

KTL Test Report: 9R00977

Applicant: E.T.M. Industries Inc.
PO Box 610
266 Hall Avenue
Renfrew, Ontario
K7V 4E7

**Equipment Under Test:
(E.U.T.)** Farm Alert Implement Lighting System
Tractor Keypad Transmitter

FCC ID: OMBETM-FA-K-4

In Accordance With: **FCC Part 15, Subpart C**
For Low Power Transmitters Operating Periodically
In The Band 40.66 - 40.77 MHz And Above 70 MHz

Tested By: KTL Ottawa Inc.
3325 River Road, R.R. 5
Ottawa, Ontario K1V 1H2

Authorized By:

R. Grant, Senior RF Specialist

Date:

Total Number of Pages: 31

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EQUIPMENT: *Farm Alert Implement Lighting System - Tractor Keypad Transmitter*
FCC ID: *OMBETM-FA-K-4*

Section 1. Summary of Test Results

Manufacturer: E.T.M. Industries Inc.

Model No.: ETM-FA-K-4

Serial No.: None

General: **All measurements are traceable to national standards.**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, Subpart C, Paragraph 15.231. All tests were conducted using measurement procedure ANSI C63.4-1992. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC.



New Submission



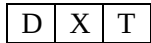
Production Unit



Class II Permissive Change



Pre-Production Unit



Equipment Code

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE.

See " Summary of Test Data".



NVLAP LAB CODE: 100351-0

TESTED BY: _____ DATE: _____
Wayne Clarke, Senior EMC Specialist

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This report applies only to the items tested.

EQUIPMENT: Farm Alert Implement Lighting System - Tractor Keypad Transmitter
FCC ID: OMBETM-FA-K-4

Summary Of Test Data

Name of Test	Paragraph Number	Results
Transmission Requirements	15.231(a)	Complies
Radiated Emissions	15.231(b)	Complies
Occupied Bandwidth	15.231(c)	Complies
Frequency Tolerance	15.231(d)	Not Applicable
Periodic Alternate Field Strength Requirements	15.231(e)	Not Applicable
Powerline Conducted Emissions	15.207	Not Applicable

Footnotes For N/A's: The E.U.T. was battery operated.

Test Conditions:

Indoor Temperature: 22 °C
 Humidity: 30 %

Outdoor Temperature: 26 °C
 Humidity: 42 %

EQUIPMENT: Farm Alert Implement Lighting System - Tractor Keypad Transmitter
FCC ID: OMBETM-FA-K-4

Section 2. Equipment Under Test (E.U.T.)

General Equipment Information

Frequency Range: 318 MHz
Operating Frequency(ies) of Sample: 317.93 MHz
Type of Emission: Pulse with modulation
Emission Designator: 147KL1D
Supply Power Requirement: 9 Vdc Battery

Duty Cycle Calculation: Short Pulse Duration: 3.83 ms
 Long Pulse Duration: 10.17 ms

NR Long Pulses In 100 ms = 2.5
NR Short Pulses In 100 ms = 8 ms

Total On Time = (2.5 x 10.17) + (8x 3.83)
 = 25.43 + 30.64
 = 56.07 ms

Duty Cycle = $20 \log \frac{\text{on time ms}}{100 \text{ ms}}$
 = $20 \log \frac{56.07}{100}$
 = $20 \log 0.5607$
 = -5.03
 = -5 dB

EQUIPMENT: Farm Alert Implement Lighting System - Tractor Keypad Transmitter
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Description of E.U.T.

The E.U.T. is a wireless keypad unit for a farm implement system.

Modifications Incorporated in E.U.T.

The EUT has not been modified from what is described by the brand name and unique type identification stated above.

EQUIPMENT: Farm Alert Implement Lighting System - Tractor Keypad Transmitter
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Theory of Operation

The E.U.T. sends a pulse from a push button on a keypad unit to the implement lighting system to indicate turns, stops and hazards.

EQUIPMENT: Farm Alert Implement Lighting System - Tractor Keypad Transmitter
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Justification

The E.U.T. was configured for testing as per typical installation.

The following combinations were investigated to establish worst case configuration:

(1) Three orthogonal axis.

Exercise Program

The E.U.T. exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to typical use.

Exercise mode:

(1) Transmitting

EQUIPMENT: Farm Alert Implement Lighting System - Tractor Keypad Transmitter
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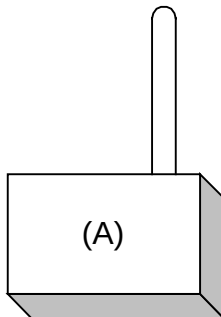
Section 3. Equipment Configuration

Equipment Configuration List:

Item	Description	Model No.	Serial.	Rev.
(A)	Tractor Keypad	ETM-FA-K-4	None	

Inter-connection Cables: Not Applicable

Configuration of the Equipment Under Test (E.U.T)



EQUIPMENT: Farm Alert Implement Lighting System - Tractor Keypad Transmitter
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Section 4. Transmission Requirements

NAME OF TEST: Transmission Requirements	PARA. NO.: 15.231(a)
TESTED BY: Wayne Clarke	DATE: May 27, 1999

- Minimum Standard:**
- 15.231(a) Continuous transmissions such as voice, video or data transmissions are not permitted.
- 15.231(a)(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds after being released.
- 15.231(a)(2) A transmitter activated automatically shall cease transmission within 5 seconds of activation.
- 15.231(a)(3) Periodic transmissions at regular pre-determined intervals are not permitted. However polling or supervisory transmissions to determine system integrity of transmitters used in security or safety applications are allowed if the periodic rate of transmission does not exceed one transmission of not more than one second duration per hour for each transmitter.
- 15.231(a)(4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm.

Test Results: Complies.

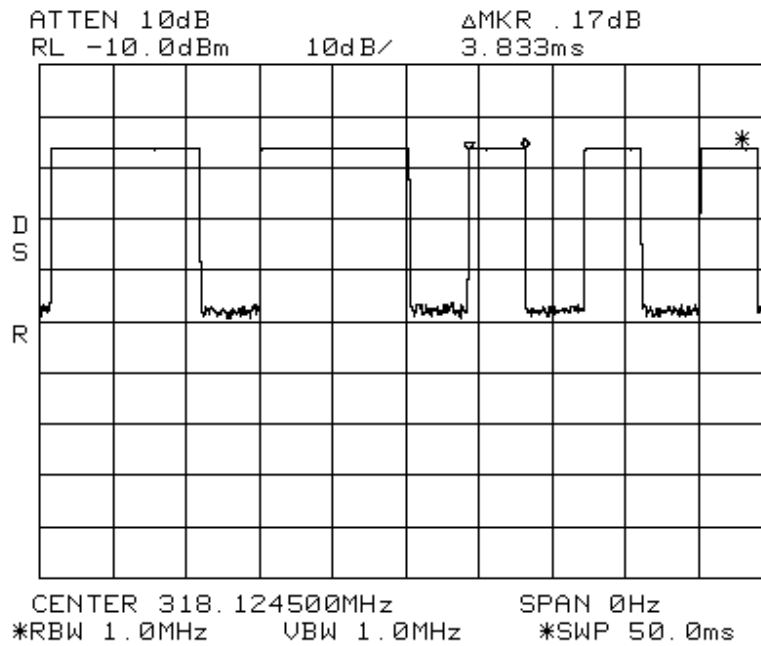
Test Data: Compliance was determined by verification of technical specifications and a functional test on the equipment.

EQUIPMENT: Farm Alert Implement Lighting System - Tractor Keypad Transmitter
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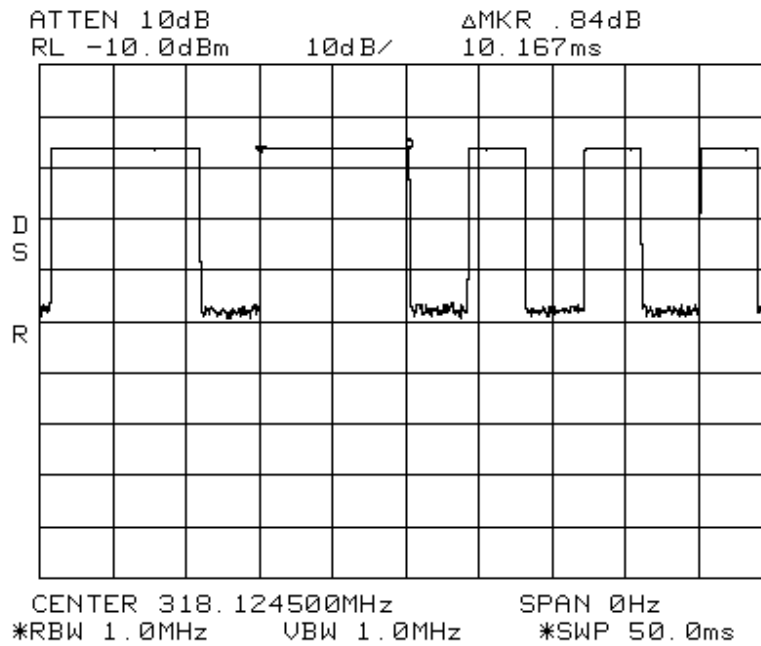
Rationale for Compliance with Transmission Requirements

- 145.231(a):** This equipment does not have provision for voice, video or data transmission
- 15.231(a)(1) :** The transmitter is automatically deactivated within 600 ms from the start of transmission
- 15.231(a)(2) :** Manual Activation
- 15.231(a)(3) :** Manual Activation
- 15.231(a)(4) :** Not Applicable

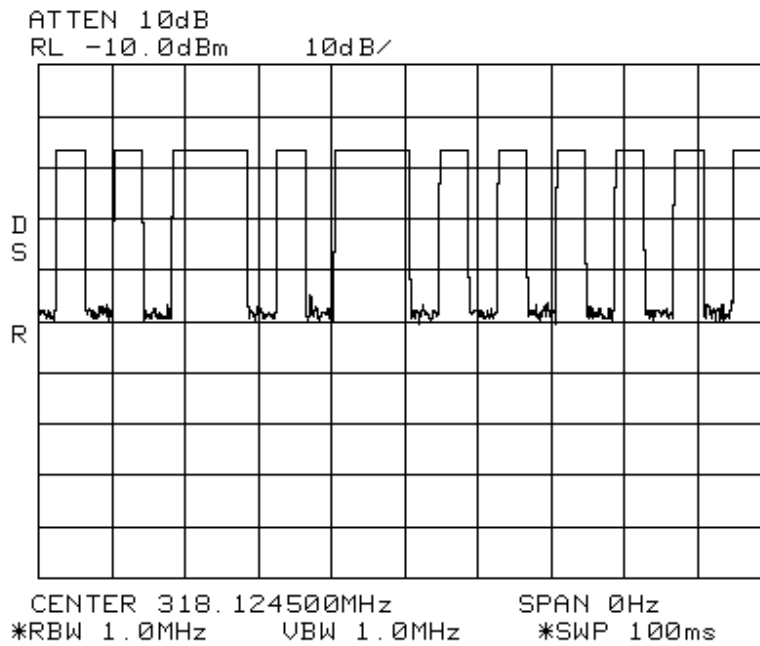
EQUIPMENT: Farm Alert Implement Lighting System - Tractor Keypad Transmitter
FCC ID: OMBETM-FA-K-4



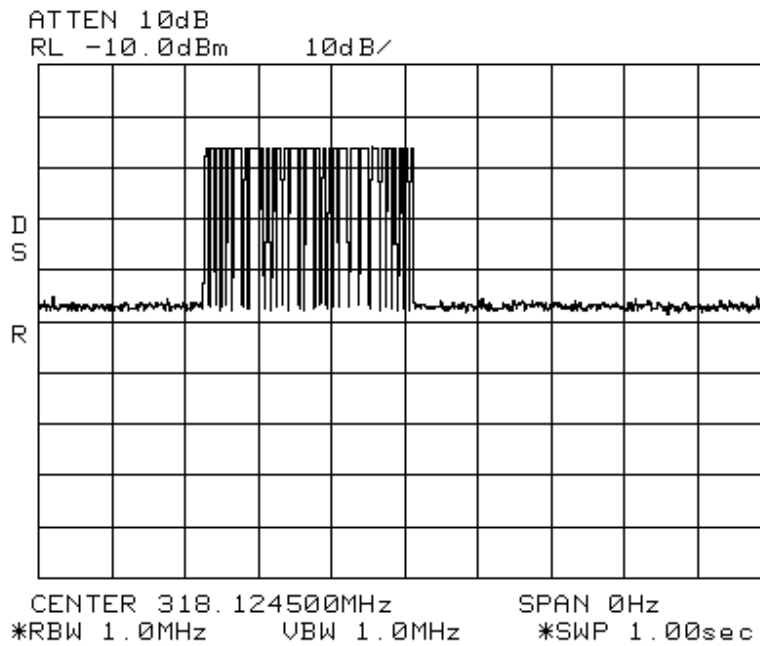
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Section 5. Radiated Emissions

NAME OF TEST: Radiated Emissions	PARA. NO.: 15.231(b)
TESTED BY: Wayne Clarke	DATE: June 4, 1999

Minimum Standard:

Permissible Field Strength Limits (Momentarily Operated Devices)

Fundamental Frequency (MHz)	Field Strength of Fundamental Microvolts/Meter at 3 meters; (watts)	Field Strength of Unwanted Emissions Microvolts/Meter at 3 meters; (watts)
40.66 - 40.70	2,250	225
70-130	1, 250	125
130-174	1,250 to 3,750*	125 to 375
174-260 (note 1)	3,750	375
260-470 (note 1)	3,750 to 12,500*	375 to 1,250
Above 470	12,500	1,250

Notes:

# Use quasi-peak or averaging meter.	For 130 - 174 MHz: $FS \text{ (microvolts/m)} = (56.82 \times F) - 6136$
* Linear interpolation with frequency F in MHz	For 260 - 470 MHz: $FS \text{ (microvolts/m)} = (41.67 \times F) - 7083$

Any emissions that fall within the restricted bands of 15.205 shall not exceed the following limits:

Frequency (MHz)	Field Strength ($\mu\text{V/m}$ @ 3m)	Field Strength (dB @ 3m)
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

Test Results: Complies. The worst-case emission level is 73.3 dB $\mu\text{V/m}$ @ 3m at 317.93 MHz. This is 2.5 dB below the specification limit.

Test Data: See attached table.

Above 1 GHz a spectrum analyzer and low noise amplifier are used to measure emission levels. The spectrum analyzer resolution bandwidth was set to 1 MHz and video bandwidth was 3 MHz.

In the case of handheld equipment, the E.U.T. is rotated in three planes to obtain worst-case results.

EQUIPMENT: Farm Alert Implement Lighting System - Tractor Keypad Transmitter
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Test Data - Radiated Emissions

Test Distance (meters) : 3		Range: A Tower		Receiver: ESVP		RBW(kHz): 120		Detector: CISPR			
Freq. (MHz)	Ant. *	Pol. (V/H)	Ant. HGT. (m)	Table (deg.)	RCVD Signal (dBµV/m)	Ant. Factor (dB)**	Amp. Gain (dB)***	Duty Cycle (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
317.93	ED3	V			55.2	23.1		-5	73.3	75.8	2.5
317.93	ED3	H			52.7	23.1		-5	70.8	75.8	5.0
Notes: B/C = Biconical, B/L = Biconilog, L/P = Log-Periodic, H = Horn, D/P = Dipole * Re-measured using dipole antenna. ** Includes cable loss when amplifier is not used. *** Includes cable loss. () Denotes failing emission level.											

EQUIPMENT: Farm Alert Implement Lighting System - Tractor Keypad Transmitter
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Radiated Photographs (Worst Case Configuration)

Front View



Rear View



EQUIPMENT: Farm Alert Implement Lighting System - Tractor Keypad Transmitter
FCC ID: OMBETM-FA-K-4

Section 6. Occupied Bandwidth

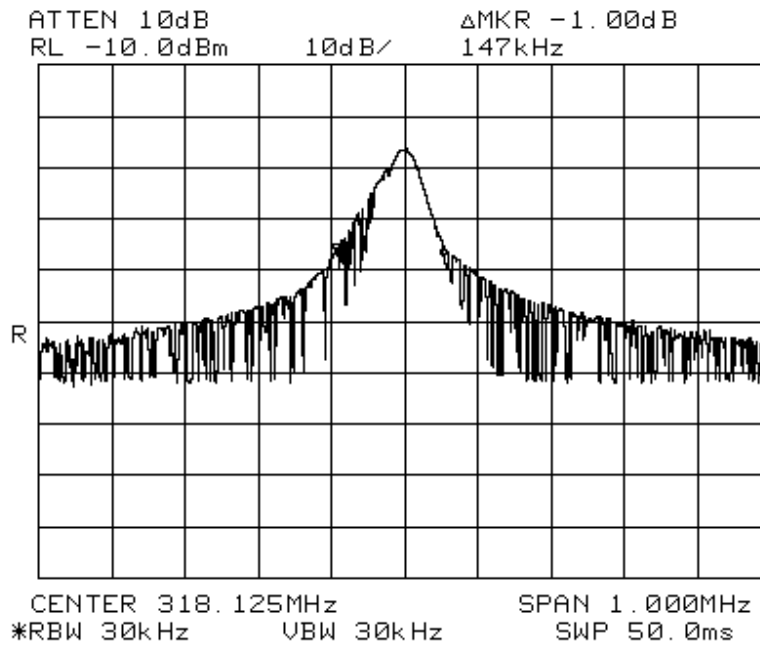
NAME OF TEST: Occupied Bandwidth	PARA. NO.: 15.231(c)
TESTED BY: Wayne Clarke	DATE: May 27, 1999

Minimum Standard: 15.231(c) The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

Test Results: Complies. See attached graph.

Test Data: See attached graph.

EQUIPMENT: Farm Alert Implement Lighting System - Tractor Keypad Transmitter
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EQUIPMENT: Farm Alert Implement Lighting System - Tractor Keypad Transmitter
FCC ID: OMBETM-FA-K-4

Section 7. Frequency Tolerance

Devices in the Frequency Band 40.66 - 40.77 MHz

NAME OF TEST: Frequency Tolerance

PART No.: 15.231(d)

TESTED BY:

Minimum Standard:

15.231(d) For devices operating in the frequency band 40.66 - 40.70 MHz, the bandwidth of the emission shall be confined within the band edges and the frequency tolerance of the carrier shall be $\pm 0.01\%$. This frequency tolerance shall be maintained for a temperature variation of -20 degrees to +50 degrees C at normal supply voltage and for a variation in the primary power supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

Test Results:

Complies/Does Not Comply. See attached graph and data.

Test Data:

See attached graph.

EQUIPMENT: Farm Alert Implement Lighting System - Tractor Keypad Transmitter
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Section 8. Periodic Alternate Field Strength Requirements

NAME OF TEST: Periodic Alternate Field Strength Requirements PARA. NO.: 15.231(e)

TESTED BY:

DATE:

Minimum Standard:

15.231(e) Intentional radiators may operate at a periodic rate exceeding that specified in paragraph (a) of this section and may be employed for any type of operation including operation prohibited in paragraph (a) of this section, provided the intentional radiator complies with the provisions of paragraphs (b) through (d) of this section, except the field strength table in paragraph (b) of this section is replaced by the following.

Fundamental Frequency (MHz)	Field Strength of Fundamental (microvolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)
40.66 - 40.70	1,000	100
70 - 130	500	50
130 - 174	500 to 1,500	50 to 150
174 - 260	1,500	150
260-470	1,500 to 5,000	150 to 500
Above 470	5,000	500

In addition, devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

Test Results:

Complies/Does Not Comply.

Test Data:

See attached table.

EQUIPMENT: Farm Alert Implement Lighting System - Tractor Keypad Transmitter
FCC ID: OMBETM-FA-K-4

Section 9. Powerline Conducted Emissions

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.207
TESTED BY:	DATE:

Minimum Standard:

Frequency(MHz)	Maximum Powerline Conducted Voltage	
	μV	dB μV
0.45 - 30.0	250	48

Test Results: Complies/Does Not Comply. See attached graphs and table.

Test Data: See attached graphs and table.

Method Of Measurement: (Per ANSI C63.4-1992)

Measurements were made using a spectrum analyzer with 10 kHz RBW, Peak detector. Any emissions that are close to the limit are measured using a test receiver with 10 kHz bandwidth, CISPR Quasi-Peak detector.

Broadband emissions are identified by switching the receiver detector function from Quasi-Peak to Average. If the amplitude of the emission drops by 6 dB or more then the emission is classified as broadband and the Quasi-Peak level is reduced by a factor of 13 dB.

All emissions within 10 dB of limit have been recorded.

FCC ID: OMBETM-FA-K-4

[illegible]

EQUIPMENT: Farm Alert Implement Lighting System - Tractor Keypad Transmitter
FCC ID: OMBETM-FA-K-4

Conducted Photographs (Worst Case Configuration)

SIDE VIEW

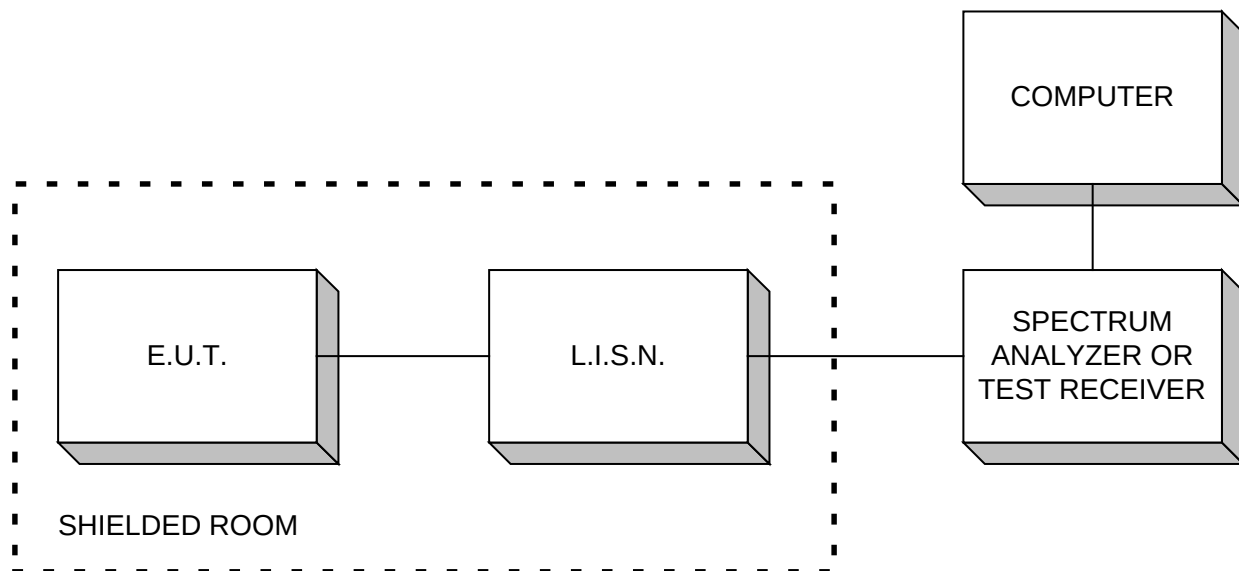
NOT APPLICABLE

FRONT VIEW

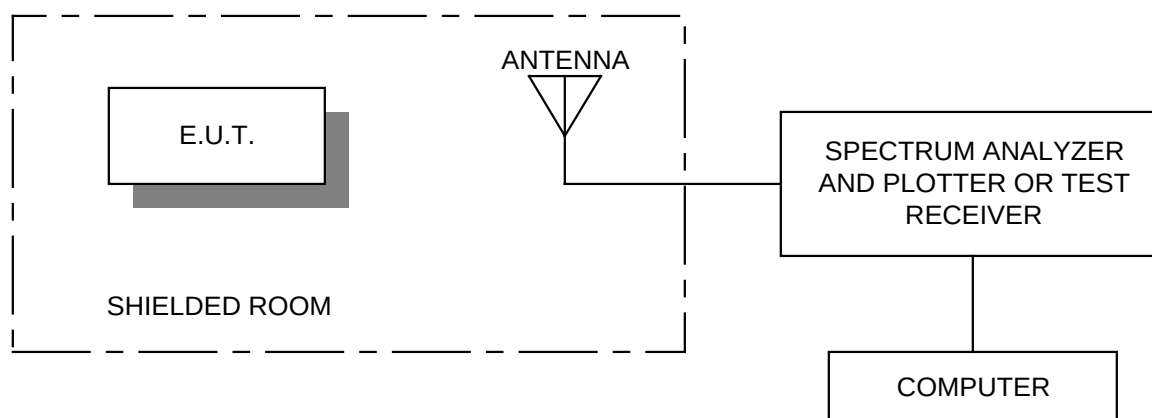
EQUIPMENT: Farm Alert Implement Lighting System - Tractor Keypad Transmitter
FCC ID: OMBETM-FA-K-4

Section 10. Block Diagrams

Conducted Emissions

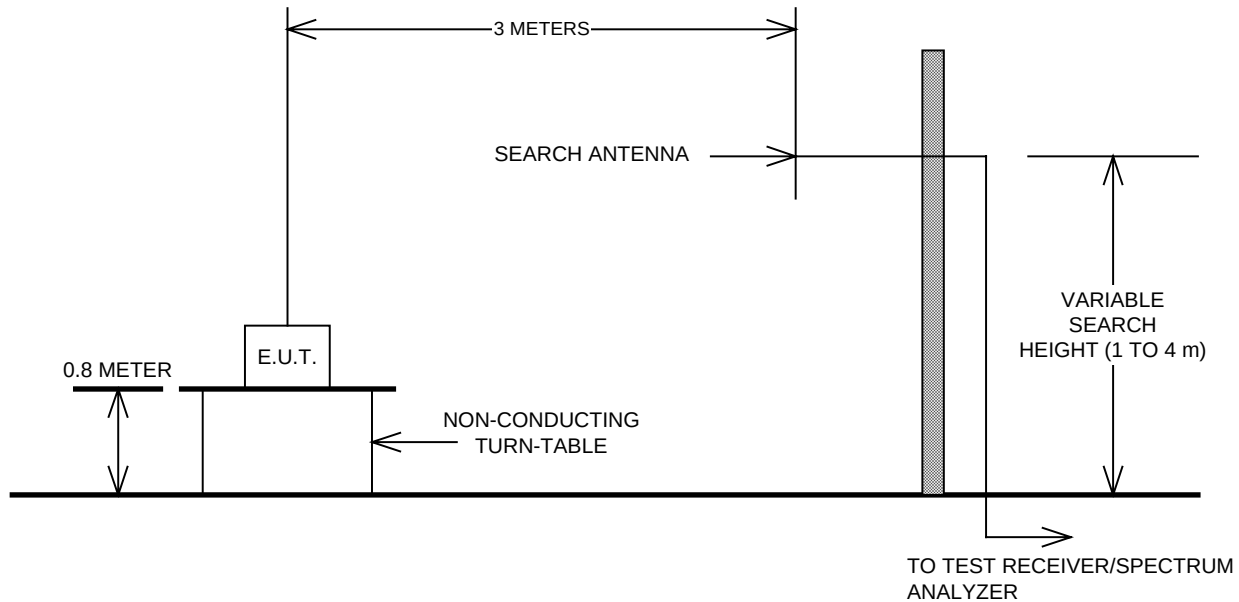


Radiated Prescan



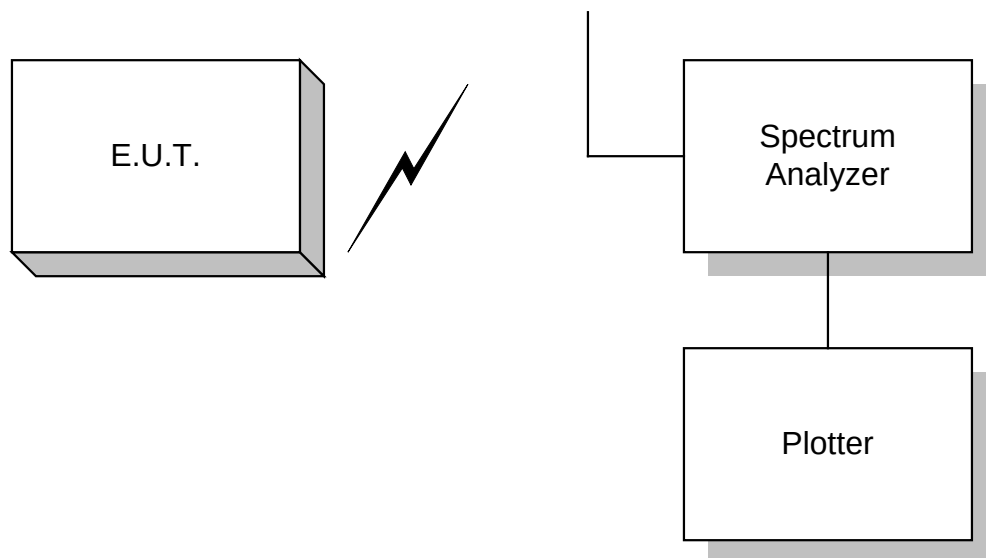
EQUIPMENT: Farm Alert Implement Lighting System - Tractor Keypad Transmitter
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Outdoor Test Site For Radiated Emissions



The spectrum was searched up to the 10th harmonic of the fundamental frequency of operation.

Occupied Bandwidth



EQUIPMENT: Farm Alert Implement Lighting System - Tractor Keypad Transmitter
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Section 11. Test Equipment List

CAL CYCLE	EQUIPMENT	MANUFACTURER	MODEL	SERIAL	LAST CAL.	NEXT CAL.	
1 Year	Spectrum Analyzer	Hewlett Packard	8565E	FA000981	May 20/98	July 20/99	
1 Year	Receiver	Rohde & Schwarz	ESVP	892661/014	Mar. 31/98	Mar. 31/99	
2 Year	Horn Antenna	EMCO #2	3115	4336	Oct. 30/97	Oct. 30/99	
1 Year	Log Periodic Antenna	EMCO	LPA-25	1141	July 27/98	July 27/99	
1 Year	Low Noise Amplifier	Avantek	AWT-8035	1005	Aug. 4/98	Aug. 4/99	

NA: Not Applicable
NCR: No Cal Required
COU: CAL On Use

KTL Ottawa

FCC PART 15, SUBPART C
FOR LOW POWER TRANSMITTERS
PROJECT NO.: 9R00977
ANNEX A

EQUIPMENT: Farm Alert Implement Lighting System - Tractor Keypad Transmitter
FCC ID: OMBETM-FA-K-4

ANNEX A
RESTRICTED BANDS

EQUIPMENT: Farm Alert Implement Lighting System - Tractor Keypad Transmitter
FCC ID: OMBETM-FA-K-4

Section A Restricted Bands of Operation

(a) Except as shown in paragraph (d) of this section , only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42-16.423	399.9-410	4.5-5.15
0.49 - 0.51	16.69475-16.69525	608-614	5.35-5.46
2.1735 - 2.1905	16.80425-16.80475	960-1240	7.25-7.75
3.020 - 3.026	25.5-25.67	1300-1427	8.025-8.5
4.125 - 4.128	37.5-38.25	1435-1626.6	9.0-9.2
4.17725 - 4.17775	73-74.6	1645.5-1646.5	9.3-9.5
4.20725 - 4.20775	74.8-75.2	1660-1710	10.6-12.7
6.215 - 6.218	108-121.94	1718.8-1722.2	13.25-13.4
6.31175 - 6.31225	123-138	2220-2300	14.47-14.5
8.291 - 8.294	149.9-150.05	2310-2390	15.35-16.2
8.362 - 8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625 - 8.38675	156.7-156.9	2655-2900	22.01-23.12
8.41425 - 8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29 - 12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975 - 12.52025	240-285	3345.8-3358	36.43-36.5
12.57675 - 12.57725	322-335.4	3600-4400	Above 38.6
13.36 - 13.41			