

*FCC PART 15, SUBPART B and C
TEST REPORT*

for

POOL / SPA CONTROLLER - BASE UNIT

MODEL: LENNOVATOR

Prepared for

ALLIED INNOVATIONS, LLC
7215 BERMUDA ROAD
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Prepared by: _____

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Approved by: _____

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DATE: AUGUST 08, 2002

	REPORT BODY	APPENDICES					TOTAL
		A	B	C	D	E	
PAGES	16	2	2	2	13	21	56

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TABLE OF CONTENTS

Section / Title	PAGE
GENERAL REPORT SUMMARY	4
SUMMARY OF TEST RESULTS	4
1. PURPOSE	5
2. ADMINISTRATIVE DATA	6
2.1 Location of Testing	6
2.2 Traceability Statement	6
2.3 Cognizant Personnel	6
2.4 Date Test Sample was Received	6
2.5 Disposition of the Test Sample	6
2.6 Abbreviations and Acronyms	6
3. APPLICABLE DOCUMENTS	7
4. Description of Test Configuration	8
4.1 Description of Test Configuration - EMI	8
4.1.1 Cable Construction and Termination	9
5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT	10
5.1 EUT and Accessory List	10
5.2 EMI Test Equipment	11
6. TEST SITE DESCRIPTION	12
6.1 Test Facility Description	12
6.2 EUT Mounting, Bonding and Grounding	12
7. Test Procedures	13
7.1 Conducted Emissions Test	13
7.2 Radiated Emissions (Spurious and Harmonics) Test	14
8. CONCLUSIONS	16



LIST OF APPENDICES

APPENDIX	TITLE
A	Modifications to the EUT
B	Additional Models Covered Under This Report
C	Diagrams, Charts and Photos • Test Setup Diagrams • Radiated Emissions Photos • Antenna and Effective Gain Factors
D	Data Sheets
E	Laboratory Recognitions

LIST OF FIGURES

FIGURE	TITLE
1	Conducted Emissions Test Setup
2	Plot Map And Layout of Test Site



GENERAL REPORT SUMMARY

This electromagnetic emission test report is generated by Compatible Electronics Inc., which is an independent testing and consulting firm. The test report is based on testing performed by Compatible Electronics personnel according to the measurement procedures described in the test specifications given below and in the "Test Procedures" section of this report.

The measurement data and conclusions appearing herein relate only to the sample tested and this report may not be reproduced without the written permission of Compatible Electronics, unless done so in full.

This report must not be used to claim product endorsement by NVLAP or any other agency of the U.S. Government.

Device Tested: Pool / Spa Controller - Base Unit
Model: Lennovator
S/N: N/A

Product Description: See Expository Statement.

Modifications: The EUT was not modified during the testing.

Manufacturer: Allied Innovations, LLC
7215 Bermuda Road
Las Vegas, Nevada 89119-4304

Test Dates: August 6 and 7, 2002

Test Specifications: EMI requirements
CFR Title 47, Part 15 Subpart B; and Subpart C, Sections 15.205, 15.207, 15.209, and 15.249

Test Procedure: ANSI C63.4: 1992

Test Deviations: The test procedure was not deviated from during the testing.

SUMMARY OF TEST RESULTS

TEST	DESCRIPTION	RESULTS
1	Conducted RF Emissions, 450 kHz - 30 MHz	Complies with the Class B limits of CFR Title 47, Part 15, Subpart B; and Subpart C, section 15.207
2	Radiated RF Emissions, 10 kHz - 4300 MHz	Complies with the Class B limits of CFR Title 47, Part 15, Subpart B; and Subpart C, sections 15.205, 15.209, and 15.249



1. PURPOSE

This document is a qualification test report based on the Electromagnetic Interference (EMI) tests performed on the Pool / Spa Controller - Base Unit Model: Lennovator. The EMI measurements were performed according to the measurement procedure described in ANSI C63.4: 1992. The tests were performed in order to determine whether the electromagnetic emissions from the equipment under test, referred to as EUT hereafter, are within the Class B specification limits defined by CFR Title 47, Part 15, Subpart B; and Subpart C, sections 15.205, 15.207, 15.209, and 15.249.

Note: For Conducted Emissions, the limits are based on the new amended FCC rules mandated by FCC document 02-157.



2. ADMINISTRATIVE DATA

2.1 Location of Testing

The EMI tests described herein were performed at the test facility of Compatible Electronics, 114 Olinda Drive, Brea, California 92823.

2.2 Traceability Statement

The calibration certificates of all test equipment used during the test are on file at the location of the test. The calibration is traceable to the National Institute of Standards and Technology (NIST).

2.3 Cognizant Personnel

Allied Innovations, LLC

Brooks Bishofberger Engineer

Compatible Electronics, Inc.

Kyle Fujimoto Test Engineer

Michael Christensen Test Engineer

2.4 Date Test Sample was Received

The test sample was received on August 06, 2002.

2.5 Disposition of the Test Sample

The sample was returned to Allied Innovations, LLC on August 07, 2002.

2.6 Abbreviations and Acronyms

The following abbreviations and acronyms may be used in this document.

RF	Radio Frequency
EMI	Electromagnetic Interference
EUT	Equipment Under Test
P/N	Part Number
S/N	Serial Number
HP	Hewlett Packard
ITE	Information Technology Equipment
CML	Corrected Meter Limit
LISN	Line Impedance Stabilization Network



3. APPLICABLE DOCUMENTS

The following documents are referenced or used in the preparation of this EMI Test Report.

SPEC	TITLE
CFR Title 47, Subpart C	FCC Rules – Radio frequency devices – Intentional Radiators
ANSI C63.4 1992	Methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz.
EN 55022: 1998	Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement
CISPR 22: 1997	Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement



4. DESCRIPTION OF TEST CONFIGURATION

4.1 Description of Test Configuration - EMI

Setup and operation of the equipment under test.

Specifics of the EUT and Peripherals Tested

The Pool / Spa Controller - Base Unit Model: Lennovator (EUT) was connected to a temperature probe. The EUT was also connected to 21 unterminated cables. The EUT was continuously transmitting and receiving.

The final radiated as well as conducted data was taken in the mode above. Please see Appendix D for the data sheets.



4.1.1 Cable Construction and Termination

Cables 1-21 These are 1 meter unterminated, unshielded cables connected to the EUT. The cables are hard wired into the EUT.

Cable 22 This is a 1 meter unshielded cable connecting the EUT to the temperature probe. The cable is hard wired at each end.



5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT**5.1 EUT and Accessory List**

EQUIPMENT	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	FCC ID
POOL / SPA CONTROLLER - BASE UNIT (EUT)	ALLIED INNOVATIONS, LLC	LENNOVATOR	N/A	QLSLNVTRBAS102
TEMPERATURE PROBE	N/A	N/A	N/A	N/A



5.2 EMI Test Equipment

EQUIPMENT TYPE	MANU- FACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. DATE	CAL. DUE DATE
Radiated Emissions Manual Test – Radiated	Compatible Electronics	N/A	N/A	N/A	N/A
Conducted Emissions Program	Compatible Electronics	N/A	N/A	N/A	N/A
Spectrum Analyzer – Main Section	Hewlett Packard	8566B	3638A08768	June 21, 2002	June 21, 2003
Spectrum Analyzer – Display Section	Hewlett Packard	85662A	3701A22262	June 21, 2002	June 21, 2003
Spectrum Analyzer – Quasi-Peak Adapter	Hewlett Packard	85662A	2811A01363	June 21, 2002	June 21, 2003
Preamplifier	Com Power	PA-102	1017	Dec. 31, 2001	Dec. 31, 2002
Biconical Antenna	Com Power	AB-100	1548	Oct. 11, 2001	Oct. 11, 2002
Log Periodic Antenna	Com Power	AL-100	16089	Oct. 11, 2001	Oct. 11, 2002
RF Attenuator	Weinschel Corp.	2	BJ6396	July 30, 2002	July 30, 2003
LISN	Com-Power	LI-215	12082	Nov. 8, 2001	Nov. 8, 2002
LISN	Com-Power	LI-215	12078	Nov. 9, 2001	Nov. 9, 2002
Computer	Hewlett Packard	D5251A 888	US74458128	N/A	N/A
Printer	Hewlett Packard	C5886A	SG7CM1P090	N/A	N/A
Monitor	Hewlett Packard	D5258A	DK74889705	N/A	N/A
Loop Antenna	Com-Power	AL-130	17070	June 19, 2002	June 19, 2003
Horn Antenna	Antenna Research	DRG-118/A	1053	Jan. 13, 2002	Jan. 13, 2003
Microwave Preamplifier	Com-Power	PA-122	25195	Jan. 7, 2002	Jan. 7, 2003



6. TEST SITE DESCRIPTION**6.1 Test Facility Description**

Please refer to section 2.1 and 7.1 of this report for EMI test location.

6.2 EUT Mounting, Bonding and Grounding

The EUT was mounted on a 1.0 by 1.5 meter non-conductive table 0.8 meters above the ground plane.

The EUT was only grounded through the safety ground of its power cord.



7. TEST PROCEDURES

The following sections describe the test methods and the specifications for the tests. Test results are also included in this section.

7.1 Conducted Emissions Test

The spectrum analyzer was used as a measuring meter. The data was collected with the spectrum analyzer in the peak detect mode with the "Max Hold" feature activated. The quasi-peak was used only where indicated in the data sheets. A 10 dB attenuation pad was used for the protection of the spectrum analyzer input stage, and the offset was adjusted accordingly to read the actual data measured. The LISN output was measured using the spectrum analyzer. The output of the second LISN was terminated by a 50 ohm termination. The effective measurement bandwidth used for this test was 9 kHz.

Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The EUT was powered through the LISN, which was bonded to the ground plane. The LISN power was filtered and the filter was bonded to the ground plane. The EUT was set up with the minimum distances from any conductive surfaces as specified in ANSI C63.4: 1992. The excess power cord was wrapped in a figure eight pattern to form a bundle not exceeding 0.4 meters in length.

The conducted emissions from the EUT were maximized for operating mode as well as cable placement. The final data was collected under program control by the Compatible Electronics conducted emissions software in several overlapping sweeps by running the spectrum analyzer at a minimum scan rate of 10 seconds per octave. The final qualification data is located in Appendix E.



7.2 Radiated Emissions (Spurious and Harmonics) Test

The spectrum analyzer was used as a measuring meter along with the quasi-peak adapter. Amplifiers were used to increase the sensitivity of the instrument. The Com Power Preamplifier Model: PA-102 was used for frequencies from 30 MHz to 1 GHz, and the Com-Power Microwave Preamplifier Model: PA-122 was used for frequencies above 1 GHz. The spectrum analyzer was used in the peak detect mode with the "Max Hold" feature activated. In this mode, the spectrum analyzer records the highest measured reading over all the sweeps.

For the peak readings below 1000 MHz that were within 3 dB of the spec limit or higher, the quasi-peak adapter was used.

For the peak readings above 1000 MHz that were within 3dB of the spec limit or higher, the readings were averaged manually by narrowing the video filter down to 10 Hz and slowing the sweep time to keep the amplitude reading calibrated.

The measurement bandwidths and transducers used for the radiated emissions test were:

FREQUENCY RANGE	EFFECTIVE MEASUREMENT BANDWIDTH	TRANSDUCER
9 kHz to 150 kHz	200 Hz	Active Loop Antenna
150 kHz to 30 MHz	9 kHz	Active Loop Antenna
30 MHz to 300 MHz	120 kHz	Biconical Antenna
300 MHz to 1 GHz	120 kHz	Log Periodic Antenna
1 GHz to 9.3 GHz	1 MHz	Horn Antenna

The open field test site of Compatible Electronics, Inc. was used for radiated emission testing. This test site is set up according to ANSI C63.4: 1992. Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The turntable supporting the EUT is remote controlled using a motor. The turntable permits EUT rotation of 360 degrees in order to maximize emissions. Also, the antenna mast allows height variation of the antenna from 1 meter to 4 meters. Data was collected in the worst case (highest emission) configuration of the EUT. At each reading, the EUT was rotated 360 degrees and the antenna height was varied from 1 to 4 meters (for E field radiated field strength). The gunsight method was used when measuring with the horn antenna in order to ensure accurate results. The loop antenna was also rotated in the horizontal and vertical axis in order to ensure accurate results.



Radiated Emissions (Spurious and Harmonics) Test (con't)

The presence of ambient signals was verified by turning the EUT off. In case an ambient signal was detected, the measurement bandwidth was reduced temporarily and verification was made that an additional adjacent peak did not exist. This ensures that the ambient signal does not hide any emissions from the EUT. The EUT was tested at a 3 meter test distance to obtain final test data. The final qualification data sheets are located in Appendix D.



8. CONCLUSIONS

The Pool / Spa Controller - Base Unit Model: Lennovator meets all of the Class B specification limits defined in CFR Title 47, Part 15, Subpart B; and Subpart C, sections 15.205, 15.207, 15.209, and 15.249.



APPENDIX A

LABORATORY RECOGNITIONS



LABORATORY RECOGNITIONS

Compatible Electronics has the following agency accreditations:

National Voluntary Laboratory Accreditation Program - Lab Code: 200063-0

Voluntary Control Council for Interference - Registration Numbers: R-983, C-1026, R-984 and C-1027

Bureau of Standards and Metrology Inspection - Reference Number: SL2-IN-E-1031

Conformity Assessment Body for the EMC Directive Under the US/EU MRA Appointed by NIST

Compatible Electronics is recognized or on file with the following agencies:

Federal Communications Commission

Industry Canada

Radio-Frequency Technologies (Competent Body)



APPENDIX B

MODIFICATIONS TO THE EUT

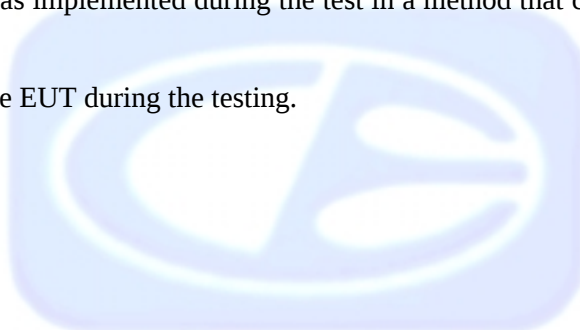


MODIFICATIONS TO THE EUT

The modifications listed below were made to the EUT to pass FCC Subpart B and FCC 15.249 specifications.

All the rework described below was implemented during the test in a method that could be reproduced in all the units by the manufacturer.

No modifications were made to the EUT during the testing.



APPENDIX C

***ADDITIONAL MODELS COVERED
UNDER THIS REPORT***



ADDITIONAL MODELS COVERED UNDER THIS REPORT

USED FOR THE PRIMARY TEST

Pool / Spa Controller – Base Unit
Model: Lennovator
S/N: N/A

There were no additional models covered under this report.



APPENDIX D

DIAGRAMS, CHARTS, AND PHOTOS



FIGURE 1: CONDUCTED EMISSIONS TEST SETUP

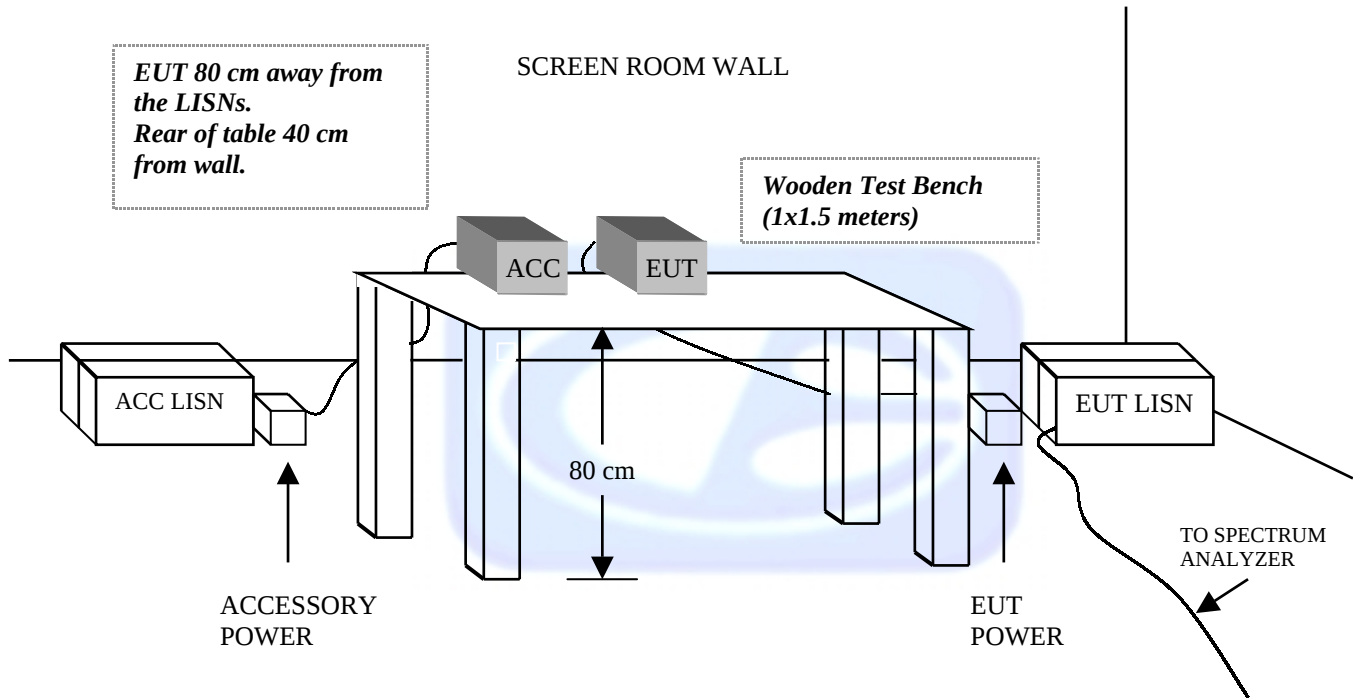
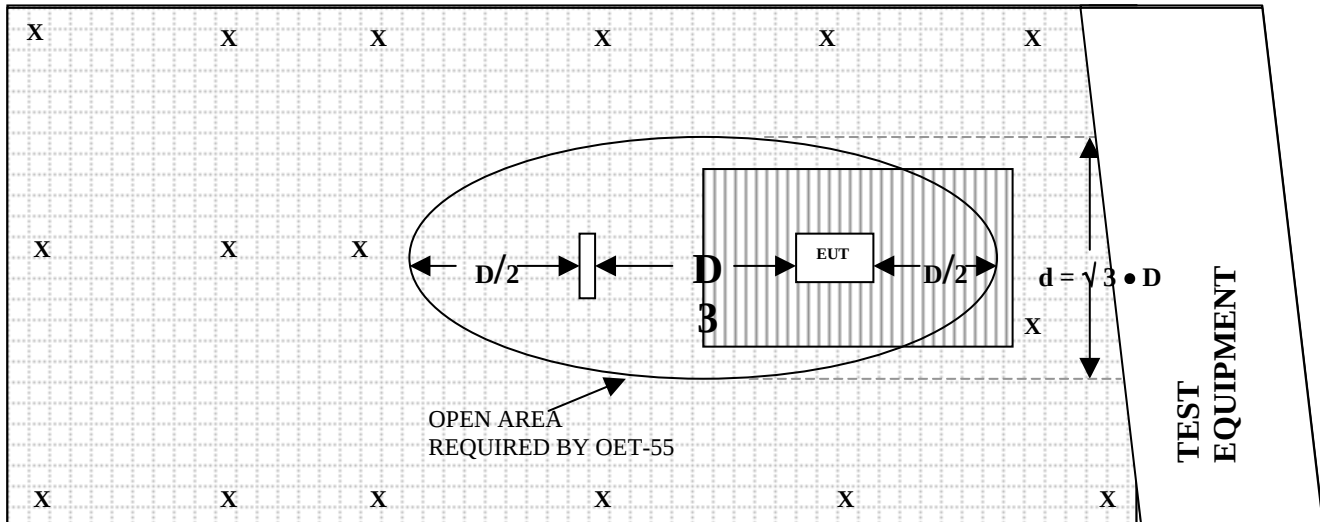


FIGURE 2: PLOT MAP AND LAYOUT OF RADIATED SITE

OPEN LAND > 15 METERS

OPEN LAND > 15 METERS



OPEN LAND > 15 METERS

X	= GROUND RODS		= GROUND SCREEN
D	= TEST DISTANCE (meters)		= WOOD COVER



COM-POWER AB-100

BICONICAL ANTENNA

S/N: 01548

CALIBRATION DATE: OCTOBER 11, 2001

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
30	13.70	120	11.00
35	13.70	125	11.20
40	11.80	140	12.50
45	12.30	150	13.20
50	11.00	160	13.50
60	10.40	175	14.60
70	8.60	180	14.40
80	8.30	200	15.90
90	8.30	250	17.60
100	8.80	300	19.90



COM-POWER AL-100

LOG PERIODIC ANTENNA

S/N: 16089

CALIBRATION DATE: OCTOBER 11, 2001

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
300	14.10	700	20.60
400	15.10	800	22.40
500	16.60	900	22.70
600	19.90	1000	26.50



COM-POWER PA-102**PREAMPLIFIER**

S/N: 1017

CALIBRATION DATE: DECEMBER 31, 2001

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
30	38.5	300	38.5
40	38.5	350	38.4
50	38.5	400	38.2
60	38.5	450	37.8
70	38.5	500	38.0
80	38.5	550	38.2
90	38.3	600	38.2
100	38.3	650	38.0
125	38.6	700	38.1
150	38.5	750	37.7
175	38.4	800	37.4
200	38.5	850	37.9
225	38.5	900	37.2
250	38.4	950	36.8
275	38.4	1000	37.3



COM-POWER PA-122**MICROWAVE PREAMPLIFIER**

S/N: 25195

CALIBRATION DATE: JANUARY 7, 2002

FREQUENCY (GHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
1.0	33.7	9.5	31.8
1.1	33.4	10.0	32.2
1.2	33.1	11.0	31.4
1.3	33.1	12.0	30.2
1.4	33.2	13.0	32.9
1.5	32.5	14.0	33.9
1.6	32.7	15.0	32.4
1.7	32.3	16.0	32.2
1.8	32.3	17.0	31.5
1.9	31.4	18.0	32.2
2.0	32.8	19.0	31.2
2.5	33.3	20.0	31.3
3.0	31.7	21.0	31.7
3.5	31.6	22.0	29.7
4.0	31.2		
4.5	31.2		
5.0	31.0		
5.5	31.3		
6.0	32.1		
6.5	32.1		
7.0	31.8		
7.5	32.0		
8.0	33.1		
8.5	32.0		
9.0	30.8		



ANTENNA RESEARCH DRG-118/A**HORN ANTENNA**

S/N: 1053

CALIBRATION DATE: JANUARY 13, 2002

FREQUENCY (GHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
1.0	25.5	9.5	39.1
1.5	26.6	10.0	39.7
2.0	29.4	10.5	40.9
2.5	30.4	11.0	40.7
3.0	31.2	11.5	42.4
3.5	32.3	12.0	42.6
4.0	32.9	12.5	42.4
4.5	33.0	13.0	41.5
5.0	34.8	13.5	41.0
5.5	35.2	14.0	40.5
6.0	36.4	14.5	43.6
6.5	36.6	15.0	43.7
7.0	38.8	15.5	43.3
7.5	38.8	16.0	42.8
8.0	38.0	16.5	43.0
8.5	38.1	17.0	42.7
9.0	39.9	17.5	44.0
		18.0	41.8



COM-POWER AL-130**LOOP ANTENNA**

S/N: 17070

CALIBRATION DATE: JUNE 19, 2002

FREQUENCY (MHz)	MAGNETIC (dB/m)	ELECTRIC (dB/m)
0.009	-40.4	11.1
0.01	-40.3	11.2
0.02	-41.2	10.3
0.05	-41.6	9.9
0.07	-41.4	10.1
0.1	-41.7	9.8
0.2	-44.0	7.5
0.3	-41.6	9.9
0.5	-41.3	10.2
0.7	-41.4	10.1
1	-40.9	10.6
2	-40.6	10.9
3	-40.5	11.0
4	-40.8	10.7
5	-40.2	11.3
10	-40.7	10.8
15	-41.4	10.1
20	-41.6	9.9
25	-41.7	9.8
30	-42.9	8.6





FRONT VIEW

ALLIED INNOVATIONS, LLC
POOL / SPA CONTROLLER - BASE UNIT
MODEL: LENNOVATOR
FCC SUBPART B AND C - RADIATED EMISSIONS – 08-06-02 and 08-07-02

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**





REAR VIEW

ALLIED INNOVATIONS, LLC
POOL / SPA CONTROLLER - BASE UNIT
MODEL: LENNOVATOR
FCC SUBPART B AND C - RADIATED EMISSIONS – 08-06-02 and 08-07-02

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**





FRONT VIEW

ALLIED INNOVATIONS, LLC
POOL / SPA CONTROLLER - BASE UNIT
MODEL: LENNOVATOR
FCC SUBPART B AND C - CONDUCTED EMISSIONS – 08-07-02

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**





REAR VIEW

ALLIED INNOVATIONS, LLC
POOL / SPA CONTROLLER - BASE UNIT
MODEL: LENNOVATOR
FCC SUBPART B AND C - CONDUCTED EMISSIONS – 08-07-02

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**



APPENDIX E

DATA SHEETS



RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.249)

COMPANY	ALLIED INNOVATIONS	DATE	8/6/02
EUT	POOL / SPA CONTROLLER - BASE UNIT	DUTY CYCLE	N/A %
MODEL	LENNOVATOR	PEAK TO AVG	N/A dB
S/N	N/A	TEST DIST.	3 Meters
TEST ENGINEER	KYLE FUJIMOTO	LAB	D

Frequency MHz	Peak Reading (dBuV)	Average (A) or Quasi- Peak (QP)	Antenna Polar. (V or H)	Antenna Height (meters)	EUT Azimuth (degrees)	EUT Axis (X,Y,Z)	EUT Tx Channel	Antenna Factor (dB)	Cable Loss (dB)	Amplifier Gain (dB)	Distance Factor (dB)	Mixer Factor (dB)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments
916.5000	63.9	A	V	1.0	180	Y	LOW	23.3	5.1	0.0	0.0	0.0	92.3	-1.7	94.0	
916.5000	64.0	A	H	1.0	180	Y	LOW	23.3	5.1	0.0	0.0	0.0	92.4	-1.6	94.0	

* CORRECTED READING = METER READING + ANTENNA FACTOR + CABLE LOSS - AMPLIFIER GAIN
 ** DELTA = SPEC LIMIT - CORRECTED READING

RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.249)

COMPANY	ALLIED INNOVATIONS	DATE	8/6/02
EUT	POOL / SPA CONTROLLER - BASE UNIT	DUTY CYCLE	N/A %
MODEL	LENNOVATOR	PEAK TO AVG	N/A dB
S/N	N/A	TEST DIST.	3 Meters
TEST ENGINEER	KYLE FUJIMOTO	LAB	D

Frequency MHz	Peak Reading (dBuV)	Average (A) or Quasi- Peak (QP)	Antenna Polar. (V or H)	Antenna Height (meters)	EUT Azimuth (degrees)	EUT Axis (X,Y,Z)	EUT Tx Channel	Antenna Factor (dB)	Cable Loss (dB)	Amplifier Gain (dB)	Distance Factor (dB)	Mixer Factor (dB)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments
1833.0000	45.9	A	H	1.0	180	Y	LOW	28.5	3.4	32.0	0.0	0.0	45.8	-8.2	54.0	
1833.0000	47.5	A	V	1.0	180	Y	LOW	28.5	3.4	32.0	0.0	0.0	47.4	-6.6	54.0	

* CORRECTED READING = METER READING + ANTENNA FACTOR + CABLE LOSS - AMPLIFIER GAIN
 ** DELTA = SPEC LIMIT - CORRECTED READING

RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.249)

COMPANY	ALLIED INNOVATIONS	DATE	8/6/02
EUT	POOL / SPA CONTROLLER - BASE UNIT	DUTY CYCLE	N/A %
MODEL	LENNOVATOR	PEAK TO AVG	N/A dB
S/N	N/A	TEST DIST.	3 Meters
TEST ENGINEER	KYLE FUJIMOTO	LAB	D

Frequency MHz	Peak Reading (dBuV)	Average (A) or Quasi- Peak (QP)	Antenna Polar. (V or H)	Antenna Height (meters)	EUT Azimuth (degrees)	EUT Axis (X,Y,Z)	EUT Tx Channel	Antenna Factor (dB)	Cable Loss (dB)	Amplifier Gain (dB)	Distance Factor (dB)	Mixer Factor (dB)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments
2749.5000	38.4	A	H	1.0	90	Y	LOW	30.8	4.3	32.5	0.0	0.0	41.0	-13.0	54.0	
2749.5000	35.6	A	V	1.0	180	Y	LOW	30.8	4.3	32.5	0.0	0.0	38.2	-15.8	54.0	

* CORRECTED READING = METER READING + ANTENNA FACTOR + CABLE LOSS - AMPLIFIER GAIN
 ** DELTA = SPEC LIMIT - CORRECTED READING

RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.249)

COMPANY	ALLIED INNOVATIONS	DATE	8/6/02
EUT	POOL / SPA CONTROLLER - BASE UNIT	DUTY CYCLE	N/A %
MODEL	LENNOVATOR	PEAK TO AVG	N/A dB
S/N	N/A	TEST DIST.	3 Meters
TEST ENGINEER	KYLE FUJIMOTO	LAB	D

Frequency MHz	Peak Reading (dBuV)	Average (A) or Quasi- Peak (QP)	Antenna Polar. (V or H)	Antenna Height (meters)	EUT Azimuth (degrees)	EUT Axis (X,Y,Z)	EUT Tx Channel	Antenna Factor (dB)	Cable Loss (dB)	Amplifier Gain (dB)	Distance Factor (dB)	Mixer Factor (dB)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments
3666.0000	37.1	A	H	1.0	0	Y	LOW	32.5	5.1	31.5	•0.0	0.0	43.2	-10.8	54.0	
3666.0000	36.8	A	V	1.0	0	Y	LOW	32.5	5.1	31.5	0.0	0.0	42.9	-11.1	54.0	

* CORRECTED READING = METER READING + ANTENNA FACTOR + CABLE LOSS - AMPLIFIER GAIN
 ** DELTA = SPEC LIMIT - CORRECTED READING

RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.249)

COMPANY	ALLIED INNOVATIONS	DATE	8/6/02
EUT	POOL / SPA CONTROLLER - BASE UNIT	DUTY CYCLE	N/A %
MODEL	LENNOVATOR	PEAK TO AVG	N/A dB
S/N	N/A	TEST DIST.	3 Meters
TEST ENGINEER	KYLE FUJIMOTO	LAB	D

Frequency MHz	Peak Reading (dBuV)	Average (A) or Quasi- Peak (QP)	Antenna Polar. (V or H)	Antenna Height (meters)	EUT Azimuth (degrees)	EUT Axis (X,Y,Z)	EUT Tx Channel	Antenna Factor (dB)	Cable Loss (dB)	Amplifier Gain (dB)	Distance Factor (dB)	Mixer Factor (dB)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments
4582.5000	37.7	A	H	1.0	180	X	LOW	34.3	6.0	31.2	0.0	0.0	46.8	-7.2	54.0	
4582.5000	35.5	A	V	1.0	180	Y	LOW	34.3	6.0	31.2	0.0	0.0	44.6	-9.4	54.0	

* CORRECTED READING = METER READING + ANTENNA FACTOR + CABLE LOSS - AMPLIFIER GAIN
 ** DELTA = SPEC LIMIT - CORRECTED READING

RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.249)

COMPANY	ALLIED INNOVATIONS	DATE	8/6/02
EUT	POOL / SPA CONTROLLER - BASE UNIT	DUTY CYCLE	N/A %
MODEL	LENNOVATOR	PEAK TO AVG	N/A dB
S/N	N/A	TEST DIST.	3 Meters
TEST ENGINEER	KYLE FUJIMOTO	LAB	D

Frequency MHz	Peak Reading (dBuV)	Average (A) or Quasi- Peak (QP)	Antenna Polar. (V or H)	Antenna Height (meters)	EUT Azimuth (degrees)	EUT Axis (X,Y,Z)	EUT Tx Channel	Antenna Factor (dB)	Cable Loss (dB)	Amplifier Gain (dB)	Distance Factor (dB)	Mixer Factor (dB)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments
5499.0000	35.6	A	H	1.0	90	X	LOW	35.6	6.2	31.3	0.0	0.0	46.1	-7.9	54.0	
5499.0000	36.7	A	V	1.0	90	Y	LOW	35.6	6.2	31.3	0.0	0.0	47.2	-6.8	54.0	

* CORRECTED READING = METER READING + ANTENNA FACTOR + CABLE LOSS - AMPLIFIER GAIN
 ** DELTA = SPEC LIMIT - CORRECTED READING

NO EMISSIONS NOR HARMONICS FOUND
 AFTER THE 6TH HARMONIC

Page: 1 of 1

Test location: Compatible Electronics
Customer : ALLIED INNOVATIONS
Manufacturer : ALLIED INNOVATIONS
EUT name : POOL / SPA CONTROLLER – BASE UNIT
Model : LENNOVATOR
Specification: Fcc_B Test distance: 3.0 mtrs Lab: D
Distance correction factor($20 \cdot \log(\text{test}/\text{spec})$) : 0.00
Test Mode : BASE UNIT
SPURIOUS EMISSIONS 30 MHz TO 9300 MHz
TEMPERATURE 75 DEGREES F., RELATIVE HUMIDITY 56%
TESTED BY: KYLE FUJIMOTO

Pol	Freq MHz	Rdng dBuV	Cable loss dB	Ant factor dB	Amp gain dB	Cor'd rdg = R dBuV	limit = L dBuV/m	Delta R-L dB
HORIZONTAL POLARIZATION								
1H	36.03	47.10	0.82	13.31	38.50	22.73	40.00	-17.27
2H	43.99	47.70	0.98	12.20	38.50	22.38	40.00	-17.62
3H	500.00	35.10	4.10	16.60	38.00	17.80	46.00	-28.20
4H	556.00	35.50	4.41	18.45	38.20	20.16	46.00	-25.84
5H	692.00	35.80	5.04	20.54	38.08	23.30	46.00	-22.70
6H	902.15	35.70	5.04	22.78	37.18	26.34	46.00	-19.66
7H	992.00	34.70	5.92	26.20	37.22	29.59	54.00	-24.41
8H	996.00	33.30	5.91	26.35	37.26	28.30	54.00	-25.70
VERTICAL POLARIZATION								
9V	80.00	50.60	1.50	8.30	38.50	21.90	40.00	-18.10
10V	120.00	37.60	1.76	11.00	38.54	11.82	43.50	-31.68
11V	228.00	36.10	2.54	16.85	38.49	17.00	46.00	-29.00
12V	902.14	33.30	5.04	22.78	37.18	23.94	46.00	-22.06



Page: 1 of 1

Test location: Compatible Electronics
Customer : ALLIED INNOVATIONS
Manufacturer : ALLIED INNOVATIONS
EUT name : POOL / SPA CONTROLLER – BASE UNIT
Model : LENNOVATOR
Specification: Fcc_B Test distance: 3.0 mtrs Lab: D
Distance correction factor($20 \cdot \log(\text{test}/\text{spec})$) : 0.00
Test Mode : BASE UNIT
SPURIOUS EMISSIONS 10 kHz TO 30 MHz
TEMPERATURE 75 DEGREES F., RELATIVE HUMIDITY 56%
TESTED BY: KYLE FUJIMOTO

NO EMISSIONS FOUND FROM 10 kHz TO 30 MHz IN EITHER POLARIZATION
FOR THE EUT

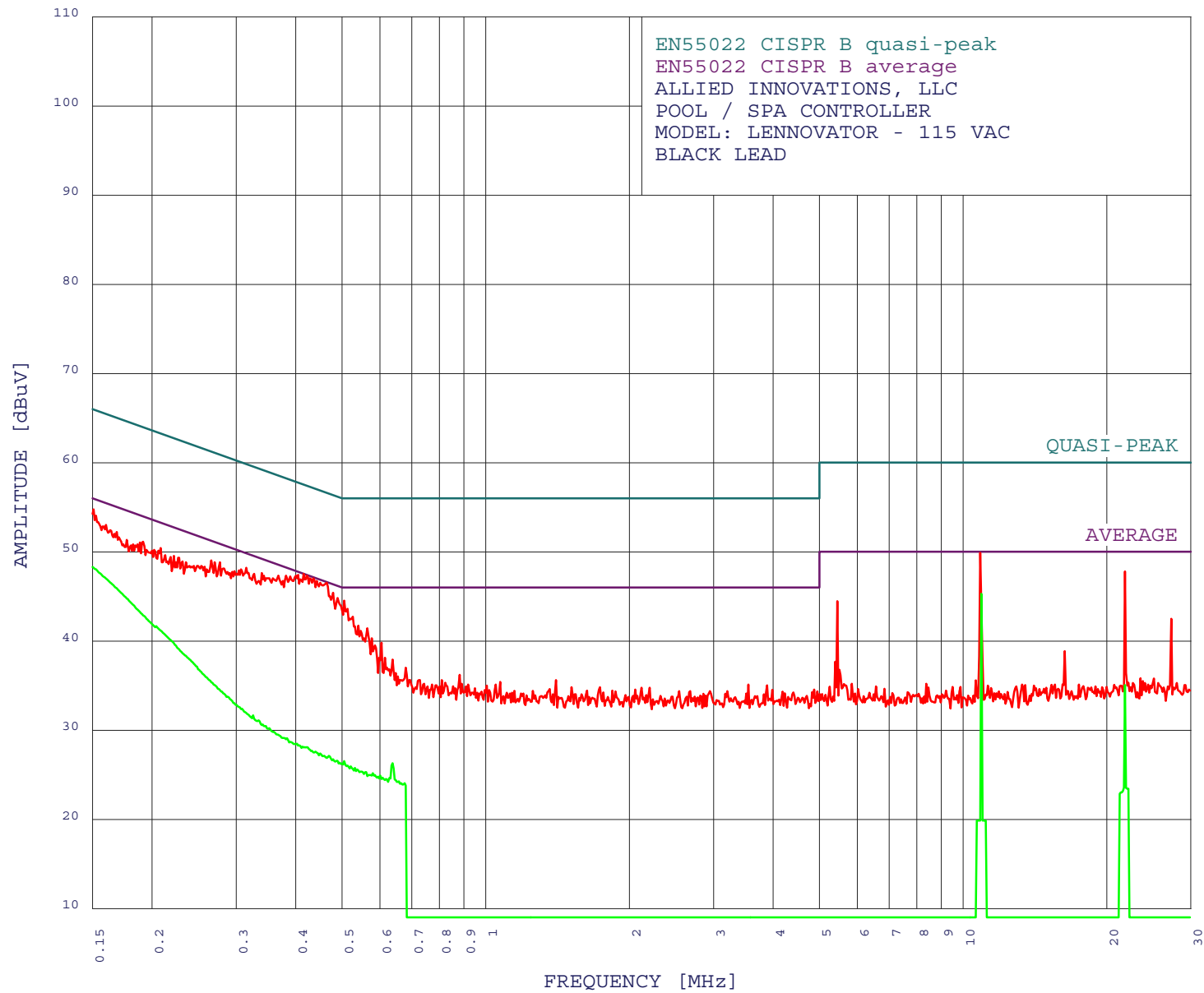




COMPATIBLE
ELECTRONICS

EMISSION LEVEL [dBuV] PEAK
Graph for Peak & Average

8/07/2002 12:23:09





**COMPATIBLE
ELECTRONICS**

8/07/2002

12:23:09

ALLIED INNOVATIONS, LLC
POOL / SPA CONTROLLER
MODEL: LENNOVATOR - 115 VAC
FCC SUBPART C - BLACK LEAD
TEST ENGINEER : KYLE FUJIMOTO

39 highest peaks above -50.00 dB of AVERAGE limit line

Peak criteria : 1.00 dB, Curve : Peak

Peak#	Freq(MHz)	Amp(dBuV)	Limit(dB)	Delta(dB)
1	0.415	47.53	47.54	-0.01*
2	10.862	49.90	50.00	-0.10*
3	0.405	47.43	47.76	-0.33*
4	0.489	44.82	46.18	-1.36*
5	0.505	44.52	46.00	-1.48*
6	0.340	47.63	49.21	-1.58*
7	0.315	48.23	49.84	-1.61*
8	0.278	48.83	50.89	-2.06*
9	21.830	47.80	50.00	-2.20*
10	0.266	49.03	51.24	-2.21*
11	0.270	48.83	51.10	-2.27*
12	0.192	51.13	53.97	-2.83*
13	0.208	50.43	53.27	-2.83*
14	0.222	49.53	52.73	-3.20*
15	0.227	49.33	52.56	-3.23*
16	0.236	48.83	52.25	-3.42*
17	0.565	41.42	46.00	-4.58*
18	5.450	44.48	50.00	-5.52*
19	0.577	40.32	46.00	-5.68*
20	0.605	39.82	46.00	-6.18*
21	27.285	42.50	50.00	-7.50
22	0.615	38.12	46.00	-7.88*
23	0.638	37.92	46.00	-8.08*
24	0.680	37.02	46.00	-8.98
25	0.881	36.21	46.00	-9.79
26	1.404	35.62	46.00	-10.38
27	0.724	35.62	46.00	-10.38
28	0.809	35.61	46.00	-10.39
29	1.072	35.41	46.00	-10.59
30	0.822	35.31	46.00	-10.69
31	0.743	35.22	46.00	-10.78
32	0.890	35.21	46.00	-10.79
33	0.772	35.12	46.00	-10.88
34	0.919	35.11	46.00	-10.89
35	1.050	35.11	46.00	-10.89
36	3.549	35.11	46.00	-10.89
37	3.885	35.02	46.00	-10.98
38	0.785	35.02	46.00	-10.98
39	1.005	35.01	46.00	-10.99



8/07/2002

12:23:09

ALLIED INNOVATIONS, LLC
POOL / SPA CONTROLLER
MODEL: LENNOVATOR - 115 VAC
FCC SUBPART C - BLACK LEAD
TEST ENGINEER : KYLE FUJIMOTO

20 highest peaks above -50.00 dB of AVERAGE limit line

Peak criteria : 0.10 dB, Curve : Average

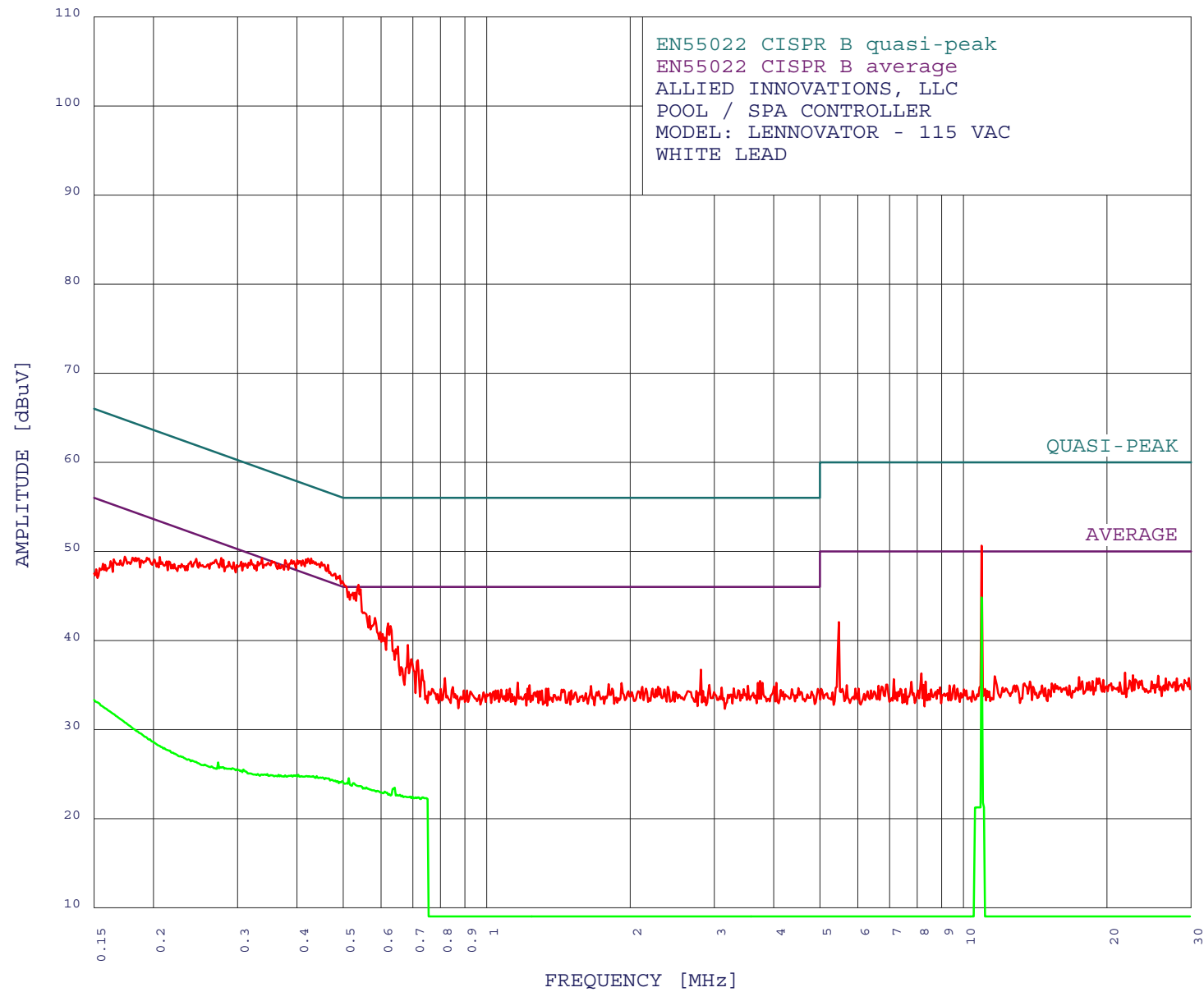
Peak#	Freq(MHz)	Amp(dBuV)	Limit(dB)	Delta(dB)
1	10.920	45.29	50.00	-4.71
2	0.204	41.65	53.44	-11.79
3	21.830	35.05	50.00	-14.95
4	0.326	31.67	49.57	-17.90
5	0.383	29.10	48.20	-19.11
6	0.469	27.13	46.53	-19.39
7	0.413	28.15	47.58	-19.44
8	0.505	26.52	46.00	-19.48
9	0.450	27.38	46.88	-19.50
10	0.638	26.31	46.00	-19.69
11	0.522	25.93	46.00	-20.07
12	0.532	25.76	46.00	-20.24
13	0.538	25.58	46.00	-20.42
14	0.559	25.29	46.00	-20.71
15	0.580	25.17	46.00	-20.83
16	0.601	24.92	46.00	-21.08
17	0.595	24.79	46.00	-21.21
18	0.608	24.66	46.00	-21.34
19	0.618	24.53	46.00	-21.47
20	0.676	24.06	46.00	-21.94



COMPATIBLE
ELECTRONICS

EMISSION LEVEL [dBuV] PEAK
Graph for Peak & Average

8/07/2002 12:28:56





8/07/2002

12:28:56

ALLIED INNOVATIONS, LLC
 POOL / SPA CONTROLLER
 MODEL: LENNOVATOR - 115 VAC
 FCC SUBPART C - WHITE LEAD
 TEST ENGINEER : KYLE FUJIMOTO

39 highest peaks above -50.00 dB of AVERAGE limit line

Peak criteria : 1.00 dB, Curve : Peak

Peak#	Freq(MHz)	Amp(dBuV)	Limit(dB)	Delta(dB)
1	0.422	49.19	47.41	1.78*
2	0.378	49.01	48.33	0.68*
3	10.920	50.64	50.00	0.64*
4	0.538	46.25	46.00	0.25*
5	0.338	49.22	49.26	-0.03*
6	0.320	49.03	49.70	-0.67*
7	0.305	48.84	50.09	-1.26*
8	0.278	49.25	50.89	-1.64*
9	0.288	48.84	50.58	-1.74*
10	0.246	49.16	51.90	-2.74*
11	0.568	42.74	46.00	-3.26*
12	0.583	42.53	46.00	-3.47*
13	0.206	49.37	53.36	-3.99*
14	0.621	41.92	46.00	-4.08*
15	0.194	49.28	53.88	-4.60*
16	0.174	49.39	54.76	-5.37*
17	0.163	48.89	55.33	-6.44*
18	0.683	39.49	46.00	-6.51*
19	0.651	39.30	46.00	-6.70*
20	5.478	42.06	50.00	-7.94
21	0.695	37.89	46.00	-8.11*
22	0.717	37.78	46.00	-8.22*
23	2.813	36.71	46.00	-9.29
24	0.731	36.67	46.00	-9.33*
25	0.817	35.77	46.00	-10.23
26	3.744	35.43	46.00	-10.57
27	1.161	35.28	46.00	-10.72
28	4.051	35.23	46.00	-10.77
29	3.785	35.23	46.00	-10.77
30	3.704	35.23	46.00	-10.77
31	1.919	35.19	46.00	-10.81
32	1.803	35.09	46.00	-10.91
33	2.931	35.01	46.00	-10.99
34	1.230	34.98	46.00	-11.02
35	3.531	34.92	46.00	-11.08
36	1.656	34.89	46.00	-11.11
37	4.006	34.83	46.00	-11.17
38	2.398	34.80	46.00	-11.20
39	2.287	34.80	46.00	-11.20



**COMPATIBLE
ELECTRONICS**

8/07/2002

12:28:56

ALLIED INNOVATIONS, LLC
POOL / SPA CONTROLLER
MODEL: LENNOVATOR - 115 VAC
FCC SUBPART C - WHITE LEAD
TEST ENGINEER : KYLE FUJIMOTO

26 highest peaks above -50.00 dB of AVERAGE limit line

Peak criteria : 0.10 dB, Curve : Average

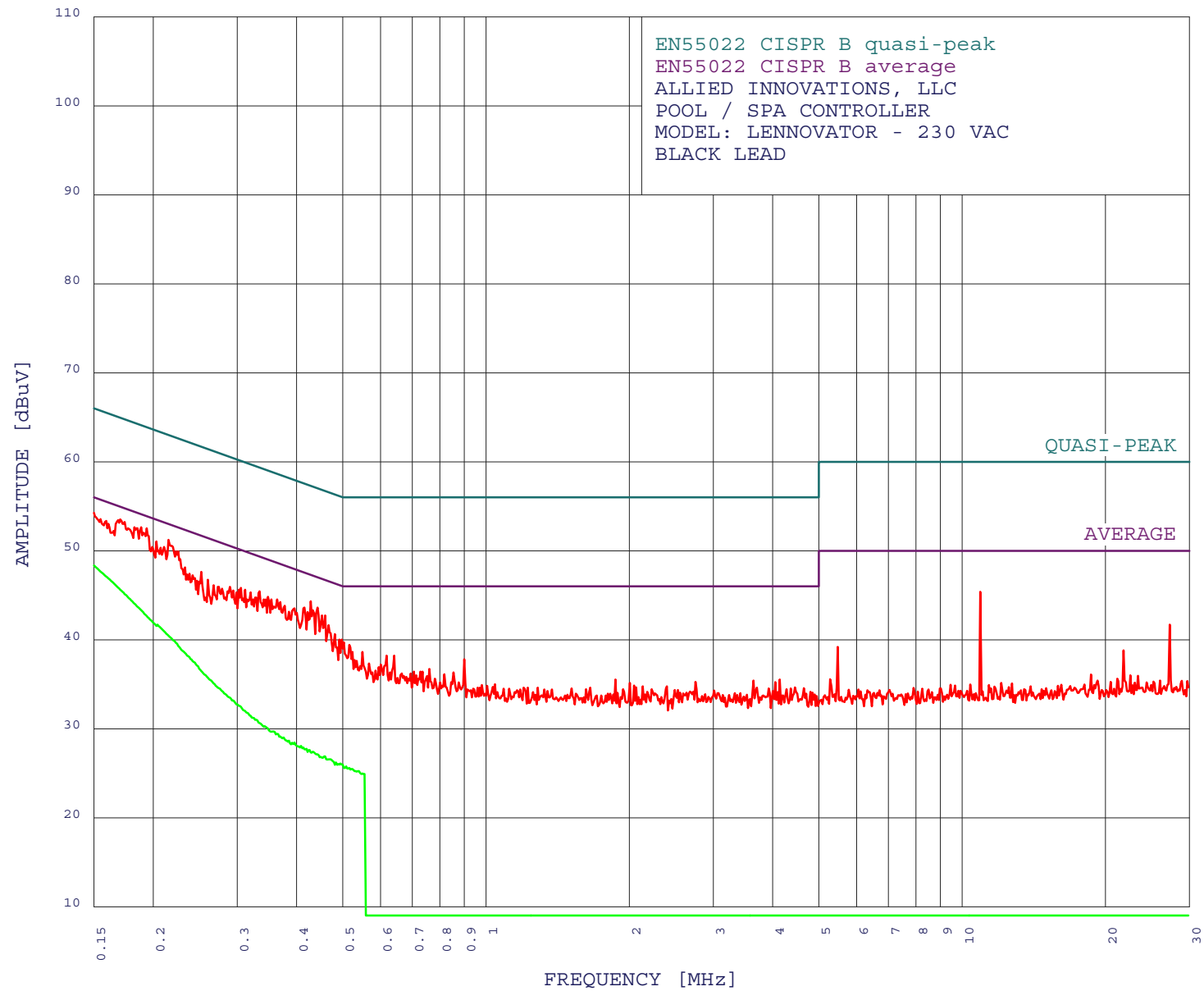
Peak#	Freq(MHz)	Amp(dBuV)	Limit(dB)	Delta(dB)
1	10.920	44.82	50.00	-5.18
2	0.513	24.53	46.00	-21.47
3	0.497	24.19	46.04	-21.85
4	0.524	23.96	46.00	-22.04
5	0.459	24.55	46.70	-22.16
6	0.440	24.76	47.06	-22.30
7	0.559	23.50	46.00	-22.50
8	0.641	23.47	46.00	-22.53
9	0.402	24.91	47.80	-22.90
10	0.611	23.01	46.00	-22.99
11	0.394	24.85	47.99	-23.13
12	0.389	24.85	48.08	-23.22
13	0.378	24.86	48.33	-23.47
14	0.698	22.47	46.00	-23.53
15	0.731	22.37	46.00	-23.63
16	0.370	24.86	48.51	-23.65
17	0.366	24.92	48.60	-23.67
18	0.347	25.00	49.04	-24.04
19	0.331	25.01	49.43	-24.43
20	0.309	25.51	50.01	-24.49
21	0.273	26.30	51.02	-24.72
22	0.299	25.52	50.27	-24.75
23	0.293	25.65	50.45	-24.79
24	0.276	25.78	50.93	-25.15
25	0.256	26.07	51.55	-25.48
26	0.241	26.53	52.07	-25.54



COMPATIBLE
ELECTRONICS

EMISSION LEVEL [dBuV] PEAK
Graph for Peak & Average

8/07/2002 11:59:53





**COMPATIBLE
ELECTRONICS**

8/07/2002

11:59:53

ALLIED INNOVATIONS, LLC
POOL / SPA CONTROLLER
MODEL: LENNOVATOR - 230 VAC
FCC SUBPART C - BLACK LEAD
TEST ENGINEER : KYLE FUJIMOTO

40 highest peaks above -50.00 dB of AVERAGE limit line

Peak criteria : 1.00 dB, Curve : Peak

Peak#	Freq(MHz)	Amp(dBuV)	Limit(dB)	Delta(dB)
1	0.170	53.53	54.94	-1.40*
2	0.189	52.63	54.10	-1.47*
3	0.183	52.63	54.37	-1.73*
4	0.150	54.25	56.00	-1.75*
5	0.215	51.23	53.00	-1.76*
6	0.203	51.03	53.49	-2.45*
7	0.428	44.33	47.28	-2.96*
8	0.442	43.63	47.01	-3.39*
9	0.415	43.63	47.54	-3.91*
10	0.334	45.43	49.34	-3.91*
11	0.459	42.73	46.70	-3.98*
12	0.252	47.63	51.68	-4.05*
13	0.452	42.73	46.84	-4.11*
14	0.364	44.53	48.64	-4.11*
15	0.348	44.83	49.00	-4.17*
16	0.305	45.83	50.09	-4.26*
17	0.312	45.63	49.92	-4.29*
18	0.354	44.53	48.87	-4.34*
19	0.320	45.33	49.70	-4.37*
20	0.396	43.53	47.94	-4.41*
21	10.920	45.40	50.00	-4.60
22	0.290	45.93	50.54	-4.61*
23	0.260	46.73	51.42	-4.68*
24	0.299	45.33	50.27	-4.94*
25	0.467	41.63	46.57	-4.95*
26	0.268	46.13	51.19	-5.06*
27	0.273	45.93	51.02	-5.09*
28	0.481	40.62	46.32	-5.69*
29	0.497	40.02	46.04	-6.02*
30	0.492	40.02	46.13	-6.11*
31	0.516	39.42	46.00	-6.58*
32	0.550	38.62	46.00	-7.38*
33	0.618	38.22	46.00	-7.78
34	0.641	38.22	46.00	-7.78
35	0.900	37.81	46.00	-8.19
36	27.285	41.70	50.00	-8.30
37	0.568	37.32	46.00	-8.68
38	0.601	37.22	46.00	-8.78
39	0.760	36.72	46.00	-9.28
40	0.586	36.52	46.00	-9.48

**COMPATIBLE
ELECTRONICS**

8/07/2002

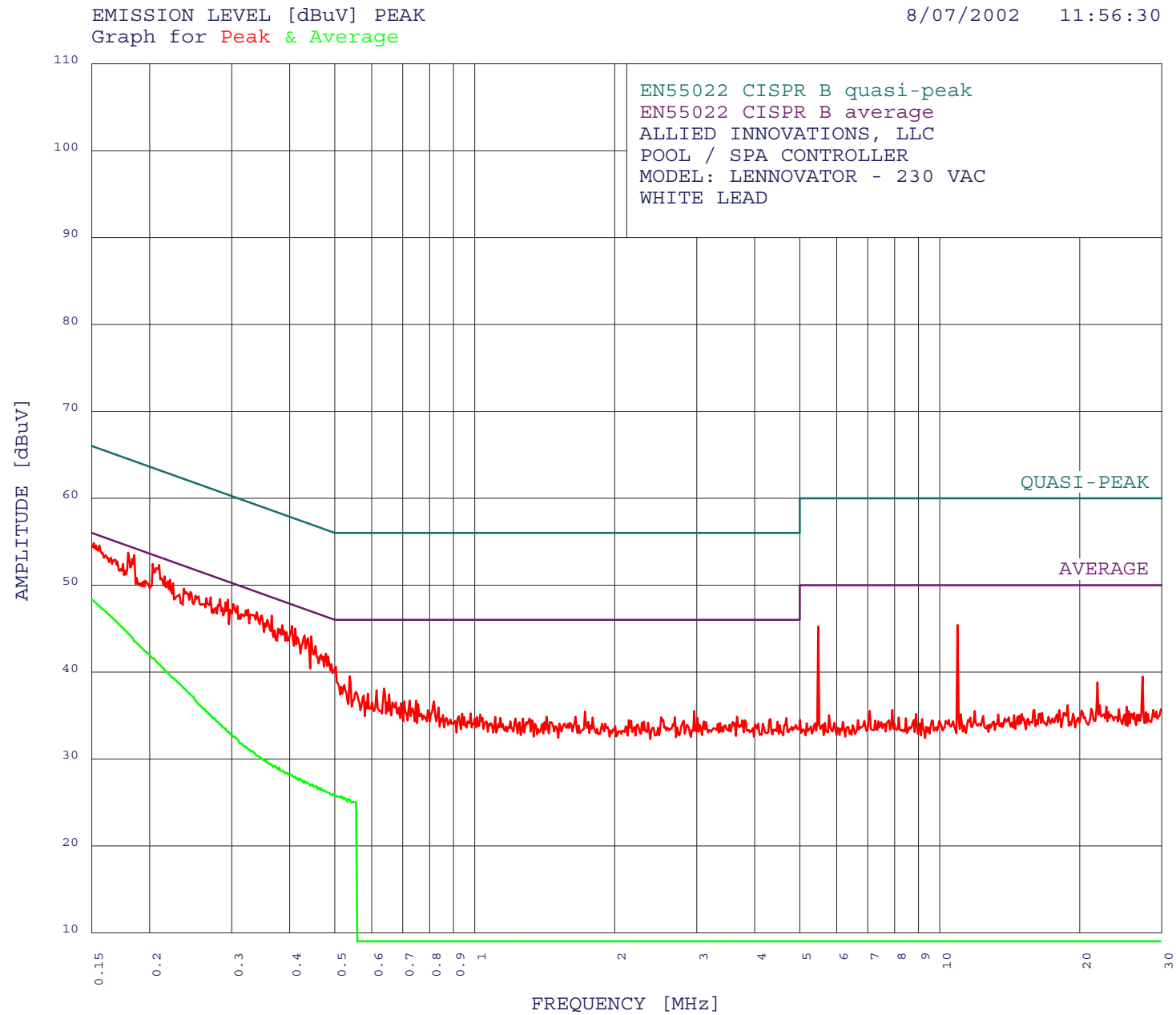
11:59:53

ALLIED INNOVATIONS, LLC
POOL / SPA CONTROLLER
MODEL: LENNOVATOR - 230 VAC
FCC SUBPART C - BLACK LEAD
TEST ENGINEER : KYLE FUJIMOTO

11 highest peaks above -50.00 dB of AVERAGE limit line

Peak criteria : 0.10 dB, Curve : Average

Peak#	Freq(MHz)	Amp(dBuV)	Limit(dB)	Delta(dB)
1	0.150	48.32	56.00	-7.68
2	0.204	41.68	53.44	-11.76
3	0.396	28.45	47.94	-19.49
4	0.385	28.66	48.16	-19.51
5	0.409	28.06	47.67	-19.61
6	0.391	28.41	48.03	-19.63
7	0.424	27.61	47.37	-19.76
8	0.457	26.89	46.75	-19.86
9	0.495	26.09	46.09	-20.00
10	0.484	26.20	46.27	-20.07
11	0.508	25.76	46.00	-20.24





8/07/2002

11:56:30

ALLIED INNOVATIONS, LLC
 POOL / SPA CONTROLLER
 MODEL: LENNOVATOR
 FCC SUBPART C - WHITE LEAD - 230 VAC
 TEST ENGINEER : KYLE FUJIMOTO

40 highest peaks above -50.00 dB of AVERAGE limit line

Peak criteria : 1.00 dB, Curve : Peak

Peak#	Freq(MHz)	Amp(dBuV)	Limit(dB)	Delta(dB)
1	0.180	53.74	54.49	-0.76*
2	0.185	53.43	54.24	-0.81*
3	0.203	52.43	53.49	-1.06*
4	0.150	54.46	56.00	-1.54*
5	0.215	51.02	53.00	-1.97*
6	0.366	46.49	48.60	-2.10*
7	0.294	48.30	50.40	-2.10*
8	0.221	50.62	52.78	-2.16*
9	0.283	48.40	50.72	-2.32*
10	0.340	46.89	49.21	-2.32*
11	0.326	47.19	49.57	-2.37*
12	0.302	47.79	50.18	-2.39*
13	0.225	50.22	52.65	-2.43*
14	0.405	45.30	47.76	-2.46*
15	0.291	48.00	50.49	-2.49*
16	0.270	48.60	51.10	-2.50*
17	0.348	46.49	49.00	-2.51*
18	0.237	49.62	52.21	-2.59*
19	0.411	45.00	47.63	-2.63*
20	0.385	45.39	48.16	-2.77*
21	0.358	45.99	48.78	-2.78*
22	0.445	44.10	46.97	-2.87*
23	0.431	44.20	47.24	-3.04*
24	0.438	43.90	47.11	-3.21*
25	0.455	43.00	46.79	-3.79*
26	0.479	42.10	46.36	-4.26*
27	0.484	41.80	46.27	-4.47*
28	10.920	45.43	50.00	-4.57
29	0.467	42.00	46.57	-4.57*
30	5.478	45.23	50.00	-4.77
31	0.538	39.50	46.00	-6.50*
32	0.524	38.50	46.00	-7.50*
33	0.638	38.11	46.00	-7.89
34	0.615	37.91	46.00	-8.09
35	0.556	37.70	46.00	-8.30
36	0.589	37.50	46.00	-8.50
37	0.655	37.41	46.00	-8.59
38	0.577	37.30	46.00	-8.70
39	0.748	36.71	46.00	-9.29
40	0.724	36.71	46.00	-9.29

**COMPATIBLE
ELECTRONICS**

8/07/2002

11:56:30

ALLIED INNOVATIONS, LLC
POOL / SPA CONTROLLER
MODEL: LENNOVATOR
FCC SUBPART C - WHITE LEAD - 230 VAC
TEST ENGINEER : KYLE FUJIMOTO

12 highest peaks above -50.00 dB of AVERAGE limit line

Peak criteria : 0.10 dB, Curve : Average

Peak#	Freq(MHz)	Amp(dBuV)	Limit(dB)	Delta(dB)
1	0.372	29.21	48.46	-19.25
2	0.380	29.02	48.29	-19.27
3	0.420	27.77	47.45	-19.69
4	0.431	27.44	47.24	-19.80
5	0.447	27.11	46.92	-19.82
6	0.457	26.86	46.75	-19.89
7	0.467	26.66	46.57	-19.91
8	0.462	26.71	46.66	-19.95
9	0.497	25.96	46.04	-20.08
10	0.519	25.68	46.00	-20.32
11	0.524	25.51	46.00	-20.49
12	0.535	25.45	46.00	-20.55
