended to be connected to telecommunications networks (e.g. public switched telecommunications networks, integrated serviced digital networks), local area networks (e.g. ethernet, token ring) and similar networks.

No limits are defined for differential current or voltage signal levels in this standard. However, the maximum signal levels that can be present at telecommunication ports in differential mode are dependent upon, and are limited by, the electrical balance or longitudinal conversion loss (LCL) of the telecommunication ports and the cables or networks to which they are intended to be connected, if the wanted signals are not to appear as unacceptable disturbances across the common mode impedance to ground. The LCL of a signal port, cable, or network causes a portion of any differential signals on that port, cable, or network to be converted to common mode disturbances for which this standard has defined limits. Common mode disturbances (also called antenna mode disturbances because they are a source of radiated disturbances in the environment) must be limited if interference with the reception of radio signals of all kinds is to be minimized. Common mode disturbances created at a nominally balanced signal port or transmission medium, for example a twisted copper pair, must be controlled and limited whether or not the port or medium is provided with an overall shield. If a shielded medium is used, deficiencies in the shield itself as well as in the shield connectors — leading perhaps to significant electrical discontinuities — will allow a portion of the common mode disturbances created within the shield environment to appear outside the shield. The worst-case values for balance and LCL quoted in many network specifications are based upon the desired signal transmission and crosstalk performance of the networks and do not necessarily have regard for the control of the common mode disturbances considered in this standard.

Conducted common mode emissions at telecommunication ports are measured from the device over the frequency range of 0.15 to 30 MHz. The EUT is powered from a Line Impedance Stabilization Network (LISN). The purpose of the LISN is to provide a calibrated impedance for the AC power port. The RF noise voltage and current produced by the EUT is measured and compared to the respective limits.



Class A limits of conducted common mode disturbance at telecommunication ports				
Frequency Range MHz	Voltage Limits dB(μV)		Current Limits dB(μA)	
	Quasi-Peak	Average	Quasi-Peak	Average
0.15 to 0.5	97 to 87	84 to 74	53 to 43	40 to 30
0.5 to 30	87	74	43	30

Class B limits of conducted common mode disturbance at telecommunication ports				
Frequency Range MHz	Voltage Limits dB(μV)		Current Limits dB(μA)	
	Quasi-Peak	Average	Quasi-Peak	Average
0.15 to 0.5	84 to 74	74 to 64	40 to 30	30 to 20
0.5 to 30	74	64	30	20

For tabletop equipment the measurement is performed with the equipment 40 cm from the horizontal ground plane under the product. The ground plane extends 0.5 meters beyond the product and is 2.5mx3.7m in size. For shielded cables, the shield of the cable under test is terminated to the ground plane via a 150Ω resistor placed 30-80cm from the EUT. Current measurements are made with a current clamp which is positioned between the EUT and the cable termination at a location to maximize the emission readings. Voltage measurements are optional for shielded cables, but can be measured across the termination. Unshielded cables are measured in the same fashion as shielded cables, but without the 150Ω termination. Voltage measurements are required for unshielded cables and are measured using a capacitive voltage probe.

As with radiated emissions, the “human factor” is accounted for by the use of a “quasi-peak” detector in the receiver or spectrum analyzer which measures the signal from the probes. Both an average and a quasi-peak limit are specified. Emissions from a device must be below both limits when measured with the appropriate detector. If the emission level is below the average limit when measured with the quasi-peak detector, the EUT is presumed to pass both limits.

At least the six highest emissions with respect to the limit are recorded. If less than six emissions are visible above the noise floor of the instrumentation, then the noise floor at six representative frequencies is recorded. The test report will document if noise floor readings are reported.

All testing is performed within the framework of a laboratory quality system modeled on ISO/IEC 17025 General requirements for the competence of calibration and testing laboratories and is subject to our terms and conditions. This test method is covered by our A2LA accreditation.



Measurement Uncertainty

The listed uncertainties are the worst case uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the PASS/FAIL results.

Measurement	Expanded Uncertainty k=2	Maximum allowable uncertainty
Radiated Emissions (30-1000MHz)		
NIST	5.6dB	N/A
CISPR	4.6dB	5.2dB (Ucisprr)
Radiated Emissions (1-26.5GHz)	4.6dB	N/A
Radiated Emissions (above 26.5GHz)	4.9dB	N/A
Magnetic Radiated Emissions	5.6dB	N/A
Conducted Emissions		
NIST	3.9dB	N/A
CISPR	3.6dB	3.6dB (Ucisprr)
Telco Conducted Emissions (Current)	2.9dB	N/A
Telco Conducted Emissions (Voltage)	4.4dB	N/A
Electrostatic Discharge	11.5%	N/A
Radiated RF Immunity (Uniform Field)	1.6dB	N/A
Electrical Fast Transients	23.1%	N/A
Surge	23.1%	N/A
Conducted RF Immunity	3dB	N/A
Magnetic Immunity	12.8%	N/A
Dips and Interrupts	2.3V	N/A
Harmonics	3.5%	N/A
Flicker	3.5%	N/A
Radio frequency (@ 2.4GHz)	3.23×10^{-8}	1×10^{-7}
RF power, conducted	0.40dB	0.75dB
Maximum frequency deviation:		
• Within 300Hz and 6kHz of audio frequency / Within 6kHz and 25kHz of audio frequency	3.4% 0.3dB	5% 3dB
Adjacent channel power	1.9dB	3dB
Conducted spurious emission of transmitter, valid up to 12.75GHz	2.39dB	3dB
Conducted emission of receivers	1.3dB	3dB
Radiated emission of transmitter, valid up to 26.5GHz	3.9dB	6dB
Radiated emission of transmitter, valid up to 80GHz	3.3dB	6dB
Radiated emission of receiver, valid up to 26.5GHz	3.9dB	6dB
Radiated emission of receiver, valid up to 80GHz	3.3dB	6dB
Humidity	2.37%	5%
Temperature	0.7°C	1.0°C
Time	4.1%	10%
RF Power Density, Conducted	0.4dB	3dB
DC and low frequency voltages	1.3%	3%
Voltage (AC, <10kHz)	1.3%	2%
Voltage (DC)	0.62%	1%
The above reflects a 95% confidence level		



Jurisdictional Labeling and Required Instruction Manual Inserts

CE Marking - European Union (EU)

The CE mark is affixed by a manufacturer to its product in order to demonstrate to customs and other officials that the product marked is in conformity with all applicable European Union (EU) Directives. The CE mark must take the form shown below and must be affixed to the product unless the product is too small. If the product is too small, the CE mark may be affixed to the packaging, instructions for use or the guarantee certificate. The CE mark must be a minimum 5mm in height.

It is customary to include the written Declaration of Conformity with the shipment of the product as well in case of questions at the border. Supplying the Declaration of Conformity with the product is not required, it's just good preventative practice. It is required that the directive be held available to EU officials for a period of ten years following the placement of the product on the market.



The CE marking is available in bit-mapped form from the Curtis-Straus web site at <http://www.curtis-straus.com> or call us for a complementary disk.

Sample Declaration of Conformity

<p>Declaration of conformity Konformitätserklärung Déclaration de conformité Declaración de Confomidad Verklaring de overeenstemming Dichiarazione di conformità</p> <p>We/Wir/ Nous/WIJ/Noi: COMPANY NAME ADDRESS</p> <p>declare under our sole responsibility that the product, erklären, in alleniniger Verantwortung, daß dieses Produkt, déclarons sous notre seule responsabilité que le produit, declaramos, bajo nuestra sola responsabilidad, que el producto, verklaren onder onze verantwoordelijkheid, dat het product, dichiariamo sotto nostra unica responsabilità, che il prodotto,</p> <p>MODEL NUMBER SERIAL NUMBER RANGE</p> <p>to which this declaration relates is in conformity with the following standard(s) or other normative documents. auf das sich diese Erklärung bezieht, mit der/den folgenden Norm(en) oder Richtlinie(n) übereinstimmt. auquel se réfère cette déclaration est conforme à la (aux) norme(s) ou au(x) document(s) normatif(s). al que se refiere esta declaración es conforme a la(s) norma(s) u otro(s) documento(s) normativo(s). waarnaar deze verklaring verwijst, aan de volende norm(en) of richtlijn(en) beantwoordt. a cui si riferisce questa dichiarazione è conforme alla/e seguente/i norma/o documento/i normativo/i.</p> <p>LIST OF DIRECTIVES AND EN'S TO WHICH CONFORMANCE IS CLAIMED (Including Title and edition date). SIGNATURE OF RESPONSIBLE PARTY, DATE, and PLACE OF ISSUE</p>



EN 55022 Class A Warning Requirements

EN 55022 does not restrict the marketing of Class A information technology equipment, but does require it to include the following warning in the instructions for use.

Warning

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

FCC Requirements

Required Equipment Authorization for Device Type

Type of Device	Equipment Authorization Required
TV broadcast receiver	Verification
FM broadcast receiver	Verification
CB receiver	Declaration of Conformity or Certification
Superregenerative receiver	Declaration of Conformity or Certification
Scanning receiver	Certification
Radar detector	Certification
All other receivers subject to part 15	Declaration of Conformity or Certification
TV interface device	Declaration of Conformity or Certification
Cable system terminal device	Declaration of Conformity
Stand-alone cable input selector switch	Verification
Class B personal computers and peripherals	Declaration of Conformity or Certification
CPU boards and internal power supplies used with Class B personal computers	Declaration of Conformity or Certification
Class B personal computers assembled using authorized CPU boards or power supplies	Declaration of Conformity
Class B external switching power supplies	Verification
Other Class B digital devices & peripherals	Verification
Class A digital devices, peripherals & external switching power supplies	Verification
Access Broadband over Power Line (Access BPL)	Certification
All other devices	Verification

FCC Required labeling for Verified Devices 47 CFR Part 15.19

The specific labeling requirements for a device subject to the Verification or Certification procedure are contained in Section 15.19(a). These labelling requirements are:

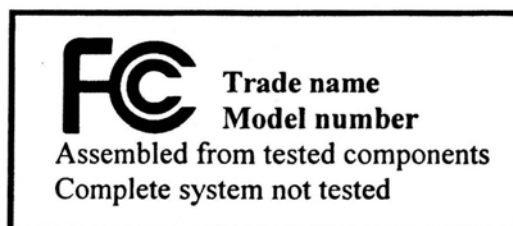
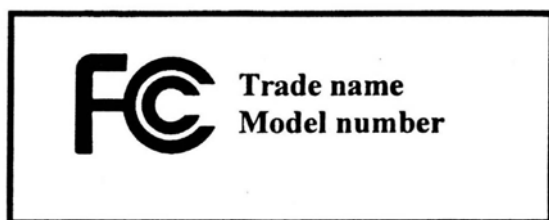
- One of three compliance statements specified in Section 15.19(a);
- If the device is subject only to Verification include a label bearing a unique identifier - Section 2.954;
- If the device is subject to Certification (1) Section 2.925 contains information on identification of the equipment; (2) include a label bearing an FCC Identifier (FCC ID) - Section 2.926.



If the labeling area for the device is so small, and / or it is not practical to place the required statement on the device, then the statement can be placed in the user manual or product packaging - Section 15.19(a)(5). Generally, devices smaller than the palm of the hand are considered small. However, the device must still be labeled with the unique identifier (Verification) or the FCC ID (Certification).

Declaration of Conformity (DoC):

The labeling requirements for a device subject to the Declaration of Conformity (DoC) procedure are specified in Section 15.19(b). The label should include the FCC logo along with the Trade Name and Model Number, which satisfies the unique identifier requirement of Section 2.1074 if it represents the identical equipment tested for DoC compliance. For personal computers assembled from authorized components, the following additional text must also be included: "Assembled from tested components," "Complete system not tested." When the device is so small and / or when it is not practical to place the required additional text on the device, the text may be placed in the user manual or pamphlet supplied to the user. However, the FCC logo, Trade Name, and Model Number must still be displayed on the device - Section 15.19(b)(3).



Part 15 Declaration of Conformity (DoC) Label Examples

FCC Required Instruction Manual Inserts CFR 47 Part 15.21 and 15.105

Section 15.21 requires that in the user manual, the user shall be cautioned that changes / modifications not approved by the responsible party could void the user's authority to operate the equipment. The acceptable formats for user information dissemination are paper, computer disk or over the Internet. Where special accessories, such as shielded cables and/or special connectors, are required to comply with the emission limits, the instruction manual shall include appropriate instructions on the first page of the text describing the installation of the device (Section 15.27(a)).

For a Class A or Class B digital device (unintentional radiator), as well as any composite device that is both an intentional and unintentional radiator, the text specified in Section 15.105 must be placed in the user manual.

Devices authorized under the Declaration of Conformity (DoC) procedure must also include a compliance information statement (in the user manual or on a separate sheet) as required by Section 2.1077. The objective of this compliance statement is to allow the FCC to associate the equipment with the party responsible for compliance with the DoC requirements.

Devices certified as software defined radio that use an electronic labeling method to display the FCC ID must provide instructions in the user manual on how to access the electronic display (Section 2.925(e)).

Additional statements and information may be required for compliance to specific or general rule parts. The following is an example of some additional user information requirements. The party responsible for compliance must provide any additional statement(s) required.



- Kits - TV interface and Cable system terminal device marketed as Kits: Section 15.25 (d);
- TV interface devices, including cable system terminal devices: Section 15.115 (c) (5);
- Labeling of digital cable ready products: Section 15.123 - use of the term cable ready/compatible;
- External power amplifiers and antenna modifications: Section 15:204 (d) (2) – 1 notice of authorized amplifiers;
- Cordless telephones: Section 15.214 (c) & (d) (3) - privacy statement & security code statement;
- Cordless telephones: Section 15.233 (b) (2) (ii) - interference to TV;
- Cordless telephones: Section 15.233 (h) - cordless phones without digital security (Section 15.214);
- Professionally installed systems: Section 15.247 (c) (1) (iii);
- Operation within the Band 92-95 GHz: Section 15.257 (a) (4) - indoor use only;
- Unlicensed PCS: Section 15.311 - notification and coordination with UTAM, Inc.;
- RF exposure statements: Section 2.1091 (d) (3) - Mobile devices (a minimum separation distance may be required).

Our facility codes can be found in the *Test Equipment Used* Section starting on page 24.

FCC Part 18 Required Labeling for Industrial, Scientific and Medical Equipment

Labeling Requirements for Part 18 Devices:

Equipment that intentionally generates radio frequency energy for non telecommunications functions for industrial, scientific, medical (ISM) or other purposes must be authorized and labeled according to the procedures outlined in Part 2, Subpart J, Sections 18.203 and 18.209.

Non-consumer ISM equipment is authorized under the Verification procedure. Consumer ISM equipment is authorized under either the Declaration of Conformity or Certification procedure, except that consumer ultrasonic equipment generating less than 500 watts and operating below 90 KHz is subject to the Verification procedure.

Labeling for Verification requires a unique identifier (Section 2.954) to facilitate positive identification of the Verified device. The identification should not be confused with the FCC ID used on devices subject to Certification Labels for Part 18 devices subject to Certification require an FCC Identifier as described in Section 2.926.

For Declaration of Conformity the device shall be permanently labelled with the Part 18 logo (Section 18.209) illustrated below, in addition to a unique identifier (Section 2.1074) to facilitate positive identification.



Part 18 Declaration of Conformity (DoC) Logo

All [Artwork](#) shown above for Declaration of Conformity labels is available at:



<http://www.fcc.gov/labhelp> KDB Number 784748 (Select link on the left hand side “Detail Criteria Search” and in the Publication Number field enter 784748; then push the Submit Query button.)

User Manual and User Information for Part 18 Devices:

For all industrial, scientific, medical (ISM) devices, the instruction manual or, if no instruction manual is provided, the product packaging must provide information that addresses the following: (1) interference potential of the device, (2) maintenance of the system and (3) simple measures that can be taken to correct interference. RF lighting devices must add a statement similar to the following: “This product may cause interference to radio equipment and should not be installed near maritime safety communications equipment, ships at sea or other critical navigation or communications equipment operating between 0.45-30 MHz.” (Section 18.213)

In addition, Part 18 devices that are authorized under the Declaration of Conformity procedure shall also include in the instruction manual, on a separate sheet, or on the packaging the following: identification of the product (e.g. name and model number), a statement similar to “This device complies with Part 18 of the FCC Rules” (Section 18.212), and the name and address of the responsible party (Section 2.909).

Multiple Authorization Procedures:

A device subject to multiple authorization procedures requires appropriate testing and labeling for each of the respective authorization procedures. As a general rule, the Declaration of Conformity (DoC) text statement is required over any Verification statement. For devices subject to DoC and Verification, or Certification and Verification, the labeling requirements for DoC or Certification need only apply. When a device is authorized under both DOC and Certification procedures, the DoC logo and FCC ID (or FCC IDs if applicable) are required.

This requirement does not negate the testing requirement for each individual device that is subject to both multiple authorization procedures, and / or multiple technical rules. For example, an 802.11 WIFI Router that is also a CLASS B personal computer peripheral digital device must be tested as a computer peripheral (Section 15.3) and as a Digital Transmitter (Section 15.247) and must be labeled with the DoC logo and an FCC ID.

When supplying information to users, all relevant instructions that pertain to all components of a composite device are required. For example, Class A or Class B statements in Section 15.105; all warning statements and special instructions as required by Sections 15.21 and 15.27; and all Part 18 applicable instructions must be clearly stated. Variations in editing to clarify the language and structure are permitted if all the relevant points applicable to all of the components are represented.

Australian Communications and Media Authority (ACMA)

Labeling

Before a product can be marketed it must be labeled. Labeling for EMC is intended to provide a traceable link between a device and the supplier responsible for placing it on the Australian market, that is, the Australian manufacturer, importer or agent for an overseas manufacturer.

Under the EMC framework, manufacturers and importers of a device must satisfy certain requirements before a label can be affixed to a device. In general these involve completing the supplier’s Declaration of Conformity and establishing a Compliance Folder.



General Labeling Conditions

The label should meet the following specifications:

Location:	The label shall normally be placed on the external surface of the product as near as practical to the model identification. Where this is not practical, due to the size or nature of the product, the label may be placed on the labeling or packaging or warranty or instructions of this device. In addition the label may be placed on promotional material associated with the product.
Method of Marking:	The label shall be durably applied by any suitable means such as printing, painting, molding, etching and engraving. Reproduction shall be legible and conform the specifications for each mark.
Scale:	The label shall be legible with characters generally larger than 3mm.
Color:	The label may be reproduced in any color provided that visibility is assured through either contrast with the background color or marking in relief (molding, engraving etc.)
Identification of the supplier:	Devices bearing the compliance mark shall also be marked with some means of identifying the person responsible for placing the product on the Australian market: In the case of products manufactured in Australia this will be the manufacturer. For devices manufactured outside Australia this will be the importer or agent of an overseas manufacturer/supplier.

The label may be affixed to a product at any point prior to its being offered for sale on the Australian market. The ACMA recognizes that for many imported products it will be more cost effective to label the product at the time of manufacture rather than to apply the label at the time of marketing and distribution. A product may not be offered for sale unless it is properly labeled and the Compliance Folder is complete. Penalties apply to the misuse of the label.

C-Tick Mark

The C-Tick Mark is intended for use on all articles which conform with the EMC framework. The C-Tick Mark can also be used to show compliance with telecommunications and radiocommunications standards. For EMC compliance the C-Tick Mark must be accompanied by:

- The registered name and address of the place of business of the Australian supplier; or
- The Australian Company Number (ACN); or
- A supplier code issued by the ACMA; or
- Trademark/Name registered in Australia.

If the Trademark/Name option is to be used, registration details of the Trademark/Name should accompany the application. Suppliers may elect their preferred option for labeling using the C-Tick Mark. The components of the compliance label will be combined in such a manner that the C-Tick Mark and supplier identification information are contiguous.

Before a device is labeled with the C-Tick Mark the supplier must submit a written notice to the ACMA. A supplier is only required to submit one application to the ACMA advising of their intention to use the C-Tick Mark on all compliant products. The ACMA proposes that retailers and wholesalers satisfy themselves that a product is correctly labeled before offering it for sale.

Regulatory Compliance Mark

The Regulatory Compliance Mark (RCM) is described in joint Australian and New Zealand standard AS/NZS 4417. The mark is intended for use by a number of regulators and covers main-connected devices. Some devices may be ineligible to use the mark and should therefore apply the C-Tick Mark. All devices that acquire a Certificate of Suitability for electrical safety



compliance will be eligible to use the RCM to denote EMC compliance once compliance has been established.

When using the RCM, the means of identifying the person responsible for placing a device on the Australian market will be through:

- The registered name and address of the place of business of the Australian supplier; or
- The Australian Company Number (ACN); or
- A supplier code issued by the ACMA; or
- Trademark/Name registered in Australia

Where a supplier intends to use the RCM for EMC compliance they should complete the application form in AS/NZS 4417 part 3.

Further information can be found at the ACMA web site at <http://www.acma.gov.au/acmainter>.

Canadian Requirements

Digital products and ISM products must be labeled by a notice in French and English. The notice **must** take the form of a label on the product. As an alternative, where it is not feasible to label the product due to product size or other consideration, the notice must be reproduced in the manual. Note that considerations such as product appearance are not considered to meet the feasibility test. The notice must state that the product is in compliance with Canadian Interference-Causing Equipment regulations and may be in your own words. A suggested text is:

For ITE products:

This Class A or B digital apparatus complies with Canadian ICES-003.

Cet appareil numerique de la classe A or B est conforme a la norme NMB-003 du Canada.

For ISM products:

This ISM apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Ce generateur de frequence radio ISM respecte toutes les exigences du Reglement sur le materiel brouilleur du Canada.

Although the ITE limits are different from the FCC in some minor ways, equipment which complies with the FCC limits is considered by Industry Canada to be compliant with the Canadian rules. For ITE, equipment in compliance with either FCC Part 15 or CISPR 22 is considered to meet ICES-003. ISM equipment limits are the same as the EU EN55011 emission limits. Reports must be kept on file for review by the appropriate Canadian Minister for a period of five years.

Our facility codes can be found in the *Test Equipment Used* Section starting on page 24.

VCCI Requirements

In order to comply with VCCI and appropriately label your product, you must be a member of the Voluntary Control Council for Interference (VCCI). Every company is eligible to join the VCCI. Membership dues are assessed based on company size and vary from 200,000 yen to 800,000 yen (about \$2,000 to \$8,000) per year. Since the VCCI fiscal year commences April 1, it may be prudent to wait for April if that month is near to avoid paying double dues.



This report contains the information you need to fill out the Conformity Verification Report. Once filled out, it must be sent to VCCI. You must also label your product with the appropriate class A or class B mark and supply the required user information in your manual. The Conformity Verification Report label marks and other VCCI forms, documents and instructions can be found at the VCCI member page http://www.vcci.or.jp/vcci_e/member/index.html.

There are two ways to submit your report to VCCI: by postal mail and by Internet. For more information regarding the VCCI internet submission service, go to http://www.vcci.or.jp/vcci_e/member/news/index6.html

Curtis-Straus, the measurement facility, is a VCCI supporting member Rank D, acceptance number 818. Our facility codes can be found in the *Test Equipment Used* Section starting on page 24.



Conditions Of Testing

[Bureau Veritas Consumer Products Services, Inc., a Massachusetts corporation], and/or its affiliates (collectively, the "Company") will conduct, at the request of the Submitter ("Client"), the tests specified on the submitted Test Request Form or equivalent in accordance with, and subject to, the following terms and conditions (collectively, "Conditions"):

1. All orders for tests are subject to acceptance by the Company, and no order will constitute a binding commitment of the Company unless and until such order is accepted by it, as evidenced by the issuance of a written report ("Test Report") by the Company. The Test Report is issued solely by the Company, is intended for the exclusive use of Client and shall not be published, used for advertising purposes, copied or replicated for distribution to any other person or entity or otherwise publicly disclosed without the prior written consent of the Company. By submitting a request for services to the Company, Client consents to the disclosure to accreditation bodies of those records of Client relevant to the accreditation body's assessment of the Company's competence and compliance with relevant accreditation criteria. The Company shall not be liable for any loss or damage whatsoever resulting from the failure of the Company to provide its services within any time period for completion estimated by the Company. If Client anticipates using the Test Report in any legal proceeding, arbitration, dispute resolution forum or other proceeding, it shall so notify the Company prior to submitting the Test Report in such proceeding. The Company has no obligation to provide a fact or expert witness at such proceeding unless the Company agrees in advance to do so for a separate and additional fee.
2. The Test Report will set forth the findings of the Company solely with respect to the test samples identified therein. Unless specifically and expressly indicated in the Test Report, the results set forth in such Test Report are not intended to be indicative or representative of the quality or characteristics of the lot from which a test sample is taken, and Client shall not rely upon the Test Report as being so indicative or representative of the lot or of the tested product in general. The Test Report will reflect the findings of the Company at the time of testing only, and the Company shall have no obligation to update the Test Report after its issuance. The Test Report will set forth the results of the tests performed by the Company based upon the written information provided to the Company. The Test Report will be based solely on the samples and written information submitted to the Company by Client, and the Company shall not be obligated to conduct any independent investigation or inquiry with respect thereto.
3. The Company may, in its sole discretion, destroy samples which have been furnished to the Company for testing and which have not been destroyed in the course of testing. The Company may delegate the performance of all or a portion of the services contemplated hereunder to an affiliate, agent or subcontractor of the Company, and Client consents to such delegation.
4. These Conditions and the Test Report represent the entire understanding of the parties hereto with respect to the subject matter hereof and of the Test Report, and no modification, variance or extrapolation with respect thereto shall be permitted without the prior written consent of the Company.
5. The names, service marks, trademarks and copyrights of the Company and its affiliates, including the names "BUREAU VERITAS," "BUREAU VERITAS CONSUMER PRODUCTS SERVICES," "BVCPS," "MTL," "ACTS," "MTL-ACTS" and "CURTIS-STRAUS" (collectively, the "Marks") are and shall remain the sole property of the Company or its affiliates and shall not be used by Client except solely to the extent that Client obtains the prior written approval of the Company and then only in the manner prescribed by the Company. Client shall not contest the validity of the Marks or take any action that might impair the value or goodwill associated with the Marks or the image or reputation of the Company or its affiliates.
6. Payment in full shall be due 30 days after the date of invoice. Interest shall be due on overdue amounts from the due date until paid at an interest rate of 1.5% per month or, if less, the maximum rate permitted by law. The Company reserves the right, at any time and from time to time, to revoke any credit extended to Client. Client shall reimburse the Company for any costs it incurs in collecting past due amounts, including court costs and fees and expenses of attorneys and collection agencies. The Test Report may not be used or relied upon by Client if and for so long as Client fails to pay when due any invoice issued by the Company or any affiliate of it to Client or any affiliate or subsidiary of Client together with interest and penalties, if any, accrued thereon.
7. The Company disclaims any and all responsibility or liability arising out of or in connection with e-mail transmissions of such information.
8. Client understands and agrees that the Company is neither an insurer nor a guarantor, that the Company does not take the place of Client or any designer, manufacturer, agent, buyer, distributor or transportation or shipping company, and that the Company disclaims all liability in such capacities. Client further understands that if it seeks assurance against loss or damage, it should obtain appropriate insurance.
9. Client agrees that the Company, by providing the services, does not take the place of Client nor any third party, nor does the Company release them from any of their obligations, nor does the Company otherwise assume, abridge, abrogate or undertake to discharge any duty of any third party to Client or any duty of Client or any third party to any other third party, and Client will not release any third party from its obligations and duties with respect to the tested goods.
10. Client shall, on a timely basis, (a) provide adequate instructions to the Company in order to enable the Company to perform properly its services, (b) provide, or cause Client's suppliers and contractors to provide, the Company with all documents necessary to enable the Company to perform its services, (c) furnish the Company with all relevant information regarding Client's intended use and purposes of the tested goods, (d) advise the Company of essential dates and deadlines relevant to the tested goods and (e) fully exercise all rights and remedies available to Client against third parties in respect of the tested goods.
11. The Company shall undertake due care and ordinary skill in the performance of its services to Client, and the Company shall accept responsibility only where such skill has not been exercised and, even in such event, only to the extent of the limitation of liability set forth herein.
12. If Client desires to assert a claim arising from or relating to (i) the performance, purported performance or non-performance of any services by the Company or (ii) the sale, resale, manufacture, distribution or use of any tested goods, it must submit that claim to the Company in a writing that sets forth with particularity the basis for such claim within 60 days from discovery of the potential claim and not more than six months after the date of issuance of the Test Report to Client. Client waives any and all such claims including, without limitation, claims that the Test Report is inaccurate, incomplete or misleading or that additional or different testing is required, unless and then only to the extent that Client submits a written claim to the Company within both such time periods.
13. CLIENT SHALL, EXCEPT TO THE EXTENT OF COMPANY'S LIABILITY TO CLIENT HEREUNDER (WHICH IN NO EVENT SHALL EXCEED THE LIMITATION OF LIABILITY HEREIN), HOLD HARMLESS AND INDEMNIFY THE COMPANY, ITS



AFFILIATES AND THEIR RESPECTIVE DIRECTORS, OFFICERS, EMPLOYEES, AGENTS AND SUBCONTRACTORS AGAINST ALL ACTUAL OR ALLEGED THIRD PARTY CLAIMS FOR LOSS, DAMAGE OR EXPENSE OF WHATSOEVER NATURE AND HOWSOEVER ARISING FROM OR RELATING TO (i) THE PERFORMANCE, PURPORTED PERFORMANCE OR NON-PERFORMANCE OF ANY SERVICES BY THE COMPANY OR (ii) THE SALE, RESALE, MANUFACTURE, DISTRIBUTION OR USE OF ANY TESTED GOODS.

14. EXCEPT AS MAY OTHERWISE BE EXPRESSLY AGREED TO IN WRITING BY THE COMPANY AND NOTWITHSTANDING ANY PROVISION TO THE CONTRARY CONTAINED HEREIN OR IN ANY TEST REPORT, NO WARRANTY OR GUARANTEE, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE, IS MADE.

15. (A) IN NO EVENT WHATSOEVER SHALL THE COMPANY BE LIABLE FOR ANY CONSEQUENTIAL, SPECIAL, INCIDENTAL, EXEMPLARY OR PUNITIVE DAMAGES IN CONNECTION WITH, RELATING TO OR ARISING OUT OF THE TEST REPORT OR THE SERVICES PROVIDED BY THE COMPANY HEREUNDER, INCLUDING WITHOUT LIMITATION LOSS OF OR DAMAGE TO PROPERTY; LOSS OF INCOME, PROFIT OR USE; OR ANY CLAIMS OR DEMANDS MADE AGAINST CLIENT OR ANY OTHER PERSON BY ANY THIRD PARTY IN CONNECTION WITH, RELATING TO OR ARISING OUT OF THE SERVICES PROVIDED BY THE COMPANY HEREUNDER.

(B) NOTWITHSTANDING ANY PROVISION TO THE CONTRARY CONTAINED HEREIN, AND IN RECOGNITION OF THE RELATIVE RISKS AND BENEFITS TO CLIENT AND THE COMPANY ASSOCIATED WITH THE TESTING SERVICES CONTEMPLATED HEREBY, THE RISKS HAVE BEEN ALLOCATED SUCH THAT UNDER NO CIRCUMSTANCES WHATSOEVER SHALL THE LIABILITY OF THE COMPANY TO CLIENT OR ANY THIRD PARTY IN RESPECT OF ANY CLAIM FOR LOSS, DAMAGE OR EXPENSE, OF WHATSOEVER NATURE OR MAGNITUDE, AND HOWSOEVER ARISING, EXCEED AN AMOUNT EQUAL TO FIVE (5) TIMES THE AMOUNT OF THE FEES PAID TO THE COMPANY FOR THE SPECIFIC SERVICES WHICH GAVE RISE TO SUCH CLAIM OR U.S.\$10,000, WHICHEVER IS THE LESSER AMOUNT.

16. The Company shall not be liable for any loss or damage resulting from any delay or failure in performance of its obligations hereunder resulting directly or indirectly from any event of force majeure or any event outside the control of the Company. If any such event occurs, the Company may immediately cancel or suspend its performance hereunder without incurring any liability whatsoever to Client.

17. Company's services, including these Conditions, shall be governed by, and construed in accordance with, the local laws of the country where the Company performs the tests or, in the case of tests performed in the United States of America, the laws of Massachusetts without regard to conflicts of laws principles. If any aspect(s) of these Conditions is found to be illegal or unenforceable, the validity, legality and enforceability of all remaining aspects of these Conditions shall not in any way be affected or impaired thereby. Any proceeding related to the subject matter hereof shall be brought, if at all, in the courts of the country where the Company performs the tests or, in the case of tests performed in the United States of America, in the courts of Massachusetts. Client waives the right to interpose any counterclaim or setoffs of any nature in any litigation arising hereunder.

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