

Measurement Report

FCC ID:N96-U1-2HOUVWThis report concerns (check one) : ☒ Original Grant ☐ Class II Change

Issued Date : Jun. 06, 2003
Project No. : 03E0287
Equipment : ELECTRONIC BALLAST
Model No. : U1-2HOUVW
Applicant : SUNPARK ELECTRONICS CORP.
6F-2, No.135, Sec.4, Pa-Teh Rd.,
Taipei, Taiwan, R.O.C.

Tested by :
Neutron Engineering Inc. EMC Laboratory
FCC Registration Number : 95335

Date of Test :
May. 29, 2003 ~ Jun. 06, 2003

Testing Engineer :

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Declaration

Neutron represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with the standards traceable to National Measurement Laboratory (**NML**) of **R.O.C.**, or National Institute of Standards and Technology (**NIST**) of **U.S.A.**

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1. General Information**1.1 Applicant**

Name SUNPARK ELECTRONICS CORP.
Address 6F-2, No.135, Sec.4, Pa-Teh Rd., Taipei, Taiwan, R.O.C.

1.2 Manufacturer

Name N/A
Address N/A

1.3 Equipment Under Tested

Name: ELECTRONIC BALLAST
Trade Name: SUNPARK
Model No.: U1-2HOUVW

1.4 OEM Brand/Model (if applicable)

OEM Brand(s)/Model(s) except the basic model in sub-clause 1.3 is(are) the follow(s):
OEM Brand: STERIL-AIRE
Model No.: N/A

1.5 Product Descriptions(Application/Features/Specification)

ISM Equipment Category : RF Lighting Devices(Ballast)
Nominal Operating Frequency : 46 +/- 1 KHz
Electrical Power : 120V-230V AC input
Power Cord : non-shielded type wire
More details of EUT technical specification, please refer to the User's Manual.

1.6 Products Covered (if applicable)

The sample tested including the following sub-system/module/accessory :

Sub-system/ Module/ Accessory	Model/Type No.	Int. Inst./ Ext. Cont.
N/A	N/A	N/A

1.7 Model Difference (Series, Versions, if any)

Except the basic model no. (model designation of the sample tested in this test report),
additional model no. covered is(are) :

N/A

1.8 EUT Modifications (if applicable)

Please refer to the Attachment – **A**.

1.9 Photos of EUT

Please refer to the Attachment – **C**.

2. RFI Emissions Measurement

2.1 Test Facility

The test facilities used to collect the test data in this report located at No.132-1, Lane 329, Sec. 2, Palain Road, Shijr City, Taipei, Taiwan. A description of this test facilities is already on file with the FCC as registration number of 95335.

2.2 Standard Compliance

The test Standard contained in this report relate only to the item(s) listed below :
FCC Part 18 , Section 18.305(C) and 18.307(C) , Consumer Equipment Limits

2.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 (1992) / MP-5 (1986).

Radiated testing was performed at an antenna to EUT distance 1 meter by loop antenna used.

Test procedures according to the technical standards of :
FCC Rules Part 18, Subpart C.

2.4 Deviations from Standard Test Method

FCC Part 15, Subpart B, Section 15.209 Radiated Emission Limits ; General Requirement is adopted

2.5 Sample(s) Tested

The representative sample tested in this reports is(are): U1-2HOUVW

Test results in this test report relate only to the sample(s) tested.

2.6 Measurement Instruments

Valid measurement instruments used in this report refer to **Table-1** enclosed.

2.7 Environmental Condition

Temperature 25 °C

Relative Humidity 57 %

2.8 Tested System Set-Up/Configuration Details

The system was configured for testing in a typical fashion (as a user would normally use) or in-accordance with the operating configuration specified in the user's manual. A Block Diagram(please refer to the Diagram - 1) and Photos(please refer to the attachment - **B**) showing the set-up/configuration of system tested. In addition, **Table-2** and **Table-3** provide a detail of all equipment items and cables information used in the system tested.

Table -1 Measurement Instruments List

Item	Instruments	Mfr/Brand	Model/Type No	Serial No.	Calib Date	Next Calib.	Note
1	LISN	EMCO	3825/2	9605-2539	2002-06-10	2003-06-09	✓
2	LISN	Rolf Heine	NNB-2/16Z	98083	2002-11-01	2003-10-31	
3	LISN	Rolf Heine	NNB-2/16Z	98053	2002-11-15	2003-11-14	
4	Pulse Limiter	Electro-Metrics	EM-7600	112644	2002-12-09	2003-12-08	✓
5	Terminator	50Ω	N/A	N/A	2003-05-09	2004-05-08	✓
6	Test Cable	N/A	C01	N/A	2002-12-10	2003-12-09	✓
7	Test Cable	N/A	10M_OS01	N/A	2002-12-10	2003-12-09	
8	Test Cable	N/A	OS01-1/-2	N/A	2002-12-10	2003-12-09	
9	Test Cable	N/A	10M_OS02	N/A	2002-12-10	2003-12-09	
10	Test Cable	N/A	OS02-1/-2/-3	N/A	2002-12-10	2003-12-09	
11	RF Switch	Anritsu	MP59B	M65982	2001-12-09	2003-12-08	
12	QP Adapter	HP	85650A	2521A00844	2003-04-21	2003-10-20	
13	Preselector	HP	85685A	2648A00417	2003-04-21	2003-10-20	
14	Spectrum Analyzer	HP	85680B	2634A03025	2003-04-21	2003-10-20	
15	Spectrum Monitor	HP	85662B	2648A13616	2003-04-21	2003-10-20	
16	Pre-Amplifier	Anritsu	MH648A	M09961	2002-12-09	2003-12-08	
17	Spectrum Analyzer	Advantest	R3261C	81720298	2002-08-14	2003-08-13	
18	Test Receiver	R&S	ESH3	860156/018	2002-10-22	2003-10-21	
19	Test Receiver	R&S	ESVP	860687/009	2002-12-06	2003-12-05	
20	Test Receiver	MEB	SMV41	130	2002-12-06	2003-12-05	✓
21	Test Receiver	PMM	PMM 9000	4310J01002	2002-10-06	2003-10-03	
22	Test Receiver	R&S	ESMI	843977/005	2003-01-13	2004-01-12	✓
23	Pre-Amplifier	R&S	ESMI-Z7	1045.5020.9801 (612.278 041 00)	2002-05-20	2003-05-19	
24	Voltage Probe	R&S	ESH2-Z3	841.800/023	2002-08-28	2003-08-27	
25	Loop Antenna	R&S	HFH2-Z2	830749/020	N/A	N/A	✓
26	Antenna Mast	Chance Most	CMTB-1.5	N/A	N/A	N/A	✓
27	Turn Table	Chance Most	CMTB-1.5	N/A	N/A	N/A	✓

Remark :

(1)" ✓" indicates the instrument used in this Test Report.

(2)" N/A" denotes No Model No. / Serial No. and No Calibration specified.

Diagram – 1

Block diagram showing the configuration of system tested

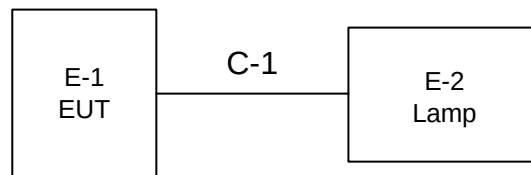


Table - 2 Equipments Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.	Note
E-1	ELECTRONIC BALLAST	SUNPARK	U1-2HOUVW	N96-U1-2HOUVW	N/A	EUT
E-2	Lamp	N/A	RGTS24	N/A	N/A	
E-2	Lamp	N/A	RGTS16	N/A	N/A	

Note:

- (1) Unless otherwise denoted as EUT in 『Remark』 column , device(s) used in tested system is a support equipment.
- (2) Unless otherwise marked as ※ in 『Remark』 column, Neutron consigns the support equipment to the tested system.
- (3) The support equipment E-2 is a ultraviolet (uv) rays lamp used as the load for EUT.

Table - 3 Information of Interface Cable

Item	Shielded Type	Ferrite Core	Length	Note
C-1	Non-Shielded	N/A	120cm	

Note:

- (1) Unless otherwise marked as ※ in 『Remark』 column, Neutron consigns the support equipment to the tested system.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.

2.9 Max.(Worst Case) RF Emission Evaluation

- (a) Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 (1992) and the FCC Measurement Procedure MP-5 (1986).
- (b) The system was configured for testing in a typical fashion (as a customer would normally use it).The lamp was connected to EUT as a customer would normally use it as possible to comply with the Rules or Standards requirement.
- (c) To investigate the maximum EMI emission characteristics, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively and used to collect the included data.

Mode 1 PN:F22000100 (45W) / Lamp type: RGTS16 X 2
Mode 2 PN:F22000200 (75W) / Lamp type: RGTS24 X 2
Mode 3 PN:F22000200 (65W) / Lamp type: RGTS20 X 2

The EUT system operated Mode1 and 2, mentioned above were found to be the worst case during the pre-scanning test.

These operation modes were used for final testing and collecting test data included in this report.

2.10 EUT Operation

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively and used to collect the included data.

3. Justification

3.1 Frequency Range of Measurement

3.1.1 Power Line Conducted Emission

150KHz-30MHz

3.1.2 Radiated Emission

Frequency Band in which Device Operates (MHz)	Range of Frequency Measurements	
	Lowest Frequency	Highest Frequency
Below 1.705	Lowest freq. generated In the device, but not lower than 9KHz	30MHz
1.705 to 30	Lowest freq. generated In the device, but not lower than 9KHz	400MHz
30 to 500	Lowest freq. generated In the device or 25MHz, whichever is lower.	Tenth harmonic or 1000MHz, whichever is higher.
500 to 1000	Lowest freq. generated In the device or 100MHz, whichever is lower.	Tenth harmonic
Above 1000	Didtto	Tenth harmonic or highest detectable emission

3.2 Limitations

3.2.1 Power Line Conducted Emission (Frequency Range 150KHz-30MHz)

Frequency Range (MHz)	Non-consumer Equipment		Frequency Range (MHz)	Consumer Equipment	
	dBuV	uV		dBuV	uV
0.45 - 1.60	60.00	1000	0.45 - 2.51	48	250
1.60 - 30.0	69.50	3000	2.51 - 3.00	69.5	3000
			3.00 - 30.0	48	250

Notes : The tighter limit applies at the band edges.

3.2.2 Radiated Emission Limits (Frequency Range 30MHz-1000MHz)

Frequency (MHz)	F.S Limitation at 30m dist		F.S Limitation at 1m dist		Remark
	(uV/m)	(dBuV/m)	(uV/m)	(dBuV/m)	
30 - 88	30	29.54	900	59.08	Non-consumer Equipment
88 - 216	50	33.98	1500	63.52	
216 - 1000	70	36.90	2100	66.44	
30 - 88	10	20.00	300	49.54	Consumer Equipment
88 - 216	15	23.52	450	53.06	
216 - 1000	20	26.02	600	55.56	

Notes :

- (1). The tighter limit shall apply at the boundary between two frequency range.
- (2). Limitation expressed in dBuV/m is calculated by $20\log$ Emission Level (uV/m).
- (3). If measurement is made at 1m distance, then F.S Limitation at 1m distance is adjusted by using the formula of $L_{d1} = L_{d2} * (d_2/d_1)$.
Example:
F.S Limit at 30m distance is 30uV/m , then F.S Limitation at 1m distance is adjusted as $L_{d1} = L_1 = 30uV/m * (30/1) = 900 uV/m$

- (4). Section 15.209 radiated emission limits and general requirement of FCC Part 15, Subpart B is adopted as the radiated emission field strength limitation for frequency range between 9KHz-30MHz. It is a deviation from standard justification specified in FCC Part-18 Section 18.305 (C).

FCC Part 15, Subpart B, Section 15.209 Radiated Emission Limits ; General Requirement

Frequency (MHz)	Field Strength Limitation		Field Strength Limitation at 1m Measurement Dist	
	(uV/m)	Dist	(uV/m)	(dBuV/m)
0.009 – 0.490	$2400 / F(\text{KHz})$	300m	$90000 * 2400/F(\text{KHz})$	$20\log 2400/F(\text{KHz}) + 99.08$
0.490 – 1.705	$24000 / F(\text{KHz})$	30m	$900 * 24000/F(\text{KHz})$	$20\log 24000/F(\text{KHz}) + 59.08$
1.705 – 30.00	30	30m	$900 * 30$	88.63

Notes :

- (1). The tighter limit shall apply at the boundary between two frequency range.
- (2). Limitation expressed in dBuV/m is calculated by $20\log$ Emission Level (uV/m).
- (3). If measurement is made at 1m distance, then F.S Limitation at 1m distance is adjusted by using the formula of $L_{d1} = L_{d2} * (d_2/d_1)^2$.

Example:

F.S Limit at 30m distance is 30uV/m , then F.S Limitation at 1m distance is adjusted as $L_{d1} = L_1 = 30\text{uV/m} * (30)^2 = 900 * 30 \text{ uV/m}$

3.3 Measurement Justification

3.3.1 Conducted Emission

The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and these signals are then Quasi Peak detector mode re-measured.

Data of **Table - 4.** lists the significant emission frequencies, measured levels, limits and safe margins. All readings are Peak Mode measured unless otherwise stated as QP in column of "Remark".

If the Peak Mode measured value lower than both QP Mode Limit, EUT shall be deemed to compliance with both QP Limits and then no additional QP Mode measurement performed.

3.3.2 Radiated Emission

The initial step in collecting radiated emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.

Data of **Table - 5.** lists the significant emission frequencies, measured levels, limits and safe margins. All readings are Peak Mode measured unless otherwise stated as QP in column of "Remark".

If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.

3.4 Measurement Data

Table - 4. Conducted Emission Data

Table - 5. Radiated Emission Data

Table 4 Conducted Emission Data

Special Notes : (EUT Operation Mode or Test Configuration Mode, if applicable)

Mode 1

Judgement : Passed by -4.14 dB at 1.92 MHz, QP Mode, Consumer Equipment , Neutral

Freq. (MHz)	Terminal L/N	Measured	Limits		Safe Margins		Remark
		(dBuV)	(dBuV)	(uV)	(dBuV)	Note	
0.46	Line	36.90	48.00	250	-11.10		C
0.58	Line	36.00	48.00	250	-12.00		
1.92	Line	40.06	48.00	250	-7.94		
2.54	Line	43.20	69.50	3000	-26.30		
4.87	Line	34.91	48.00	250	-13.09		
12.16	Line	33.47	48.00	250	-14.53		
0.47	Neutral	37.00	48.00	250	-11.00		
0.52	Neutral	36.70	48.00	250	-11.30		
1.92	Neutral	43.86	48.00	250	-4.14		
2.54	Neutral	43.80	69.50	3000	-25.70		
5.16	Neutral	35.94	48.00	250	-12.06		
10.03	Neutral	33.27	48.00	250	-14.73		

Remark :

- (1) Reading was measured by using are Quasi-Peak Mode with Detector BW=9KHz ; SPA setting in RBW=10KHz,VBW =10KHz, SWP Time = 0.3 sec./ MHz。
- (2) All readings are QP Mode value unless otherwise stated Peak in column of 『 Note 』 .
- (3) Measuring frequency range from 450KHz to 30MHz。
- (4) Remark C denotes the Consumer Equipment limitation used for judgement.
- (5) Remark NC denotes the Non-Consumer Equipment limitation used for judgement.

Table 4 Conducted Emission Data

Special Notes : (EUT Operation Mode or Test Configuration Mode, if applicable)

Mode 2

Judgement : Passed by -2.20 dB at 2.54 MHz, QP Mode, Consumer Equipment , Neutral

Freq. (MHz)	Terminal L/N	Measured (dBuV)	Limits		Safe Margins		Remark C
			(dBuV)	(uV)	(dBuV)	Note	
0.45	Line	45.60	48.00	250	-2.40		
0.63	Line	39.20	48.00	250	-8.80		
1.92	Line	42.86	48.00	250	-5.14		
2.54	Line	44.40	69.50	3000	-25.10		
12.58	Line	44.07	48.00	250	-3.93		
18.98	Line	45.60	48.00	250	-2.40		
0.45	Neutral	40.80	48.00	250	-7.20		
0.63	Neutral	41.50	48.00	250	-6.50		
1.92	Neutral	43.66	48.00	250	-4.34		
2.54	Neutral	45.80	69.50	3000	-23.70		
5.08	Neutral	40.32	48.00	250	-7.68		
12.52	Neutral	40.47	48.00	250	-7.53		

Remark :

- (1) Reading was measured by using are Quasi-Peak Mode with Detector BW=9KHz ; SPA setting in RBW=10KHz,VBW =10KHz, SWP Time = 0.3 sec./ MHz。
- (2) All readings are QP Mode value unless otherwise stated Peak in column of 『 Note 』 .
- (3) Measuring frequency range from 450KHz to 30MHz。
- (4) Remark C denotes the Consumer Equipment limitation used for judgement.
- (5) Remark NC denotes the Non-Consumer Equipment limitation used for judgement.

Table 5 Radiated Emission Data

Special Notes : (EUT Operation Mode or Test Configuration Mode, if applicable)

FCC Part 15, Subpart B, Section 15.209 Radiated Emission Limits ; General Requirement is adopted to instead of the field strength LIMITS specified in FCC Part 18, Subpart C, Section 18.305(C)

Mode 1

Judgement : Passed by -52.69 dB at 45.40 MHz

Freq. (KHz)	Receiver Reading in dBuV/m	Factor (dB) Cable loss	Field Strength Limit (uV/m)	Required Measurement Distance(m)	Limitation Converted 1 m dist. (dBuV/m)	Over Limit
45.40	80.76	0.10	52.86	300.00	133.55	-52.69
73.80	58.77	0.10	32.52	300.00	129.33	-70.46
136.70	57.65	0.10	17.56	300.00	123.97	-66.22
182.20	34.29	0.10	13.17	300.00	121.48	-87.09
226.80	47.75	0.20	10.58	300.00	119.58	-71.63
271.10	33.94	0.20	8.85	300.00	118.03	-83.89
317.80	38.20	0.20	7.55	300.00	116.65	-78.25
364.10	35.15	0.30	6.59	300.00	115.46	-80.01
408.50	35.64	0.30	5.88	300.00	114.47	-78.53
443.30	30.91	0.30	5.41	300.00	113.76	-82.55

Remark :

- (1) All receiver readings (the measured field strength levels) are measured from loop antenna directly.
- (2) The emission limits shown in the above table are base on measurements employing a quasi-peak detector except for the frequency bands 9-90 KHz, 110-490 KHz and above 1000MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
- (3) The tighter limit applies at the band edges.
- (4) **Remark:** “ ** ” means that the noise emission is too low to detect by Test Receiver.

Table 5 Radiated Emission Data

Special Notes : (EUT Operation Mode or Test Configuration Mode, if applicable)

FCC Part 15, Subpart B, Section 15.209 Radiated Emission Limits ; General Requirement is adopted to instead of the field strength LIMITS specified in FCC Part 18, Subpart C, Section 18.305(C)

Mode 2

Judgement : Passed by -39.50 dB at 45.65 MHz

Freq. (KHz)	Receiver Reading in dBuV/m	Factor (dB) Cable loss	Field Strength Limit (uV/m)	Required Measurement Distance(m)	Limitation Converted 1 m dist. (dBuV/m)	Over Limit
45.65	93.90	0.10	52.57	300.00	133.50	-39.50
91.30	49.86	0.10	26.29	300.00	127.48	-77.52
136.95	71.24	0.10	17.52	300.00	123.96	-52.62
182.60	46.51	0.10	13.14	300.00	121.46	-74.85
228.25	59.33	0.20	10.51	300.00	119.52	-59.99
273.90	*	0.20	8.76	300.00	117.94	*
319.55	53.74	0.20	7.51	300.00	116.60	-62.66
365.20	37.39	0.30	6.57	300.00	115.44	-77.75
410.85	53.26	0.30	5.84	300.00	114.42	-60.86
456.50	35.56	0.30	5.26	300.00	113.50	-77.64

Remark :

- (1) All receiver readings (the measured field strength levels) are measured from loop antenna directly.
- (2) The emission limits shown in the above table are base on measurements employing a quasi-peak detector except for the frequency bands 9-90 KHz, 110-490 KHz and above 1000MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
- (3) The tighter limit applies at the band edges.
- (4) **Remark:** " ** " means that the noise emission is too low to detect by Test Receiver.

Attachment

Table Contents

- A. EUT Modification Description
- B. EUT Test Photos
- C. EUT Photos

Attachment - A.

EUT Modification Description

No any modification required for the EUT to comply with the standards.

Attachment - B.

EUT Test Photos

- 1. Conducted Measurement Photos**
- 2. Radiated Measurement Photos**

Attachment – C

EUT Photos

- 1. Photo # 1 Front View**
- 2. Photo # 2 Unit Partially Disassembled**
- 3. Photo # 3 Unit Partially Disassembled**

Attachment – D

User' s Manual

Attachment - E

Product Labeling