

FCC ID PER PART 18 MEASUREMENT AND TEST REPORT


For

CEAC (HK) Company Limited

Unit 1011, Star House, 3 Salisbury Road,
Tsim Sha Tsui, Kow Loon, Hong Kong

Model: PVLEFU-xw

September 7, 2001

This Report Concerns: <input checked="" type="checkbox"/> Original Report	Equipment Type: Light Bulb
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Test Date: August 30, 2001	
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TABLE OF CONTENTS

1 - GENERAL INFORMATION.....	3
1.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	3
1.2 OBJECTIVE	3
1.3 RELATED SUBMITTAL(S)/GRANT(S)	3
1.4 TEST METHODOLOGY.....	3
1.5 TEST FACILITY	3
1.6 TEST EQUIPMENT LIST AND DETAILS.....	4
1.7 EQUIPMENT UNDER TEST (EUT).....	4
2 - SYSTEM TEST CONFIGURATION.....	5
2.1 JUSTIFICATION.....	5
2.2 SCHEMATICS / BLOCK DIAGRAM.....	5
2.3 EQUIPMENT MODIFICATIONS.....	5
2.4 CONFIGURATION OF TEST SYSTEM	5
2.5 TEST SETUP BLOCK DIAGRAM.....	5
3 - CONDUCTED EMISSIONS TEST DATA	6
3.1 MEASUREMENT UNCERTAINTY	6
3.2 EUT SETUP	6
3.3 SPECTRUM ANALYZER SETUP.....	6
3.4 TEST PROCEDURE	6
3.5 SUMMARY OF TEST RESULTS.....	7
3.6 CONDUCTED EMISSIONS TEST DATA.....	8
3.7 PLOT(S) OF CONDUCTED EMISSIONS TEST DATA.....	8
4 - RADIATED EMISSION DATA	12
4.1 MEASUREMENT UNCERTAINTY	12
4.2 EUT SETUP	12
4.3 SPECTRUM ANALYZER SETUP.....	12
4.4 TEST PROCEDURE	13
4.5 CORRECTED AMPLITUDE & MARGIN CALCULATION.....	13
4.6 SUMMARY OF TEST RESULTS.....	13
4.7 RADIATED EMISSIONS TEST DATA.....	14

1 - GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

The *CEAC (HK) Company Limited*'s product, model *EFU-13*, *EFU-15* and *EFU-18*, or the "EUT" as referred to in this report are light bulbs of a series family.

The EUT provides the following technical specification:

EUT	Watt	Voltage/Frequency (V/Hz)	Max DIA (mm)	Length (mm)	Initial Lumen	Lifetime (H)
EFU-13	13W	120/60	58	110	715	≥8000
EFU-15	15W	120/60	58	114	900	≥8000
EFU-18	18W	120/60	58	125	1080	≥8000

1.2 Objective

The following test report is prepared on behalf of *CEAC (HK) Company Limited* in accordance with Part 2, Subpart J, and Part 18, Subparts A, B, and C of the Federal Communication Commissions rules and regulations.

The objective of the manufacturer is to demonstrate compliance with FCC Part 18 limit requirements for Industrial, Scientific, and Medical Equipment.

1.3 Related Submittal(s)/Grant(s)

No Related Submittals.

1.4 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4 –1992, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 Meters.

1.5 Test Facility

The Open Area Test site used by Bay Area Compliance Laboratory Corporation to collect radiated and conducted emission measurement data is located in the back parking lot of the building at the back parking lot of the building at 230 Commercial Street, Suite 2, Sunnyvale, California, USA.

Test site at Bay Area Compliance Laboratory Corporation has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-1992.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2 and VCCI Registration No.: C-1298 and R-1234. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratory Corporation is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (NVLAP). The scope of the accreditation covers the FCC Method - 47 CFR Part 15 - Digital Devices, IEC/CISPR 22: 1998, and AS/NZS 3548: Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment test methods under NVLAP Lab Code 200167-0.

1.6 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Last Cal. Date	Cal. Due Date
HP	Spectrum Analyzer	8568B	Panel 2408A00105 Display 2403A06544	5/1/2001	5/1/2002
HP	Spectrum Analyzer	8593A	29190A00242	5/1/2001	5/1/2002
HP	Amplifier	8447E	1937A01054	5/1/2001	5/1/2002
HP	Quasi-Peak Adapter	8565A	2521A00718	5/1/2001	5/1/2002
HP	Signal generator	8640B	1727A06741	5/1/2001	5/1/2002
HP	Signal generator	8685A	2214A03081	5/1/2001	5/1/2002
Com-Power	Biconical Antenna	AB-100	14012	5/1/2001	5/1/2002
SOLAR	LISN	9252-50-R-24-BNC	984412	5/1/2001	5/1/2002
SOLAR	LISN	9252-50-R-20-BNC	984413	5/1/2001	5/1/2002
Com-Power	Log Periodic Antenna	AL-100	16091	5/1/2001	5/1/2002
Com-Power	Log Periodic Antenna	AB-900	15049	5/1/2001	5/1/2002

1.7 Equipment Under Test (EUT)

Manufacturer	Description	Model	Serial Number	FCC ID
CEAC (HK) Company Limited	Light Bulb	EFU-13, EFU-15, EFU-18	None	PVLEFU-xw

2 - SYSTEM TEST CONFIGURATION

2.1 Justification

The EUT was tested under normal mode as used by a common (typical) user.

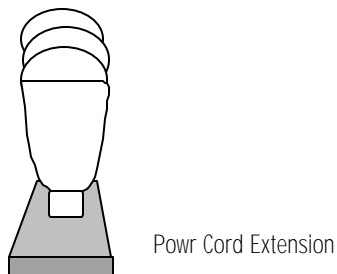
2.2 Schematics / Block Diagram

Appendix A contains a copy of the EUT's schematics diagram as reference.

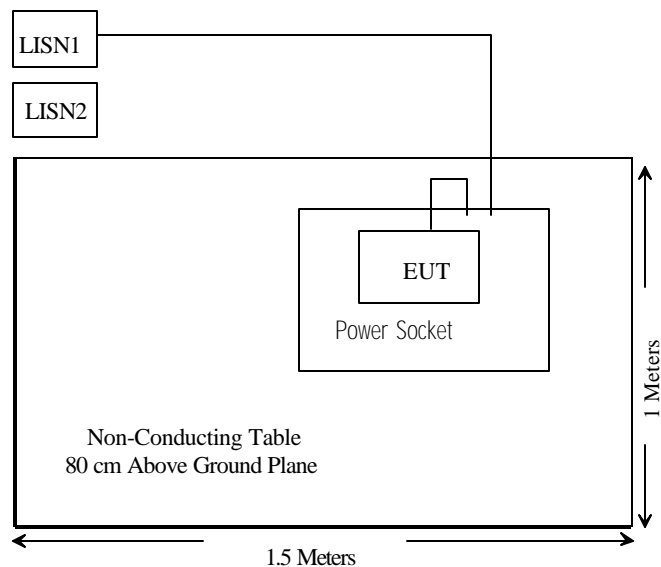
2.3 Equipment Modifications

No modifications were made by BACL to ensure the EUT to comply with the application limits and requirements.

2.4 Configuration of Test System



2.5 Test Setup Block Diagram



3 - CONDUCTED EMISSIONS TEST DATA

3.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, and LISN.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement at BACL is ± 2.4 dB.

3.2 EUT Setup

The measurement was performed at the **Open Area Test Site**, using the same setup per ANSI C63.4 - 1992 measurement procedure. The specification used was the FCC Part 18 limits.

The EUT with the outlet adapter was connected to the power cord extension and placed on the center of the back edge on the test table.

The power cord extension was connected with 110 Vac/60 Hz power source.

3.3 Spectrum Analyzer Setup

The spectrum analyzer was set with the following configuration during the conduction test:

Start Frequency	450 kHz
Stop Frequency	30 MHz
Sweep Speed.....	Auto
IF Bandwidth.....	100 kHz
Video Bandwidth.....	100 kHz
Quasi-Peak Adapter Bandwidth.....	9 kHz
Quasi-Peak Adapter Mode	Normal

3.4 Test Procedure

During the conducted emission test, the power cord of the power cord extension was connected to the auxiliary outlet of the first LISN.

Maximizing procedure was performed on the six (6) highest emissions to ensure that the EUT is compliant with all installation combination.

All data was recorded in the peak detection mode. Quasi-peak readings were only performed when an emission was found to be marginal (within -4 dB μ V of specification limits). Quasi-peak readings are distinguished with a "**Qp**".

The EUT was tested under the normal modes during the final qualification test to represent the worst case results.

3.5 Summary of Test Results

According to the data in section 3.6, the EUT: *PVLEFU-XW*, complied with the FCC 18 Conducted margin for industry, scientific and medical device, and with the worst margin reading of:

-8.0 dBmV at 0.78 MHz at the **Line** mode with the **Commercial Electric power cord extension**,
M/N: **E192912**, 0.45-30MHz, EFU-13

-6.3 dBmV at 0.78 MHz at the **Line** mode with the **Commercial Electric power cord extension**,
M/N: **E192912**, 0.45-30MHz, EFU-15

-4.4 dBmV at 0.78 MHz at the **Line** mode with the **Commercial Electric power cord extension**,
M/N: **E192912**, 0.45-30MHz, EFU-18

3.6 Conducted Emissions Test Data

3.6.1 Test data for EFU-13 with Commercial Electric power cord extension, M/N: E192912, 0.45-30MHz

LINE CONDUCTED EMISSIONS				FCC PART 18	
Frequency	Amplitude	Detector	Phase	Limit	Margin
MHz	dBμV	Qp/Ave/Peak	Line/Neutral	dBμV	dB
0.78	40.0	QP	Line	48	-8.0
0.78	38.9	QP	Neutral	48	-9.2
1.37	29.8	QP	Neutral	48	-18.2
1.16	29.6	QP	Line	48	-18.4
5.98	9.3	QP	Neutral	48	-38.8
15.58	6.6	QP	Line	48	-41.4

3.6.2 Test data for EFU-15 with Commercial Electric power cord extension, M/N: E192912, 0.45 - 30MHz

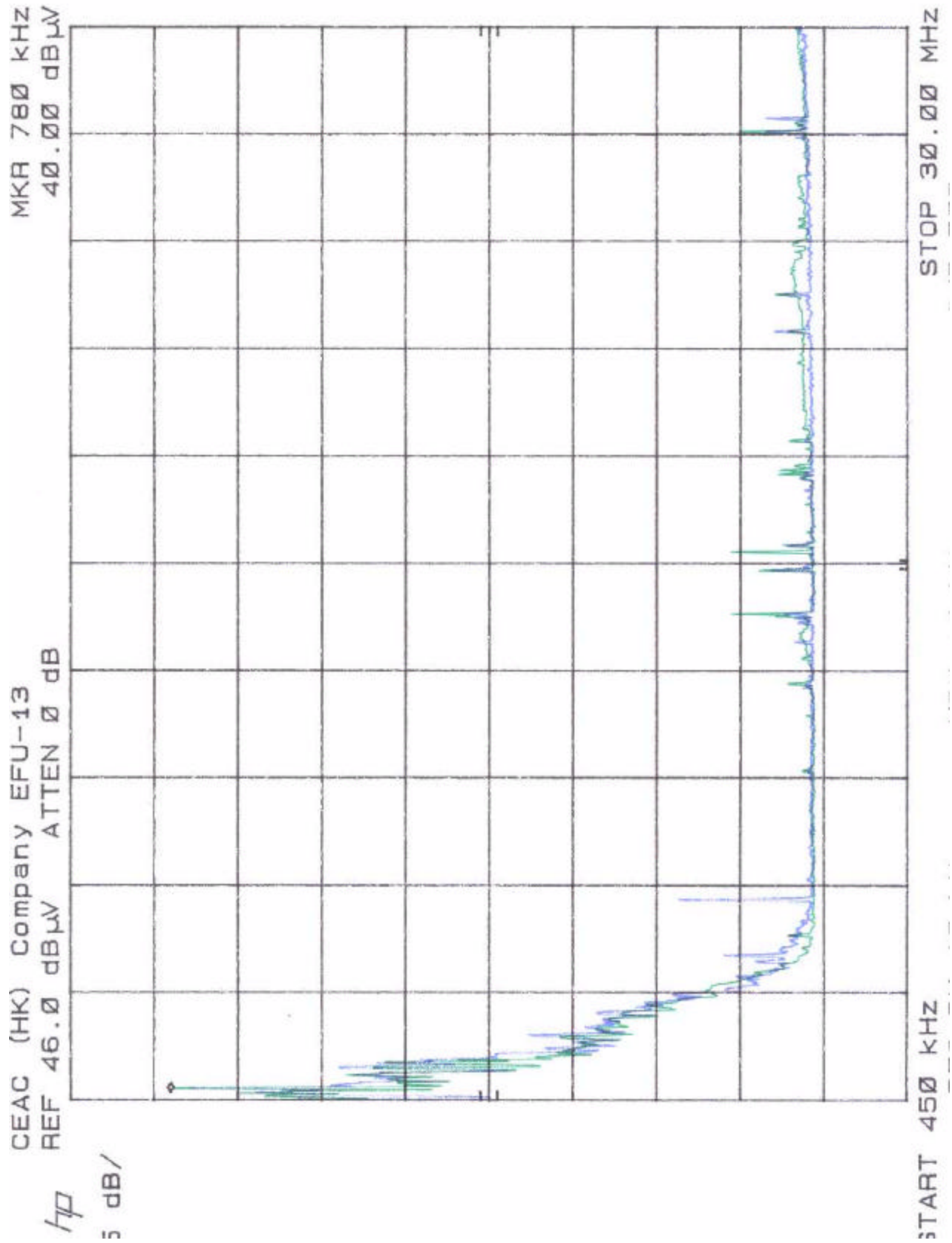
LINE CONDUCTED EMISSIONS				FCC PART 18	
Frequency	Amplitude	Detector	Phase	Limit	Margin
MHz	dBμV	Qp/Ave/Peak	Line/Neutral	dBμV	dB
0.78	41.7	QP	Neutral	48	-6.3
0.78	41.3	QP	Line	48	-6.7
1.13	30.6	QP	Neutral	48	-17.5
1.34	29.2	QP	Line	48	-18.8
11.92	14.4	QP	Neutral	48	-33.7
11.94	9.4	QP	Line	48	-38.6

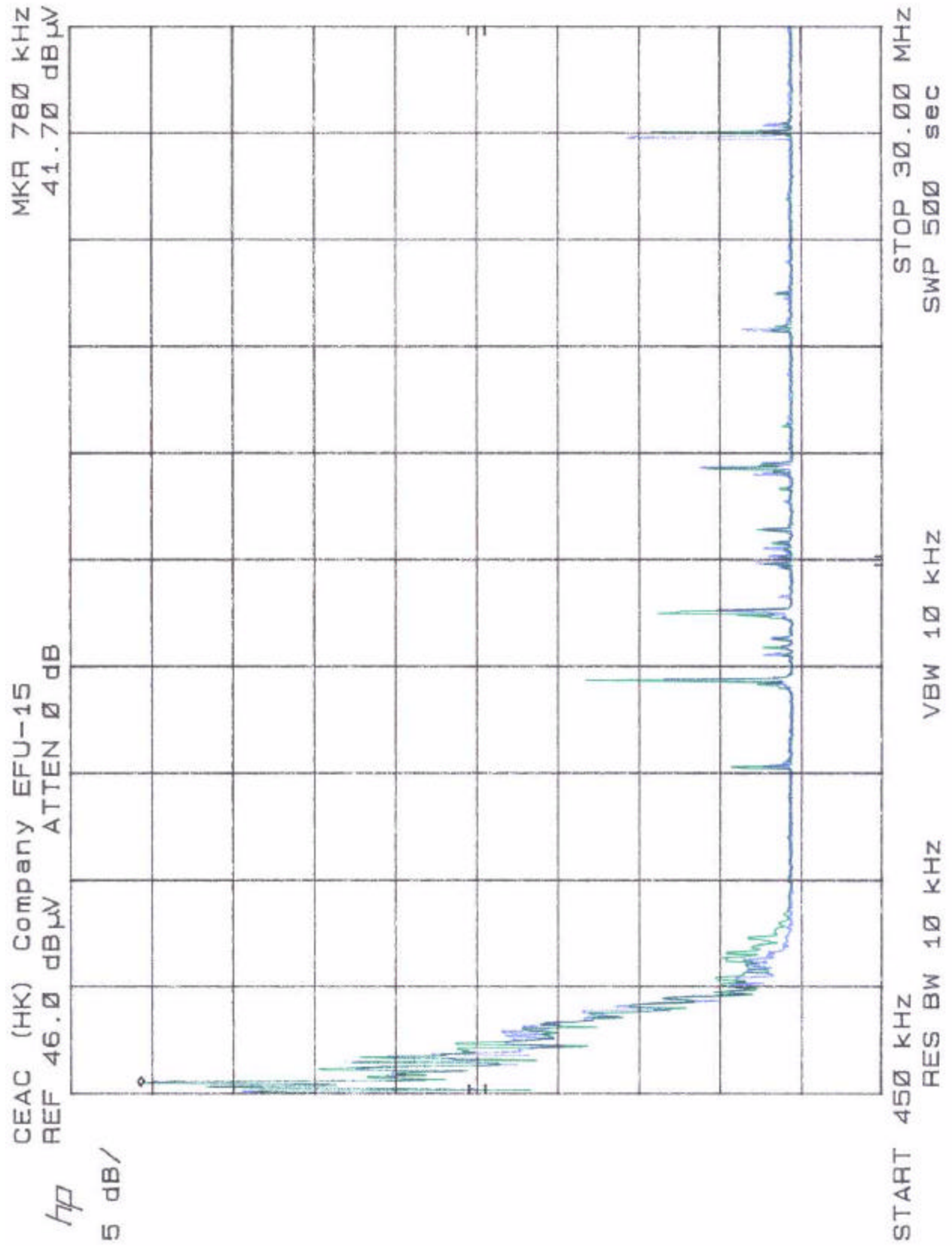
3.6.3 Test data for EFU-18 with Commercial Electric power cord extension, M/N: E192912, 0.45 - 30MHz

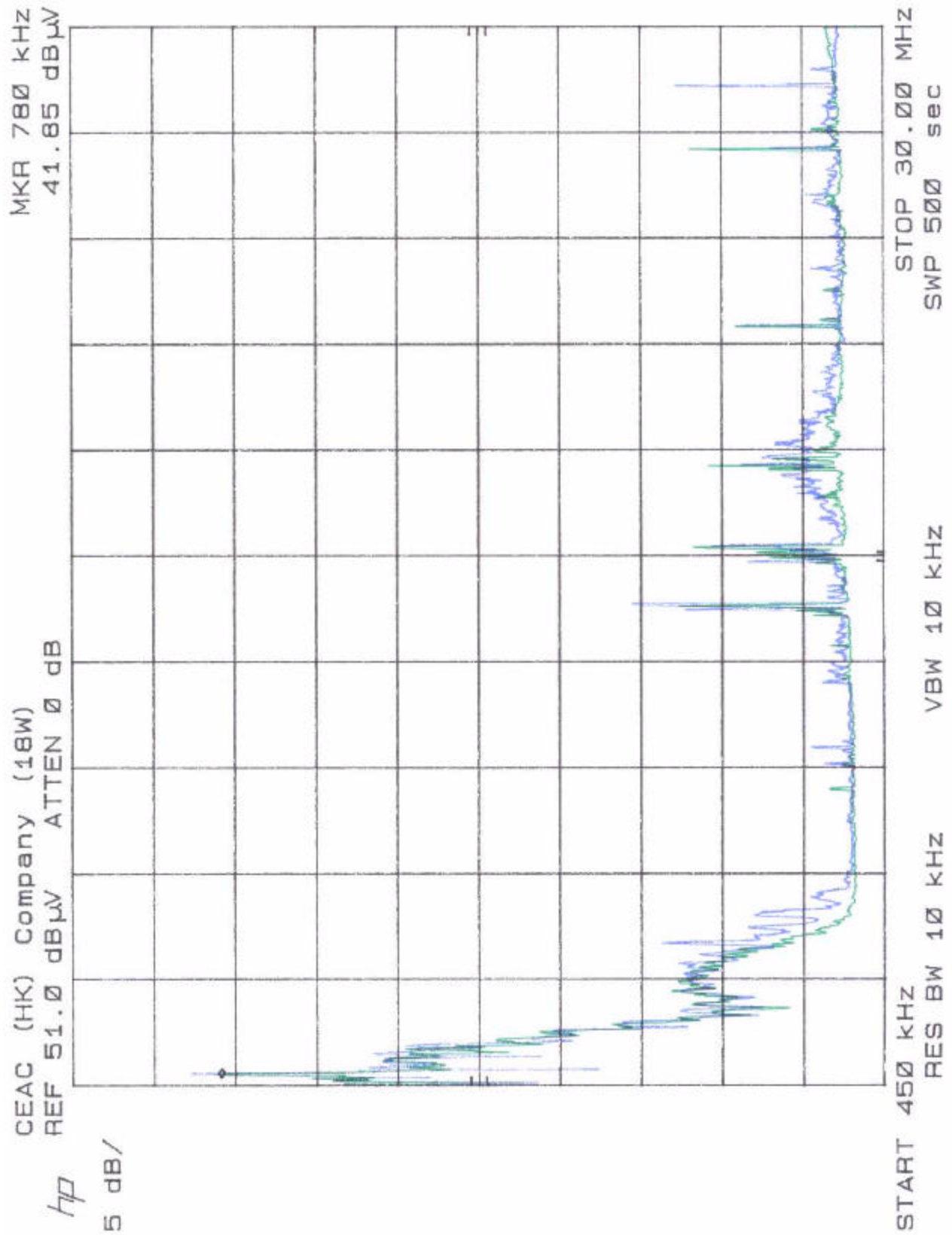
LINE CONDUCTED EMISSIONS				FCC PART 18	
Frequency	Amplitude	Detector	Phase	Limit	Margin
MHz	dBμV	Qp/Ave/Peak	Line/Neutral	dBμV	dB
0.78	43.7	QP	Neutral	48	-4.4
0.78	41.9	QP	Line	48	-6.2
13.92	16.6	QP	Neutral	48	-31.5
4.44	14.8	QP	Neutral	48	-33.2
3.11	14.2	QP	Line	48	-33.8
13.87	13.8	QP	Line	48	-34.3

3.7 Plot(s) of Conducted Emissions Test Data

The plot of conducted emission tested with Commercial Electric power cord extension, M/N: E192912, for EFU-13W, EFU-15W and EFU-18W were presented hereinafter in sequence as reference.







4 - RADIATED EMISSION DATA

4.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at BACL is ± 4.0 dB.

4.2 EUT Setup

The radiated emission tests were performed in the open area 3-meter test site, using the setup accordance with the ANSI C63.4 - 1992. The specification used in this report was the FCC Part 18 limits.

The EUT with the outlet adapter was connected to the power cord extension and placed on the center of the back edge on the test table.

The power cord extension was connected to 110 VAC/60 Hz power source.

4.3 Spectrum Analyzer Setup

According to FCC Rules, the system was tested to 1000 MHz.

Start Frequency	30 MHz
Stop Frequency	1000 MHz
Sweep Speed.....	Auto
IF Bandwidth.....	1 MHz
Video Bandwidth.....	1 MHz
Quasi-Peak Adapter Bandwidth.....	120 kHz
Quasi-Peak Adapter Mode	Normal
Resolution Bandwidth.....	1MHz

4.4 Test Procedure

For the radiated emissions test, the power cord of the power cord extension was connected to the AC floor outlet.

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT is compliant with all installation combinations.

All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dB μ V of specification limits), and are distinguished with a "Qp" in the data table.

The EUT was under normal mode during the final qualification test and the configuration was used to represent the worst case results.

4.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB μ V means the emission is 7dB μ V below the maximum limit for FCC Part 18. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 18 Limit}$$

4.6 Summary of Test Results

According to the data in section 4.7, the EUT: *PVLEFU-XW*, complied with the FCC Part 18 standards for a industry, scientific and medical device, and had the worst margin of:

-12.2 dBmV at 275.80 MHz in the Vertical polarization, 30 to 1000MHz, 3 meters, EFU-13

-11.8 dBmV at 377.30 MHz in the Vertical polarization, 30 to 1000MHz, 3 meters, EFU-15

-12.3 dBmV at 417.90 MHz in the Vertical polarization, 30 to 1000MHz, 3 meters, EFU-18

4.7 Radiated Emissions Test Data**4.7.1 Final Test Data for EFU-13, 30-1000MHz, 3 Meters**

INDICATED		TABLE	ANTENNA		CORRECTION FACTOR			CORRECTED AMPLITUDE	FCC PART 18	
Frequency MHz	Ampl. dBmV/m	Angle Degree	Height Meter	Polar H/ V	Antenna dBmV/m	Cable dB	Amp. dB	Corr. Ampl. dBmV/m	Limit dBmV/m	Margin dB
275.80	41.2	0	1.2	V	12.7	4.9	25.0	33.8	46.0	-12.2
83.26	40.1	90	1.2	V	9.6	2.7	25.0	27.4	40.0	-12.6
301.30	39.7	180	1.2	V	13.7	5.0	25.0	33.4	46.0	-12.6
275.70	40.2	200	2.0	H	12.7	4.9	25.0	32.8	46.0	-13.2
83.27	38.5	300	2.0	H	9.6	2.7	25.0	25.8	40.0	-14.2
193.27	35.3	270	2.0	H	14.4	4.3	25.0	29.0	43.5	-14.5
143.06	36.9	45	1.2	V	13.2	3.6	25.0	28.7	43.5	-14.8
166.85	36.2	250	2.2	H	13.3	3.8	25.0	28.3	43.5	-15.2
143.05	36.1	270	2.0	H	13.2	3.6	25.0	27.9	43.5	-15.6
167.47	33.9	180	1.2	V	13.3	3.8	25.0	26.0	43.5	-17.5
215.80	35.6	180	1.2	V	10.5	4.2	25.0	25.3	43.5	-18.2
195.43	31.6	180	1.2	V	14.4	4.0	25.0	25.0	43.5	-18.5
215.90	34.6	200	2.0	H	10.5	4.2	25.0	24.3	43.5	-19.2
118.92	31.8	45	1.2	V	11.9	3.5	25.0	22.2	43.5	-21.3

4.7.2 Final Test Data for EFU-15, 30-1000MHz, 3 Meters

INDICATED		TABLE	ANTENNA		CORRECTION FACTOR			CORRECTED AMPLITUDE	FCC PART 18	
Frequency MHz	Ampl. dBmV/m	Angle Degree	Height Meter	Polar H/ V	Antenna dBmV/m	Cable dB	Amp. dB	Corr. Ampl. dBmV/m	Limit dBmV/m	Margin dB
377.30	38.4	45	1.2	V	15.1	5.7	25.0	34.2	46.0	-11.8
377.28	37.6	180	2.0	H	15.1	5.7	25.0	33.4	46.0	-12.6
310.90	38.6	90	1.2	V	13.7	5.1	25.0	32.4	46.0	-13.6
72.24	38.7	200	1.2	V	9.6	2.5	25.0	25.8	40.0	-14.2
310.80	37.9	300	2.0	H	13.7	5.1	25.0	31.7	46.0	-14.3
340.60	36.1	90	1.2	V	15.0	5.5	25.0	31.6	46.0	-14.4
143.05	37.2	270	1.2	V	13.2	3.6	25.0	29.0	43.5	-14.5
340.59	35.7	270	2.0	H	15.0	5.5	25.0	31.2	46.0	-14.8
143.06	36.4	90	2.0	H	13.2	3.6	25.0	28.2	43.5	-15.3
171.66	35.2	45	1.2	V	13.3	4.0	25.0	27.5	43.5	-16.0
72.23	36.8	45	2.0	H	9.6	2.5	25.0	23.9	40.0	-16.1
171.65	34.2	45	2.0	H	13.3	4.0	25.0	26.5	43.5	-17.0
225.03	37.0	120	1.2	V	11.8	4.0	25.0	27.8	46.0	-18.2
129.20	33.4	180	1.2	V	12.3	3.5	25.0	24.2	43.5	-19.3

4.7.3 Final Test Data for EFU-18, 30-1000MHz, 3 Meters

INDICATED		TABLE	ANTENNA		CORRECTION FACTOR			CORRECTED AMPLITUDE	FCC PART 18	
Frequency MHz	Ampl. dBmV/m	Angle Degree	Height Meter	Polar H/ V	Antenna dBmV/m	Cable dB	Amp. dB	Corr. Ampl. dBmV/m	Limit dBmV/m	Margin dB
135.60	39.8	90	1.2	V	12.9	3.6	25.0	31.3	43.5	-12.2
122.89	38.7	270	1.2	V	12.1	3.4	25.0	29.2	43.5	-14.3
323.99	37.4	120	2.0	H	13.7	5.4	25.0	31.5	46.0	-14.5
365.56	35.7	180	2.0	H	15.1	5.5	25.0	31.3	46.0	-14.7
111.92	38.9	90	1.2	V	11.7	3.2	25.0	28.8	43.5	-14.7
170.67	35.9	180	1.8	H	13.3	4.0	25.0	28.2	43.5	-15.3
334.11	34.9	45	2.0	H	15.0	5.4	25.0	30.3	46.0	-15.7
122.89	37.2	270	2.0	H	12.1	3.4	25.0	27.7	43.5	-15.8
171.63	34.8	180	1.5	V	13.3	4.0	25.0	27.1	43.5	-16.4
334.12	33.8	270	1.2	V	15.0	5.4	25.0	29.2	46.0	-16.8
80.00	34.7	45	1.2	V	9.6	2.7	25.0	22.0	40.0	-18.0
80.00	32.3	180	2.0	H	9.6	2.7	25.0	19.6	40.0	-20.4
228.84	33.9	45	1.2	V	11.8	4.0	25.0	24.7	46.0	-21.3
218.25	32.8	180	1.2	V	10.5	4.2	25.0	22.5	46.0	-23.5