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FCC Part 15, Certification Application

Cooper Lighting

Model TS180DC 315 MHz Transmitter

Project No: 04-0374

Issue Date: February 15, 2005

Report Number: 04-0374
Customer: Cooper Lighting
Model: TS180DC 315 MHz Transmitter

MEASUREMENT/TECHNICAL REPORT

This report concerns (check one): Original grant_X_
Class II change_____

Equipment type: **Low Power Transmitter**

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? yes_____ No_X_

If yes, defer until:_____
date

__N.A.__ agrees to notify the Commission by__N.A.___
date
of the intended date of announcement of the product so that the grant can be issued on that date.

Report prepared by:

United States Technologies, Inc.
3505 Francis Circle
Alpharetta, GA 30004

Phone Number: (770) 740-0717
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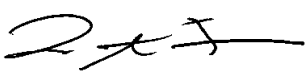
Report reviewed by:



Louis A. Feudi
Operations Manager

TABLE OF CONTENTS

LIST OF FIGURES AND TABLES

FIGURES

TABLES

SECTION 1

GENERAL INFORMATION

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Product Description

The Equipment Under Test (EUT) is the Cooper Lighting Model TS180DC 315 MHz Transmitter. The EUT is a battery operated motion sensing transmitter, intended for use with lighting equipment. The transmitter is an intentional radiator operating at 315 MHz and transmits when the motion detector detects motion, or when no motion is detected and a 4 or 12 minute timer expires. The transmit duration is 2 seconds maximum (on time) with less than 50% duty cycle.

Related Submittal(s)/Grant(s)

The EUT will be used with a DoC Approved receiver.

SECTION 2

TESTS AND MEASUREMENTS

TESTS AND MEASUREMENTS

Configuration of Tested System

The sample was tested per ANSI C63.4, Methods of Measurement from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (1992). Conducted and radiated emissions data were taken with the test receiver or spectrum analyzer's resolution bandwidth adjusted to 9 kHz and 100 kHz, respectively. All measurements are peak unless stated otherwise. The video filter associated with the spectrum analyzer was off throughout the evaluation process. Interconnecting cables were manipulated as necessary to maximize emissions. A block diagram of the tested system is shown in Figure 1. Test configuration photographs for spurious and fundamental emissions are shown in Figure 2.

The EUT was placed into a continuous mode of transmit and rotated about all 3 axis to obtain worse case results. Fresh batteries, with sufficient voltage were used during test.

Test Facility

Testing was performed at US Tech's measurement facility at 3505 Francis Circle, Alpharetta, GA. Conducted and digital device testing was performed at US Tech's measurement facility. This site has been fully described and registered by the FCC under Registration Number 91037. Additionally this site has also been fully described and submitted to Industry Canada (IC), and has been approved under file number IC2982.

Modifications

No modifications were necessary to bring the EUT into compliance with Part 15, Class B FCC Rules and Regulations:

Test Equipment

Table 2 describes test equipment used to evaluate this product.

FIGURE 1

TEST CONFIGURATION

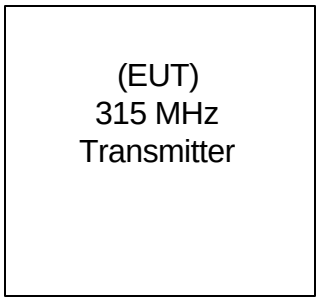


TABLE 1

EUT and Peripherals

PERIPHERAL MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	FCC ID:	CABLES P/D
315 MHz Transmitter Cooper Lighting (EUT)	TS180DC 315 MHz Transmitter	None	NCG-TS180DC (Pending)	None

TABLE 2

TEST INSTRUMENTS

EQUIPMENT	MODEL NUMBER	MANUFACTURER	SERIAL NUMBER	DATE OF LAST CALIBRATION
SPECTRUM ANALYZER	8558B	HEWLETT-PACKARD	2332A10055	2/19/04
SPECTRUM ANALYZER	8593E	HEWLETT-PACKARD	3205A00124	11/29/04
SIGNAL GENERATOR	8648B	HEWLETT-PACKARD	3642U01679	9/9/04
RF PREAMP	8447D	HEWLETT-PACKARD	2944A07436	4/29/04
RF PREAMP	8449B	HEWLETT-PACKARD	3008A00480	6/23/04
HORN ANTENNA	SAS - 571	A.H. systems	605	3/16/04
BICONICAL ANTENNA	3110	EMCO	9307-1431	5/18/04
LOG PERIODIC ANTENNA	3146	EMCO	3236	6/30/04
CALCULATION PROGRAM	N/A	N/A	EMCCALC	N/A

Note: The calibration interval of the above test instruments is 12 months and all calibrations are traceable to NIST/USA.

Periodic Operation (47 CFR 15.231(a1))

A transmitter manually activated must automatically deactivate within not more than 5 seconds of being released. The transmitter is a motion sensor / transmitter. The EUT transmits upon sensing motion. The EUT ceases transmission almost immediately after starting the transmission and appears to finish the current packet being transmitted. Therefore the longest period of time the transmitter should take to deactivate is a packet length, or 10.85 msec as shown in Figure 3.

FIGURE 3a

Periodic Operation 15.231(a)(c1)

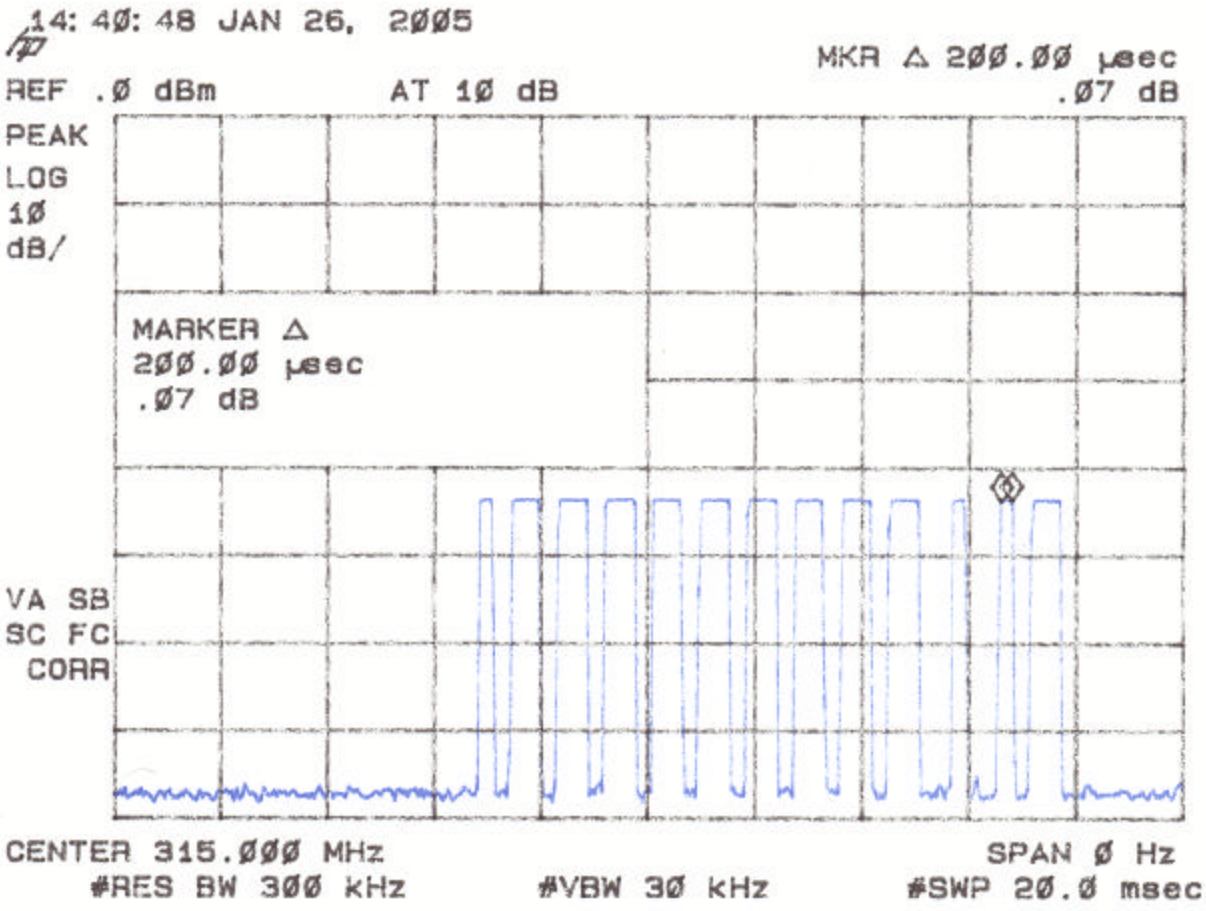


FIGURE 3b

Periodic Operation 15.231(a)(c1)

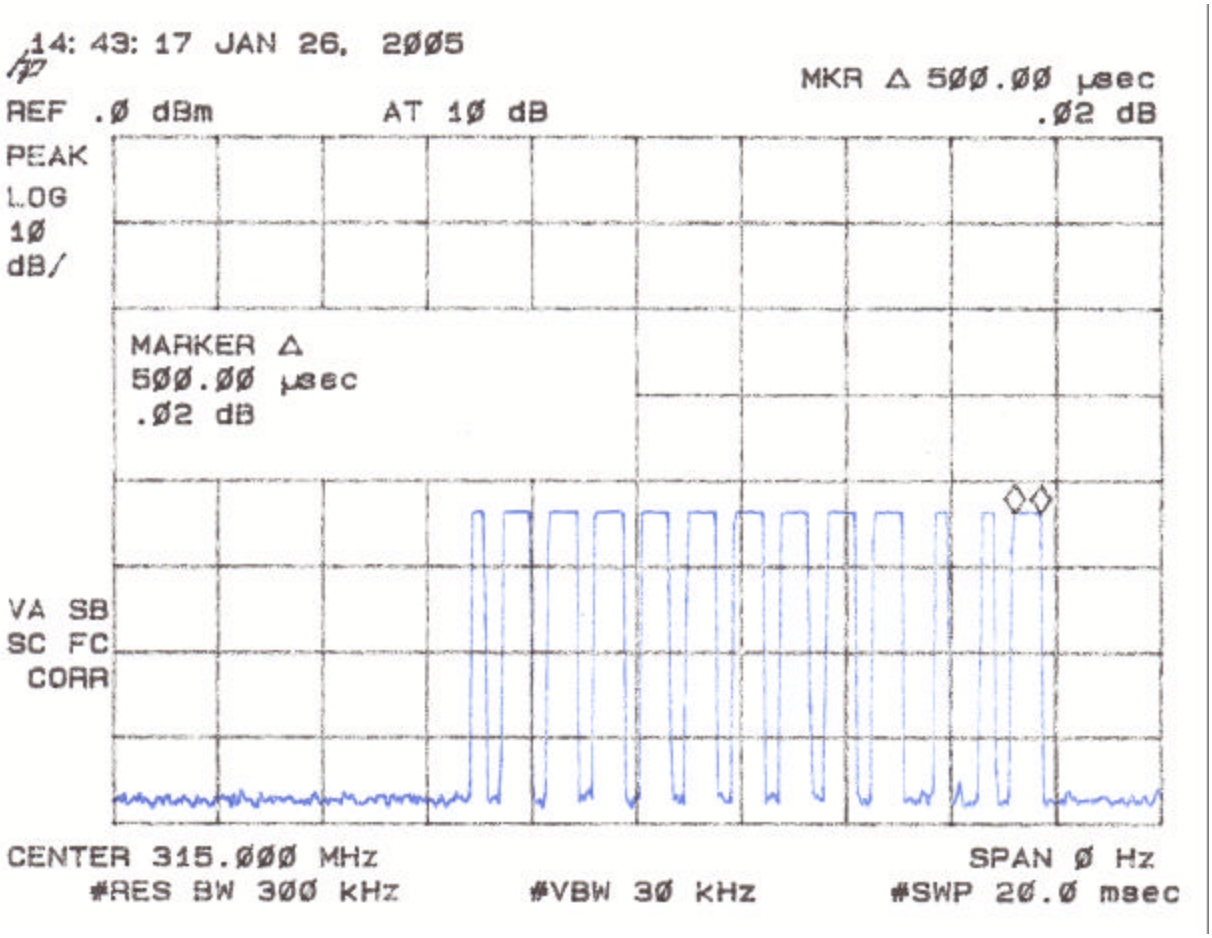
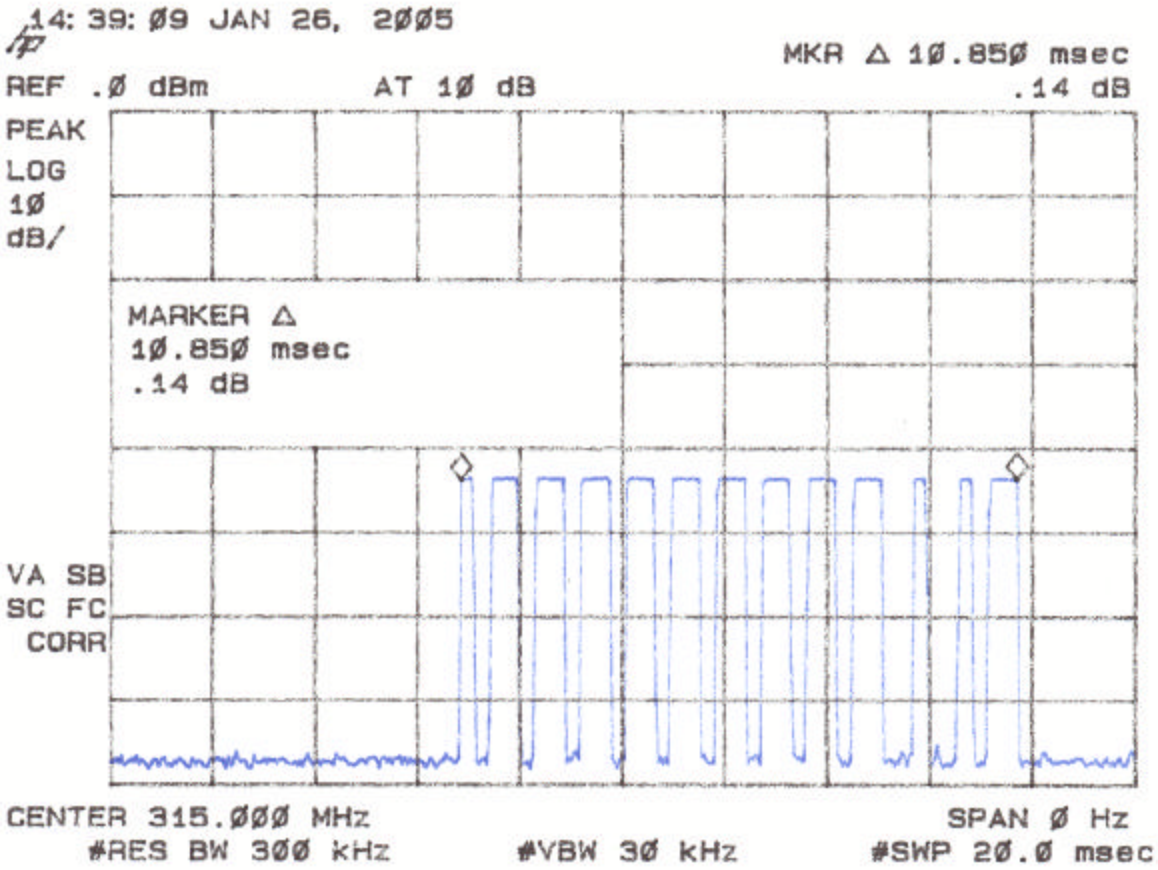


FIGURE 3c

Periodic Operation 15.231(a)(c1)



Field Strength of Fundamental Emission (47 CFR 15.231b)

Measurements were made using a peak detector. Field strength of the peak fundamental emission is shown in Table 3 and Figure 4.

Field strength of the average fundamental emission is shown in Table 4.

Duty Cycle Correction During 100 msec:

Each function key sends a different series of characters, but each packet period (21.375 msec) never exceeds a series of 10 long (500.0 µs) and 3 short (200.0 µs) pulses. The transmit duty cycle would be considered 10 x 500.0 usec + 3 x 200 usec per 21.375 msec = 26.2% duty cycle. Figure 5 shows the characteristics of the pulse train for one of these functions.

Duty Cycle Correction = 20 log (0.2619) = -11.6 dB

Duty Cycle Characteristics are shown in Figures 3a, 3b, 3c and 4.

Report Number: 04-0374
Customer: Cooper Lighting
Model: TS180DC 315 MHz Transmitter

TABLE 3a

FIELD STRENGTH OF FUNDAMENTAL EMISSION

Peak Measurement

FREQ. (MHz)	TEST DATA (dBm) @ 3m	ANTENNA FACTOR + CABLE ATTENUATION	RESULTS (uV/m) @ 3m	FCC LIMITS (uV/m) @ 3m	MARGIN BELOW FCC LIMITS (dB)
314.87	-58.8	19.5	2431.8	60361.8	27.9

SAMPLE CALCULATIONS:

RESULTS uV/m @ 3m Antilog [(-58.8 + 19.5 + 107)/20] = 2431.8
CONVERSION FROM dBm TO dBuV = 107 dB

Test Date: January 25, 2005

Tested by
Signature: David P. Blethen **Name: David Blethen**

Report Number: 04-0374
Customer: Cooper Lighting
Model: TS180DC 315 MHz Transmitter

TABLE 3b

FIELD STRENGTH OF FUNDAMENTAL EMISSION

Average Measurement

FREQ. (MHz)	TEST DATA (dBm) @ 3m	ANTENNA FACTOR + CABLE ATTENUATION	RESULTS (uV/m) @ 3m	FCC LIMITS (uV/m) @ 3m	MARGIN BELOW FCC LIMITS (dB)
314.87	-70.4	19.5	639.6	6036.2	19.5

SAMPLE CALCULATIONS:

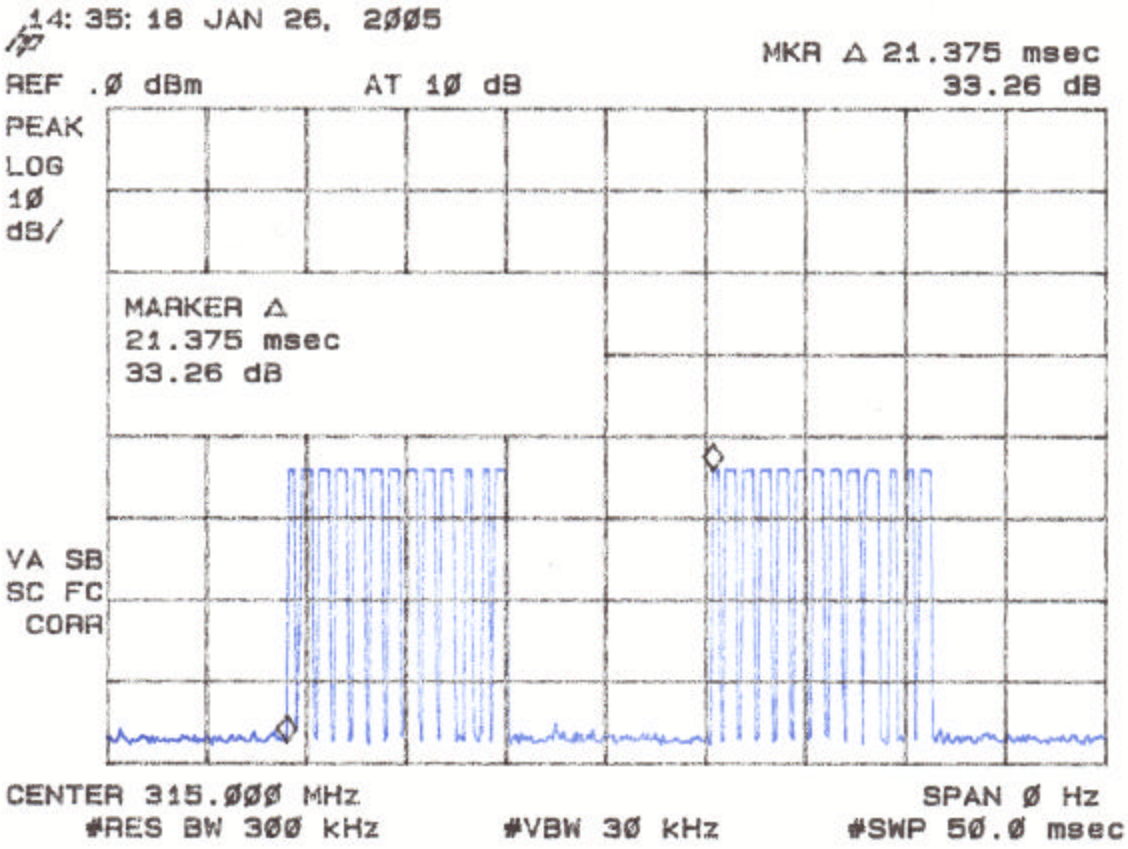
RESULTS uV/m @ 3m Antilog [(-70.4 + 19.5 + 107)/20] = 639.6
CONVERSION FROM dBm TO dBuV = 107 dB

Test Date: January 25, 2005

Tested by
Signature: David B. Blethen **Name: David Blethen**

FIGURE 4

DUTY CYCLE CHARACTERISTICS



Field Strength Of Spurious Emissions (47 CFR 15.231b)

Measurements were made using a peak detector. Field strength of Spurious Emissions are shown in Tables 5a and 5b. For comparison to the average limits, duty cycle corrections were made as given in the previous section.

Report Number: 04-0374
Customer: Cooper Lighting
Model: TS180DC 315 MHz Transmitter

TABLE 5a

FIELD STRENGTH OF SPURIOUS EMISSIONS (15.231B)

Peak Radiated Emissions									
Test By:	Test:	Part 15.231 Certification				Client:	Cooper Lighting		
DPB	Project:	04-0374		Class:	NA	Model:	Model TS180DC 315MHz Transmitter		
Frequency (MHz)	**Test Data (dBm)**	**AF Table**	**Test Data (dBuV)**	**AF+CA-AMP (dB)**	**Results (uV/m)**	**Limits (uV/m)**	**Distance / Polarity**	**Margin (dB)**	**PK = n / QP**
314.87	-58.8	2LP3mH	48.2	19.5	2431.8	60361.8	3m./HORZ	**27.9**	**PK**
629.74	-81.7	2LP3mV	25.3	25.7	354.1	6036.2	3m./VERT	**24.6**	**PK**
944.615	-96.4	2LP3mV	10.6	31.3	124.9	6036.2	3m./VERT	**33.7**	**PK**
1259.45	-50.9	2HN3m	56.1	-9.9	204.6	6036.2	3m./HORZ	**29.4**	**PK**
1574.29	-56.8	2HN3m	50.2	-8.8	118.1	6036.2	3m./HORZ	**34.2**	**PK**
1889.23	-50.2	2HN3m	56.8	-5.8	356.3	6036.2	3m./HORZ	**24.6**	**PK**

SAMPLE CALCULATIONS:

RESULTS uV = Antilog ((-58.8 + 19.5 + 107)/20) = 2431.8
CONVERSION FROM dBm TO dBuV = 107 dB

Test Date: January 25, 2005

Tested by
Signature:  **Name: David Blethen**

Report Number: 04-0374
Customer: Cooper Lighting
Model: TS180DC 315 MHz Transmitter

TABLE 5b

FIELD STRENGTH OF SPURIOUS EMISSIONS (15.231B)

Average Radiated Emissions corrected by 11.6 dB, 26.2% Duty cycle

Test By:	Test:	Part 15.231 Certification				Client:	Cooper Lighting		
DPB	Project:	04-0374		Class:	NA	Model:	Model TS180DC 315MHz Transmitter		
Frequency (MHz)	**Test Data (dBm)**	**AF Table**	**Test Data (dBuV)**	**AF+CA-AMP (dB)**	**Results (uV/m)**	**Limits (uV/m)**	**Distance / Polarity**	**Margin (dB)**	**PK = n / QP**
314.87	-70.4	2LP3mH	36.6	19.5	639.6	6036.2	3m./HORZ	**19.5**	**AVG**
629.74	-93.3	2LP3mV	13.7	25.7	93.1	603.6	3m./VERT	**16.2**	**AVG**
944.615	-108.0	2LP3mV	-1.0	31.3	32.9	603.6	3m./VERT	**25.3**	**AVG**
1259.45	-62.5	2HN3m	44.5	-9.9	53.8	603.6	3m./HORZ	**21.0**	**AVG**
1574.29	-68.4	2HN3m	38.6	-8.8	31.1	603.6	3m./HORZ	**25.8**	**AVG**
1889.23	-61.8	2HN3m	45.2	-5.8	93.7	603.6	3m./HORZ	**16.2**	**AVG**

SAMPLE CALCULATIONS:

RESULTS uV = Antilog ((-70.4 + 19.5 + 107)/20) = 639.6
CONVERSION FROM dBm TO dBuV = 107 dB

Test Date: January 25, 2005

Tested by
Signature: David P. Blethen **Name: David Blethen**

20 dB Bandwidth of Fundamental Emission (47 CFR 15.231c)

The peak 20 dB bandwidth measurement of the fundamental emission is shown in Table 6 and Figure 5.

TABLE 6

20 dB BANDWIDTH OF FUNDAMENTAL EMISSION

FREQUENCY (MHz)	20 dB BANDWIDTH (kHz)	FCC LIMITS (kHz)
315.05	525	787

FCC Limit = (0.25%) (Center Frequency) = (0.0025)(314.93) = 787 kHz

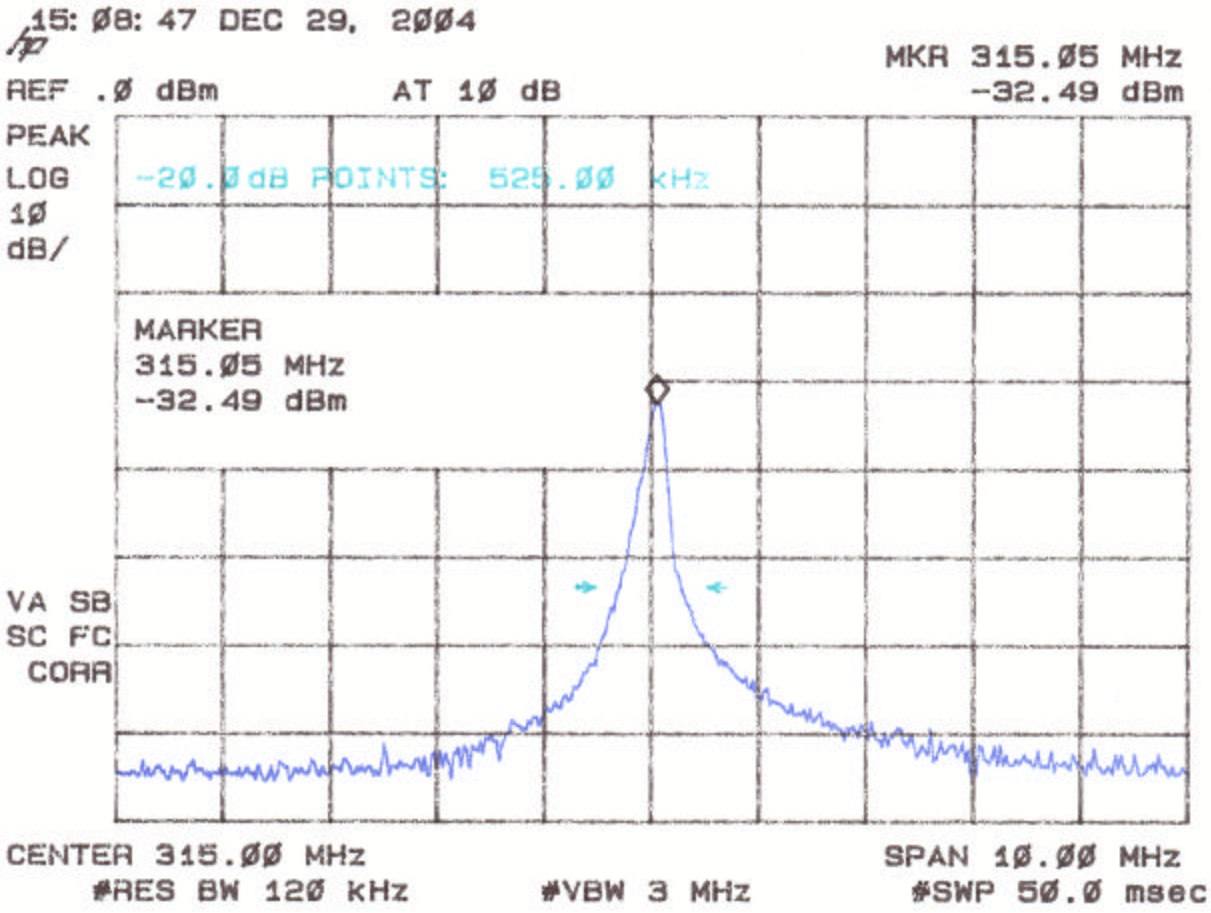
Test Date: January 25, 2005

Tested by
Signature: _____ **Name: David Blethen**

Report Number: 04-0374
Customer: Cooper Lighting
Model: TS180DC 315 MHz Transmitter

FIGURE 5

20 dB BANDWIDTH OF FUNDAMENTAL EMISSION 15.231(c)



Frequency Tolerance of Carrier Signal (47 CFR 15.231d)

The EUT does not operate in the 40.66 - 40.70 MHz band, therefore frequency tolerance measurements were deemed unnecessary.

Radiated Digital Device Emissions (47 CFR 15.109a)

Radiated emissions were evaluated from 30 to 1000 MHz. Measurements were made with the analyzer's bandwidth set to 100 kHz. Emissions are shown in Table 7.

TABLE 7

CLASS B
RADIATED EMISSIONS

FREQ. (MHz)	TEST DATA (dBm) @ 3m	ANTENNA FACTOR + CABLE ATTENUATION	RESULTS (uV/m) @ 3m	FCC LIMITS (uV/m) @ 3m
NO EMISSIONS DETECTED WITHIN 20 dB OF THE FCC LIMIT				

Test Date: January 27, 2005

Tested by Signature: David P. Blethen **Name: David Blethen**

Power Line Conducted Emissions (47 CFR 15.107a)

The EUT is operated by internal battery power only, therefore power line conducted emissions was deemed unnecessary.