

TEST REPORT NO. R-2941P

ELECTROMAGNETIC EMISSIONS EVALUATION TESTS

PER FCC PART 15 – SUBPARTS B AND C

FOR THE

LUTRON ELECTRONICS

MODEL RAMC-MFE

13 NOVEMBER 2006

PREPARED FOR:

Lutron Electronics
7200 Suter Road
Coopersburg, PA 18036



Retlif Testing Laboratories
3131 Detwiler Road
Harleysville, PA 19438

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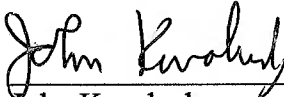
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Retlif Testing Laboratories

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ADMINISTRATIVE DATA

TEST PERFORMED:

Measurements of Radiated RF and Conducted Emissions.

PURPOSE OF TEST:

To evaluate the ElectroMagnetic Emissions (EMC) characteristics of the Equipment Under Test (EUT) with respect to Subpart B and C of Part 15 of the Federal Communications Commission (FCC) rules for intentional and unintentional radiators.

EQUIPMENT UNDER TEST:

Model Number: **RAMC-MFE**

Serial Number: **NSN**

CONTRACT:

Purchase Order Number: **NP0070890**

TEST PERIOD:

25 October through 31 October, 2006

TEST FACILITY:

Retlif Testing Laboratories, EMC Test Laboratory, located at: 3131 Detwiler Road, Harleysville, Pennsylvania 19438.

TEST PERSONNEL AND COORDINATORS:

Retlif Testing Laboratories

John Kavalusky

Lutron Electronics

Matt Cardoni



SUMMARY OF TEST RESULTS

The **Model #:** RAMC-MFE, configured as described herein, **FULLY COMPLIES WITH THE REQUIREMENTS SET FORTH IN SUBPART B AND C OF PART 15 OF THE FEDERAL COMMUNICATIONS COMMISSION (FCC) RULES FOR INTENTIONAL AND UNINTENTIONAL RADIATORS.**

The test results contained in this report represent emission and/or immunity characteristics of only the product(s) (model and serial no.) tested. **Retlif Testing Laboratories** makes no claim that identical test results will be obtained for future tests of the same model/equipment or that the test results contained herein could be duplicated after the tested product leaves the possession of the **Retlif Testing Laboratories**.



1.0 INTRODUCTION

This document is a report to determine the EMC characteristics of the Model #: **RAMC-MFE**. Presented by **Lutron Electronics** of Coopersburg, Pennsylvania.

The purpose of the testing was to evaluate the EMC characteristics of the test sample with respect to Subpart B and C of Part 15 of the **FCC Rules** for intentional and unintentional radiators.

All test procedures used meet the requirements of the American National Standards Institute Procedure C63.4: **"Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz"**, 2003.



2.0 DESCRIPTION OF THE EQUIPMENT UNDER TEST (EUT)

The **Model # RAMC-MFE**, manufactured by **Lutron Electronics** of Coopersburg Pennsylvania is a Home Works table-top and Wall Mount Lighting Control Master Keypad.

Hereinafter, the **Model # RAMC-MFE**, will be referred to as the **EUT** (Equipment Under Test).



Wall Mount Test Setup



Table Top Test Setup

3.0 TEST INSTRUMENTATION

<u>EN/ RSI INV #</u>	<u>DESCRIPTION</u>	<u>MANUFACTURER</u>	<u>MODEL #</u>	<u>SERIAL #</u>	<u>CAL DUE DATE</u>
501	MINI MAST	EMCO	2075-2	0002-2278	
502	TURNTABLE	EMCO	2065-1.21	0001-2156	
503	CONTROLLER	EMCO	2090	0001-1489	
709	40ft Cable RG-223	PASTERNAK	BNC TO BNC	N/A	9/15/2007
716	35ft Cable 1318	PASTERNAK	BNC TO BNC	N/A	9/15/2007
8013	ANTENNA	TENSOR	4108	204	6/11/2007
8014	ANTENNA	AMP.RES.ASSOC.	AT1000	4094-025	6/14/2007
8031	PRE-AMPLIFIER	H.P.	8349A	2403A00298	8/30/2007
8059	SPEC ANALYZER	ADVANTEST	R3271	J003583	6/4/2007
8073	COMPUTER	H.P. SYSTEM	9000 300 SERIES	NSN / CART	5/1/2007
8074	TRANSFORMER	G.E.	9T51B33G3	NSN	5/1/2007
8076	SPEC. ANALY.	H.P.	8568B	2841A04457	5/26/2007
8077	SPEC. A.DISPLY	H.P	85662A	2848A17406	5/26/2007
8080	RECEIVER	R & S	ESVP	861744/015	2/1/2007

IF CAL DUE DATE = BLANK FIELD
Calibration is not required.



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4.0 TEST RESULTS

4.1 Conducted Power Line Measurements, §15.107 Test Results

Conducted power line measurements were recorded for the EUT.

The EUT was placed on a table 80cm above a horizontal ground plane in a shield room. The rear of the EUT was positioned at the edge of a 1m x 1.5m tabletop that was 40cm from the vertical ground plane. The EUT was positioned 80cm from all metal objects and LISNs. The filtered power (115Vac, 60Hz) was fed through 50μh LISNs to the EUT. A spectrum analyzer was used to scan the frequency range of .150-30MHz (as required) for each line.

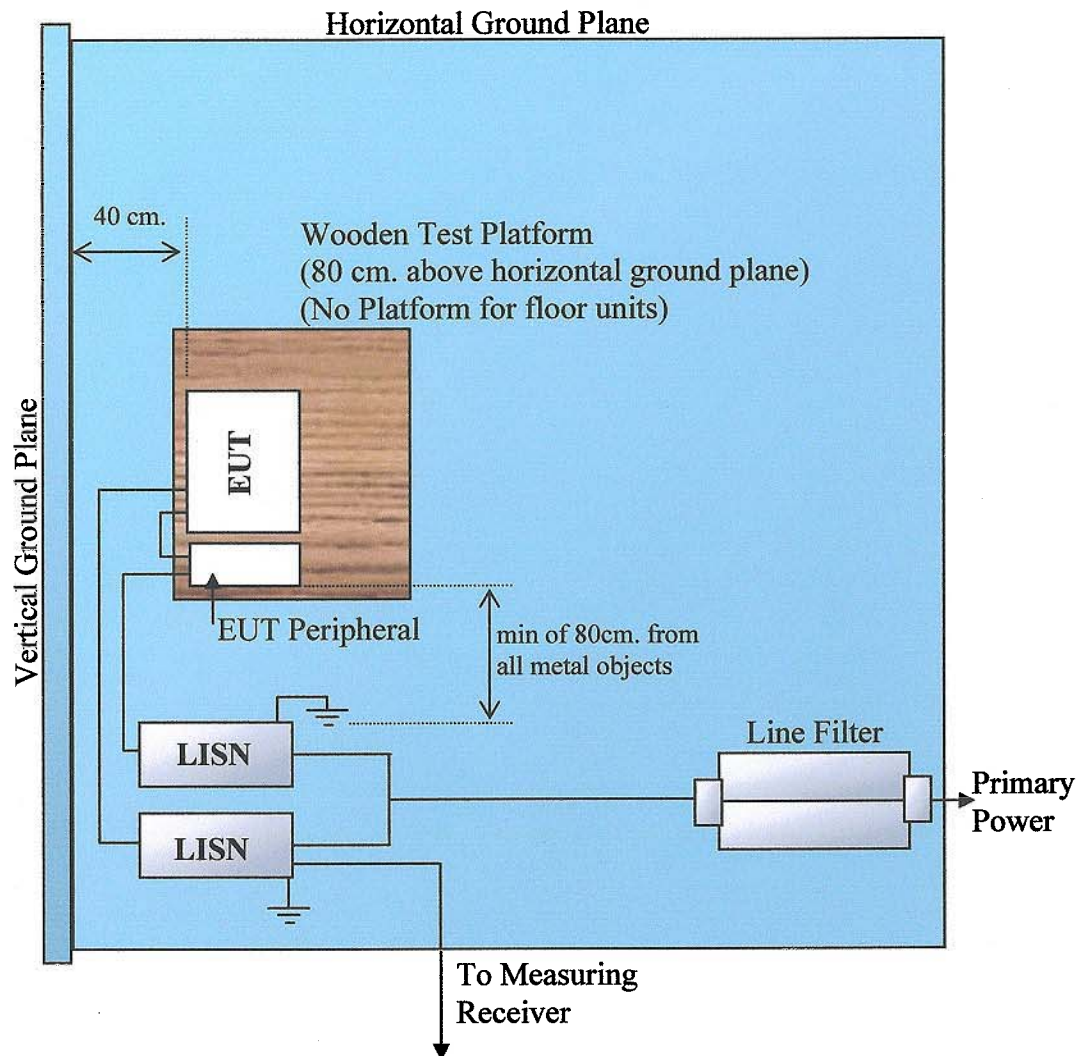
The test setup diagram is shown in Figure 1 and the photographs are shown in Figure 2.

The EUT was tested while operated at the transmit frequency of 418MHz.

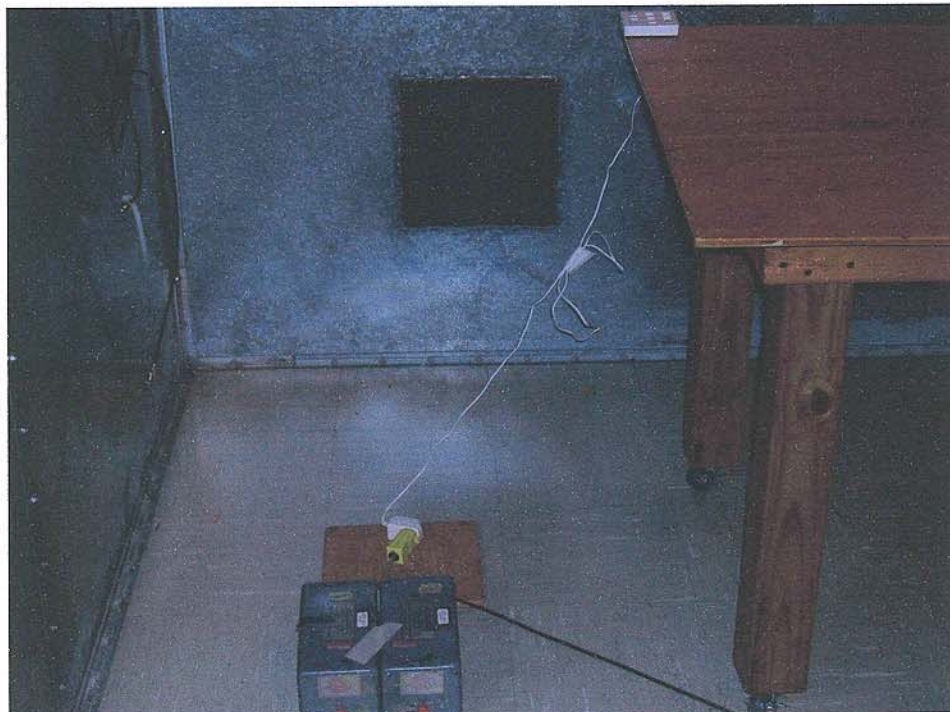
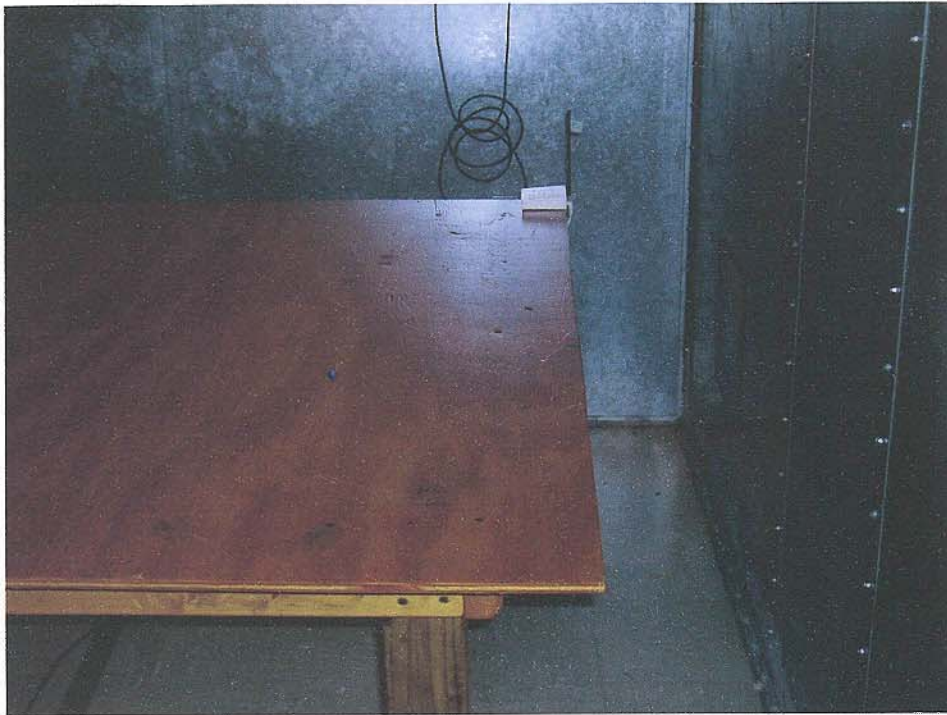
The results of the line-go-ground radio noise voltage measurements are shown in Figures 3 through 6 (Graphs) for transmit and receive modes on each operating frequency.

THE LEVELS ARE BELOW THE APPLICABLE LIMITS OF AS SPECIFIED BY FCC IN §15.107.





Conducted Emissions Test Setup Diagram (Top View)
Figure 1



Conducted Emissions Test Setup Photographs
Figure 2



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110

90

70

50

30

.15

FCC CLASS B CONDUCTED

Customer: LUTRON ELECTRONICS

Model# RAMC-MFE

S/N: NSN

LINE: PHASE 418MHZ. RECEIVE

QP LIMIT

AVERAGE LIMIT

FREQUENCY [MHz]

10

30

Figure 3

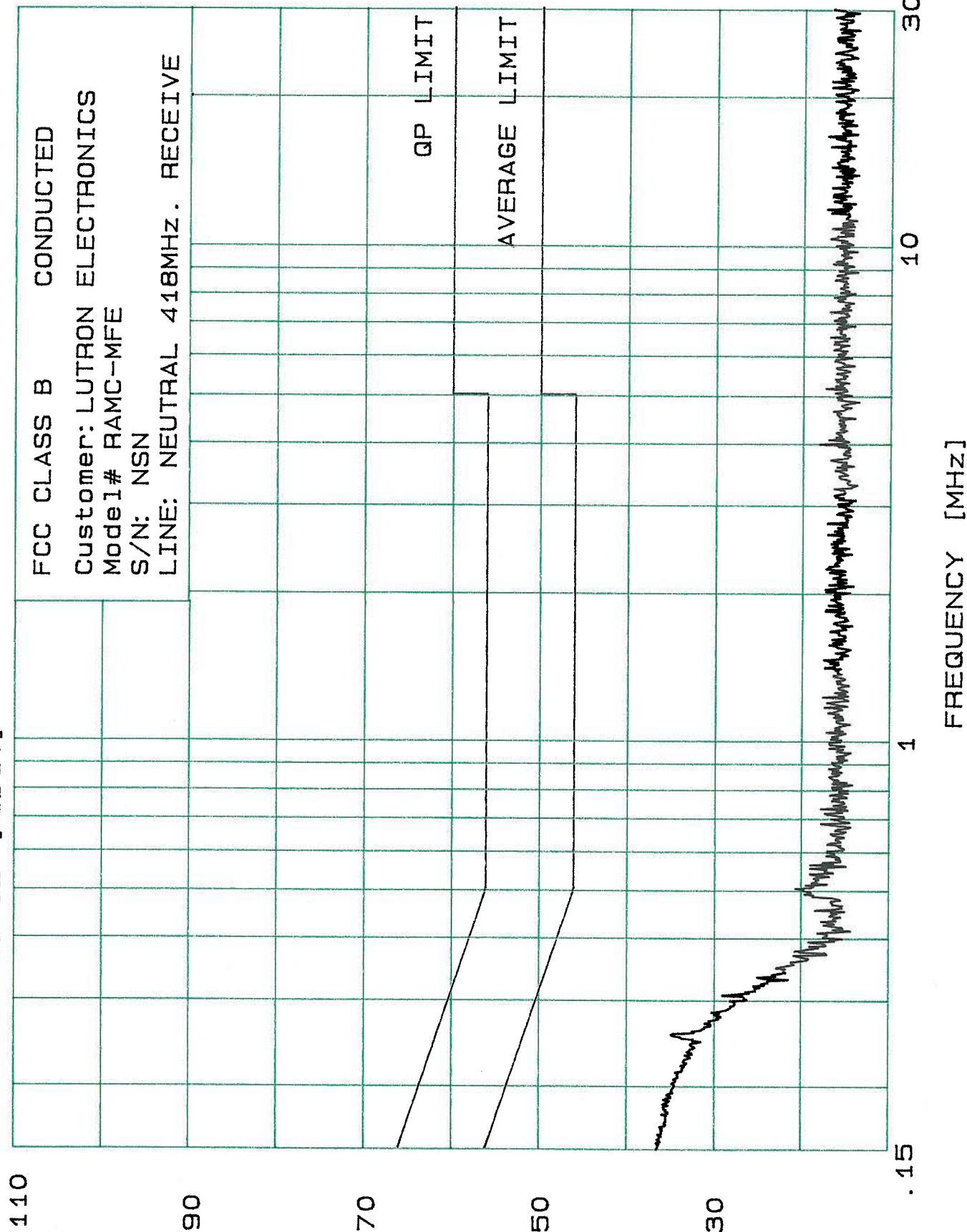


Figure 4

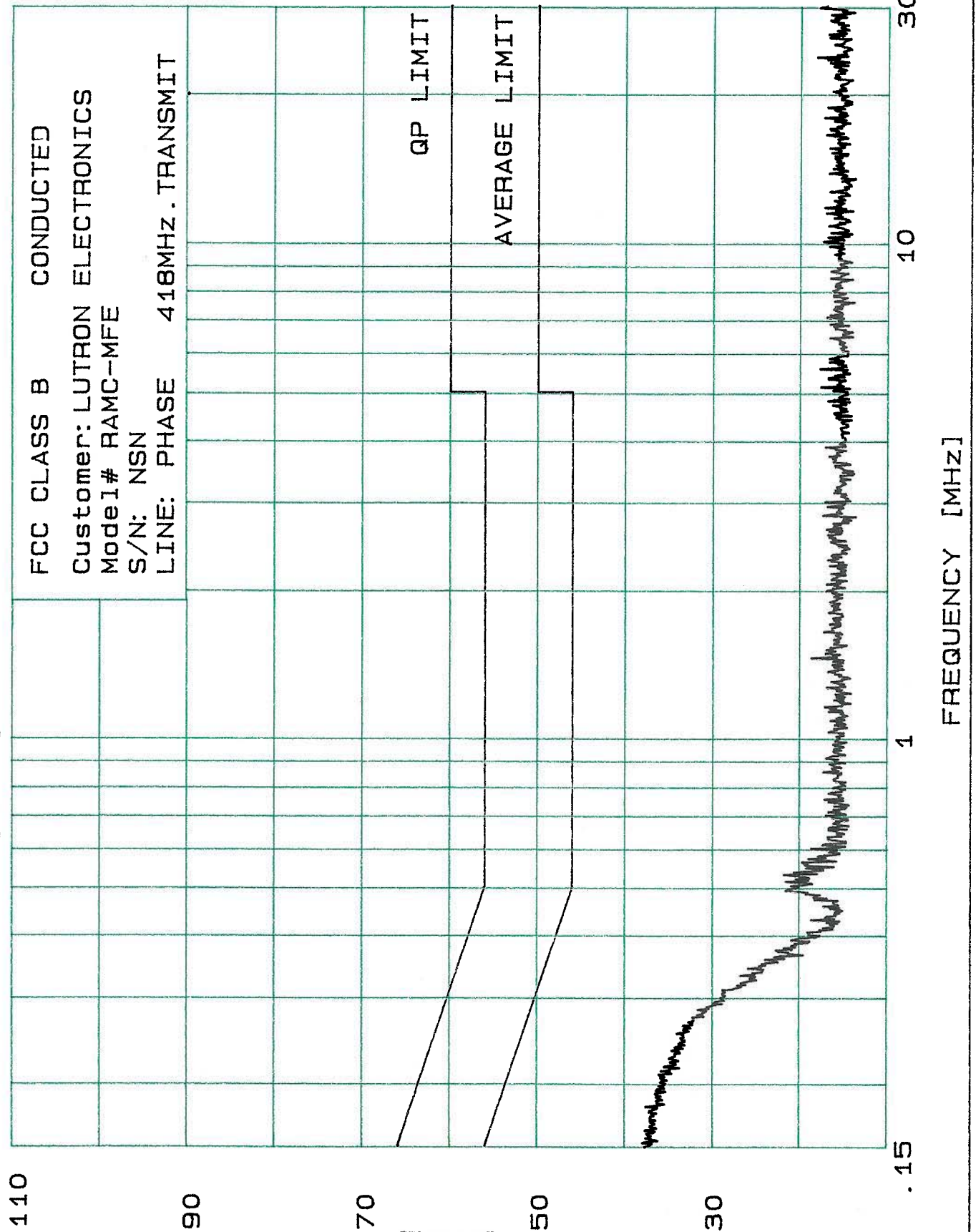


Figure 5

110

90

70

50

30

.15

FCC CLASS B CONDUCTED

Customer: LUTRON ELECTRONICS

Model# RAMC-MFE

S/N: NSN

LINE: NEUTRAL 418MHZ.TRANSMIT

QP LIMIT

AVERAGE LIMIT

FREQUENCY [MHz]

30

10

1

Figure 6

4.2 Radiated Emissions Measurements, §15.33, §15.35, §15.109, §15.205, §15.209, §15.231

Radiated Emissions measurements were recorded for the test sample at a distance of 3 meters. Radiated Emissions were measured with the antenna in both the horizontal and vertical polarizations. The antenna was raised 1 to 4 meters in height and the Equipment Under Test (EUT) was rotated 360° to maximize the emission. No significant emission level changes occurred while positioning the EUT power cable.

For intentional radiators the field strength of emissions of the EUT was measured out to the tenth harmonic of the carrier frequency. The carrier frequency was set to 418MHz.

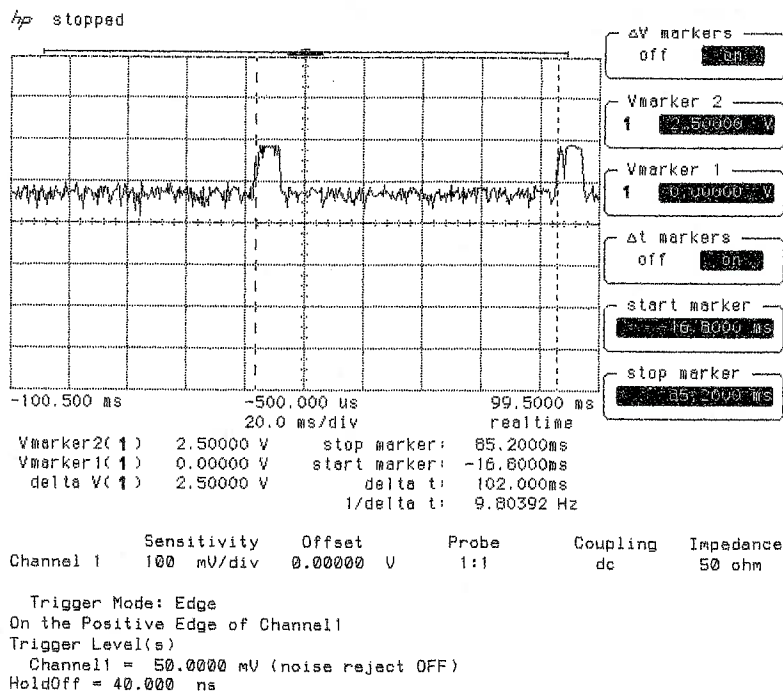
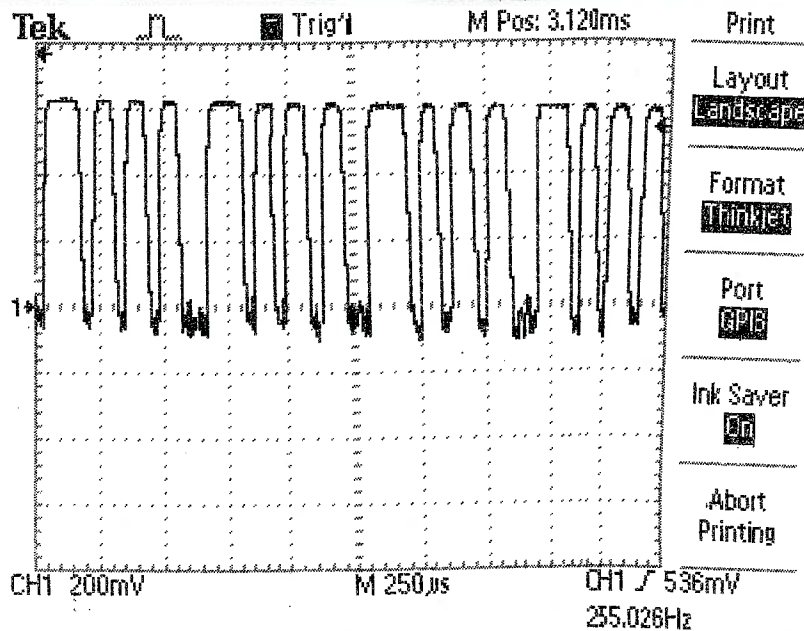
An average factor 19.2dB was applied to the level of the fundamental emission when compared to the FCC limit. The EUT duty cycle information supporting the -19.2dB factor is shown in Figure 7.

Figure 8 is a test setup diagram for Radiated Emissions and Figure 9 are the photographs of the test setup.

The test results for Radiated Emissions testing are shown in the following figures:

- FIGURE 10/11 Unintentional Radiated Emissions Data Sheets, (AM) Rx Mode, 418MHz (Table Top)
- FIGURE 12 Unintentional Radiated Emissions Graph, (AM) Rx Mode, 418MHz (Table Top)
- FIGURE 13/14 Unintentional Radiated Emissions Data Sheets, (AM) Rx Mode, 418MHz (Wall Mount)
- FIGURE 15 Unintentional Radiated Emissions Graph, (AM) Rx Mode, 418MHz (Wall Mount)
- FIGURE 16/17 Unintentional Radiated Emissions Data Sheets, (AM) Tx Mode, 418MHz (Table Top)
- FIGURE 18/19 Unintentional Radiated Emissions Data Sheets, (AM) Tx Mode, 418MHz (Wall Mount)
- FIGURE 20 Intentional Radiated Emissions Data Sheets, (AM) Tx Mode, 418MHz (Table Top)
- FIGURE 21 Intentional Radiated Emissions Data Sheet, (AM) Tx Mode, 418MHz (Wall Mount)

ALL LEVELS COMPLY WITH THE APPLICABLE FCC LIMITS PART 15 CLASS B AND C FOR RADIATED EMISSIONS PER THE APPLICABLE PARAGRAPHS.



Duty Cycle Correction Factor Calculation:

Total Number of Pulses counted in 100ms

Total Time On = 11.1ms

Duty Cycle Correction Factor

$$= 20 \log [\text{Time On} / (\text{Time On} + \text{Time Off})]$$

$$= 20 \log [11.1\text{ms} / 100\text{ms}]$$

$$= 20 \log .111$$

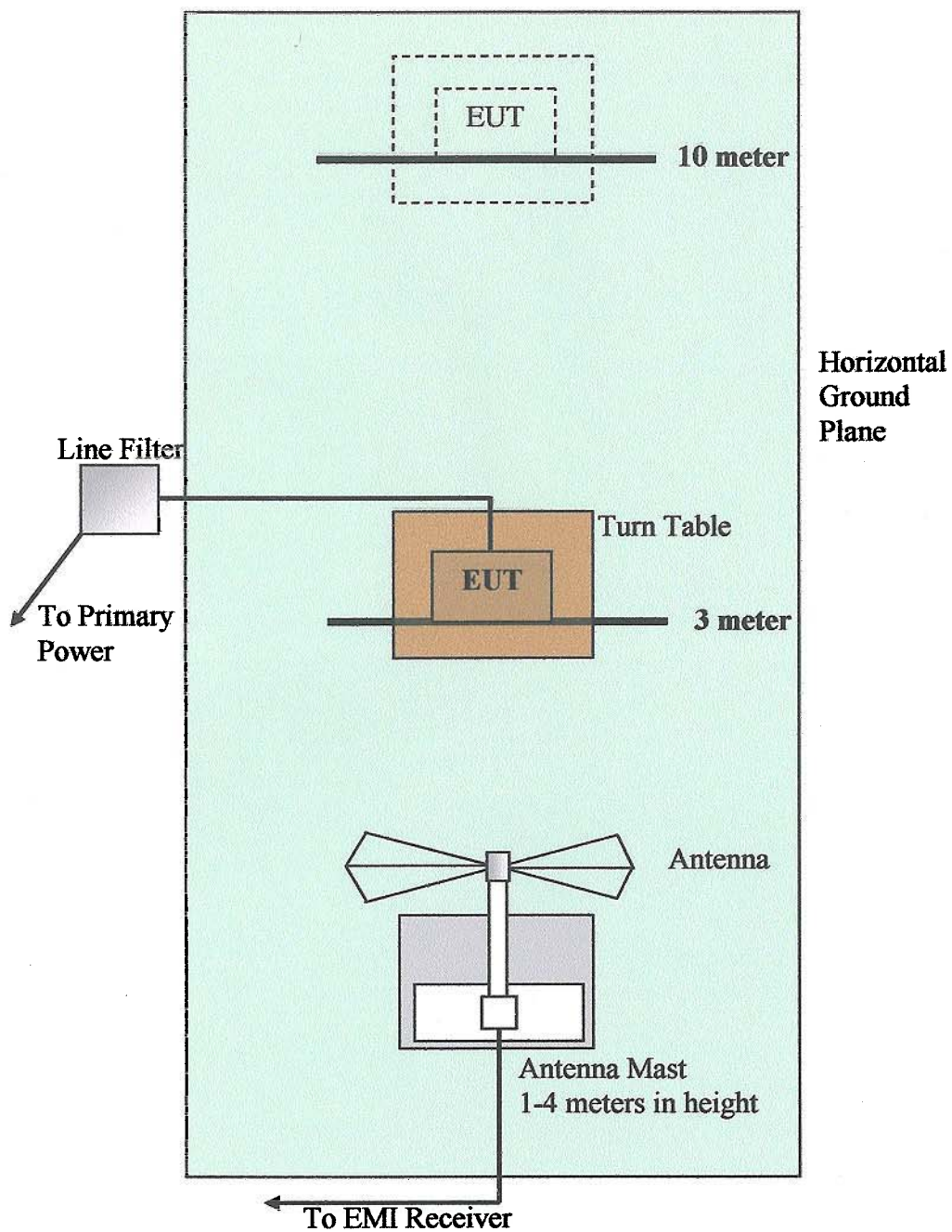
$$= 19.2 \text{ dB}$$

Figure 7



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**Radiated Emissions Test Setup Diagram
Figure 8**



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