KTL Test Report:	9L0447RUS
Applicant:	Dakota Digital 3421 Hovland Drive Sioux Falls, South Dakota 57107
Equipment Under Test: (E.U.T.)	XMT-3
FCC ID:	LEPXMT03
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 Dallas Inc. 802 North Kealy Lewisville, Texas 75057
Authorized By:	 Tom Tidwell, RF Manager
Date:	January 27, 2000
Total Number of Pages:	35

Table of Contents

Section 1. Summary of Test Results

Manufacturer: Dakota Digital

Model No.: XMT-3

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

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: David Light DATE: 1/19/00 – 1/25/00

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)	Complies
Periodic Alternate Field Strength Requirements	15.231(e)	N/A
Powerline Conducted Emissions	15.207	N/A

Footnotes: (1) Powerline Conducted Emissions is not applicable since the E.U.T. is battery operated.

Test Conditions:

Indoor	Temperature:	22 °C
	Humidity:	45 %
Outdoor	Temperature:	18 °C
	Humidity:	50 %

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

General Equipment Information

Frequency Range:	301.5 MHz
Operating Frequency(ies) of Sample:	301.5 MHz
Emission Designator:	15K0L1D
Supply Power Requirement:	12 Vdc Battery
Duty Cycle Calculation:	20 log (52.2ms/100ms) = -5.63 dB 52.3 ms total on time during 100 ms

Description of E.U.T.

The E.U.T. is a 301.5 MHz RF transmitter use to control auxiliary lights on tire repair/service vehicle.

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.

Justification

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

The following combinations were investigated to establish worst case configuration:

(1) Continuous transmission.

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) Continuous transmission

Section 3. Equipment Configuration

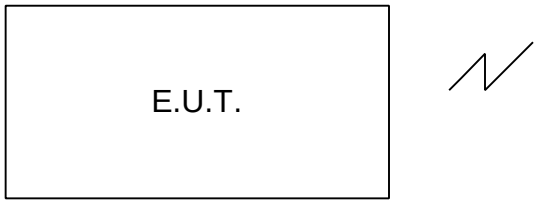
Equipment Configuration List:

Item	Description	Model No.	Serial.	Rev.
(A)	Transmitter	XMT-3	None	
(B)				
(C)				
(D)				
(E)				
(F)				
(G)				

Inter-connection Cables: NONE

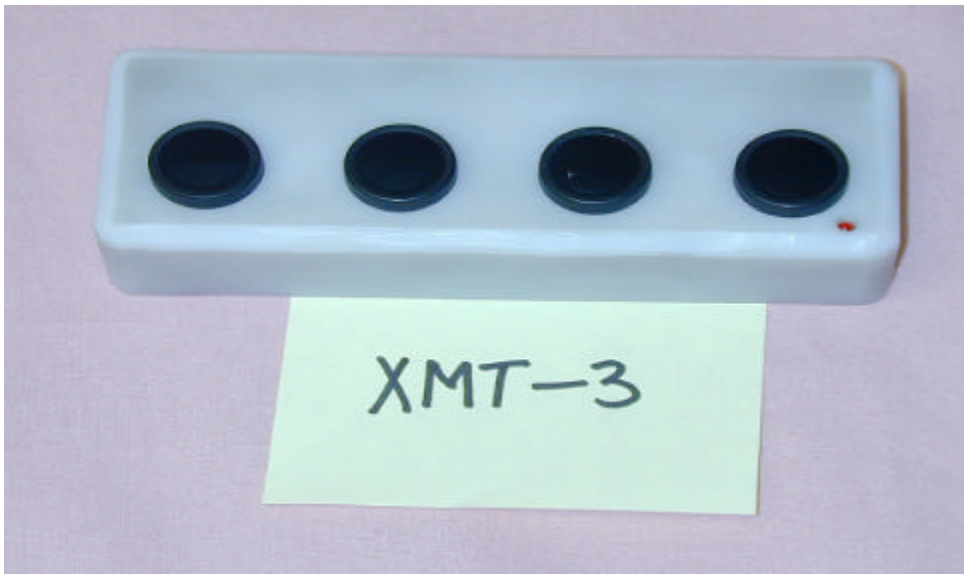
Item	Description	Length (m)
(1)		
(2)		
(3)		
(4)		
(5)		
(6)		
(7)		
(8)		

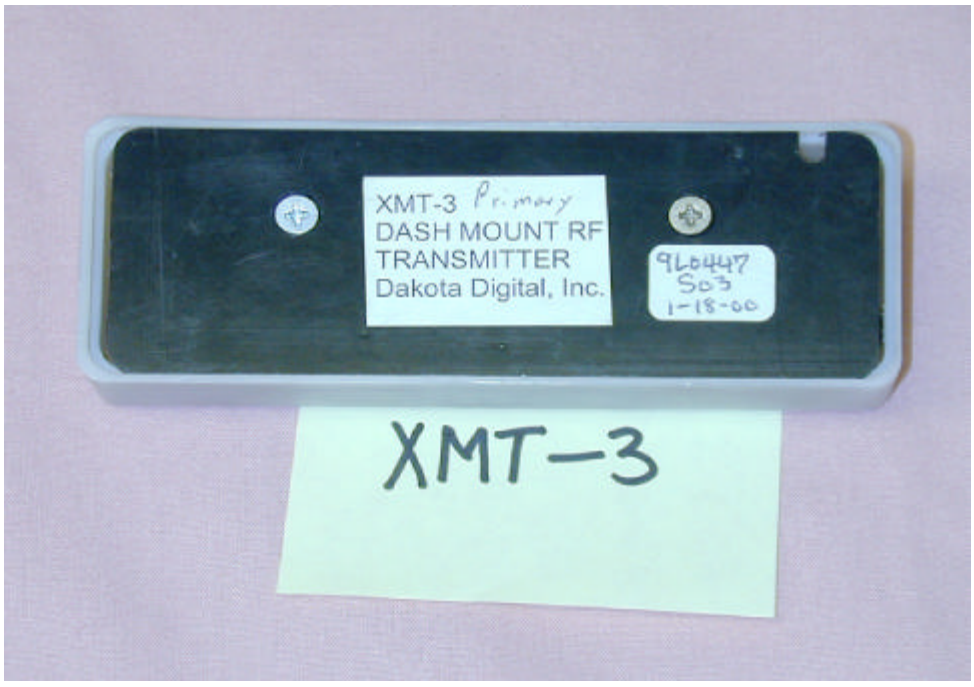
Configuration of the Equipment Under Test (E.U.T)



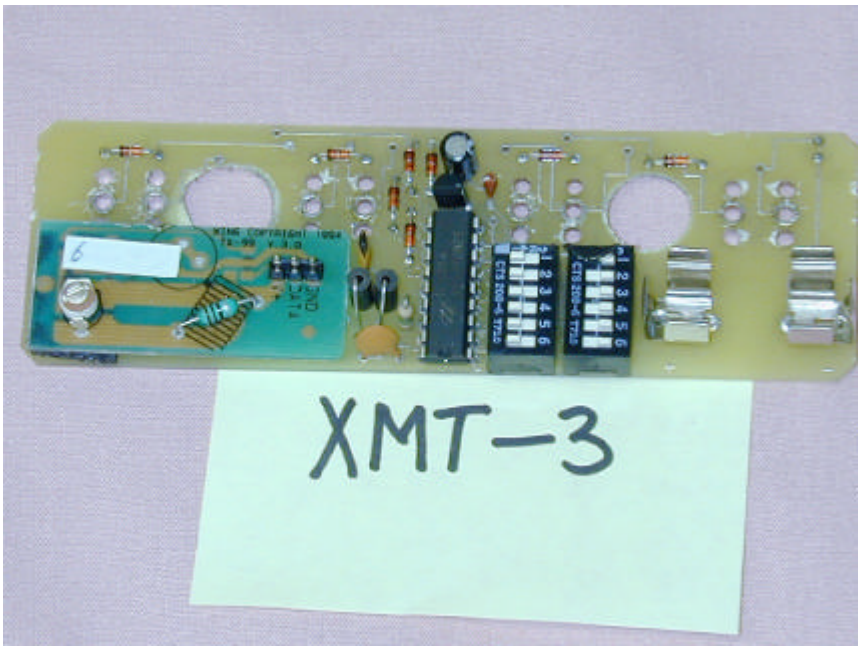
The E.U.T. was tested in three orthogonal axis.

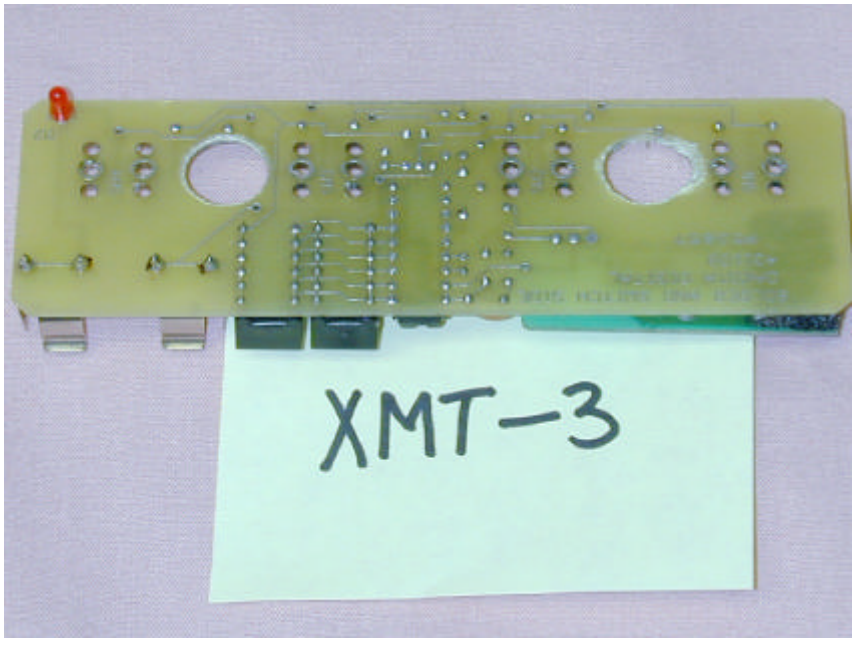
E.U.T. Photographs:



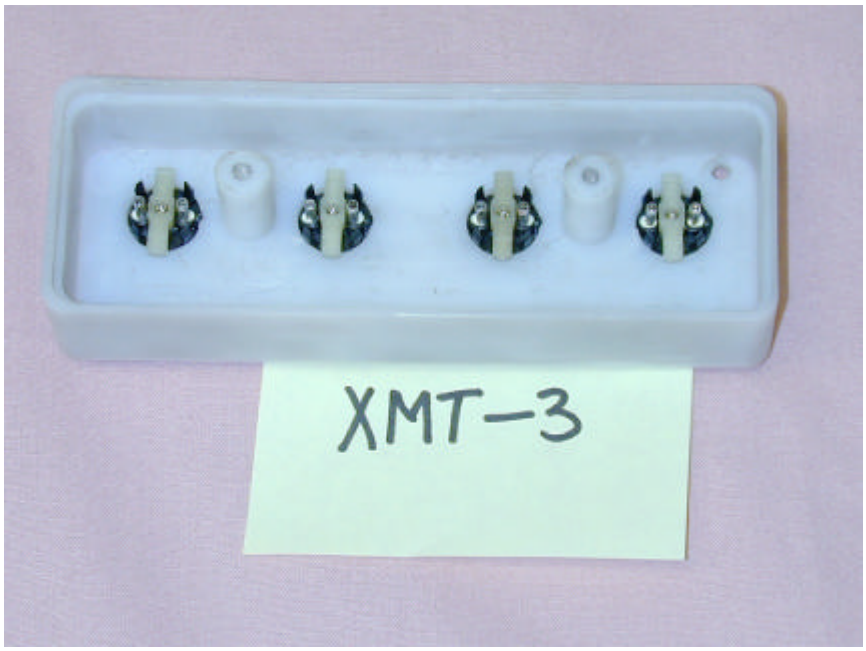


E.U.T. Photographs (Continued):





E.U.T. Photographs (Continued):



Section 4. Transmission Requirements

NAME OF TEST: Transmission Requirements	PARA. NO.: 15.231(a)
TESTED BY: David Light	DATE: 01/25/00

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.

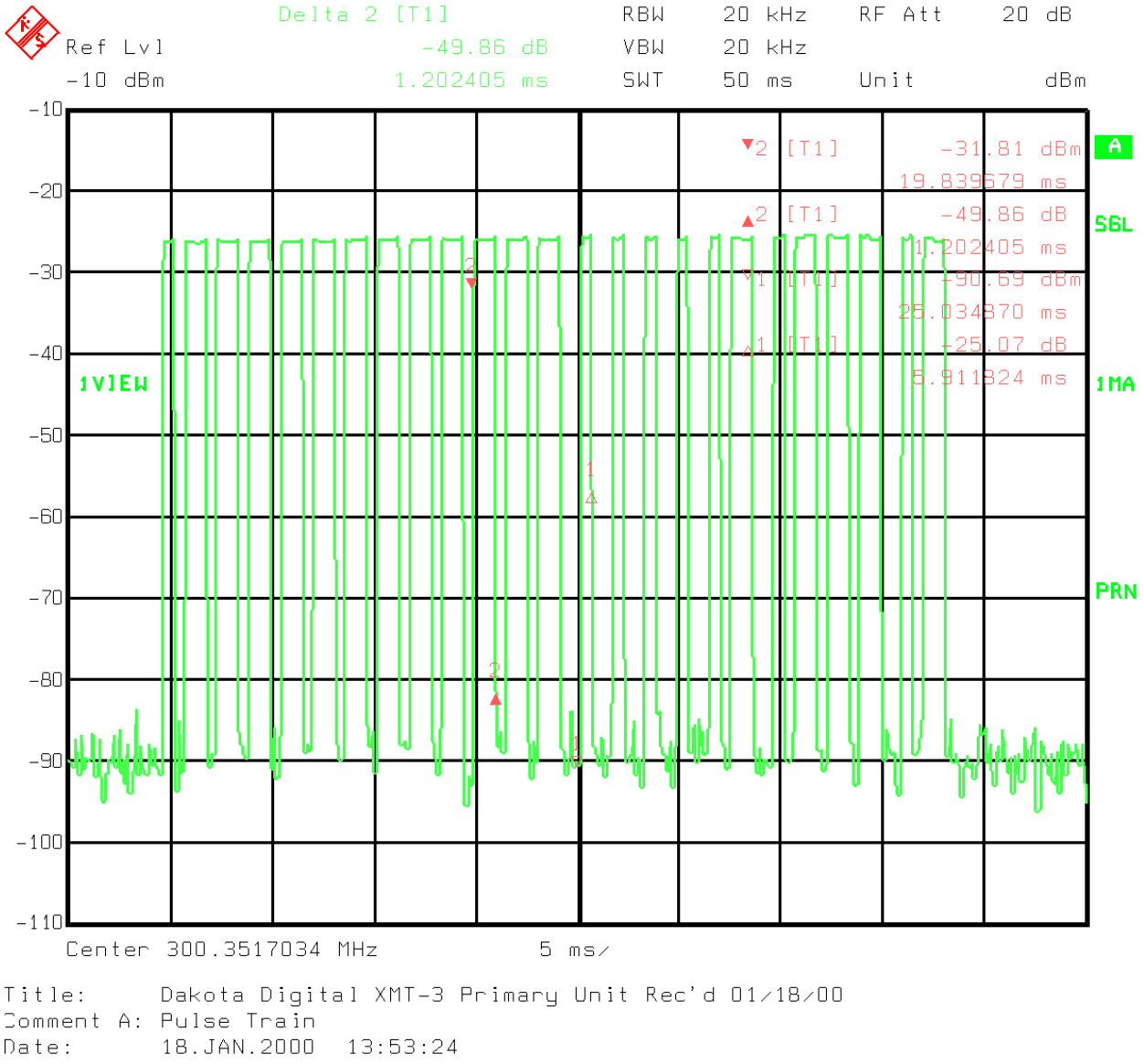
Rationale for Compliance with Transmission Requirements

15.231(a)(1) : Unit ceases transmission 206 µseconds after button is released. See graph #3

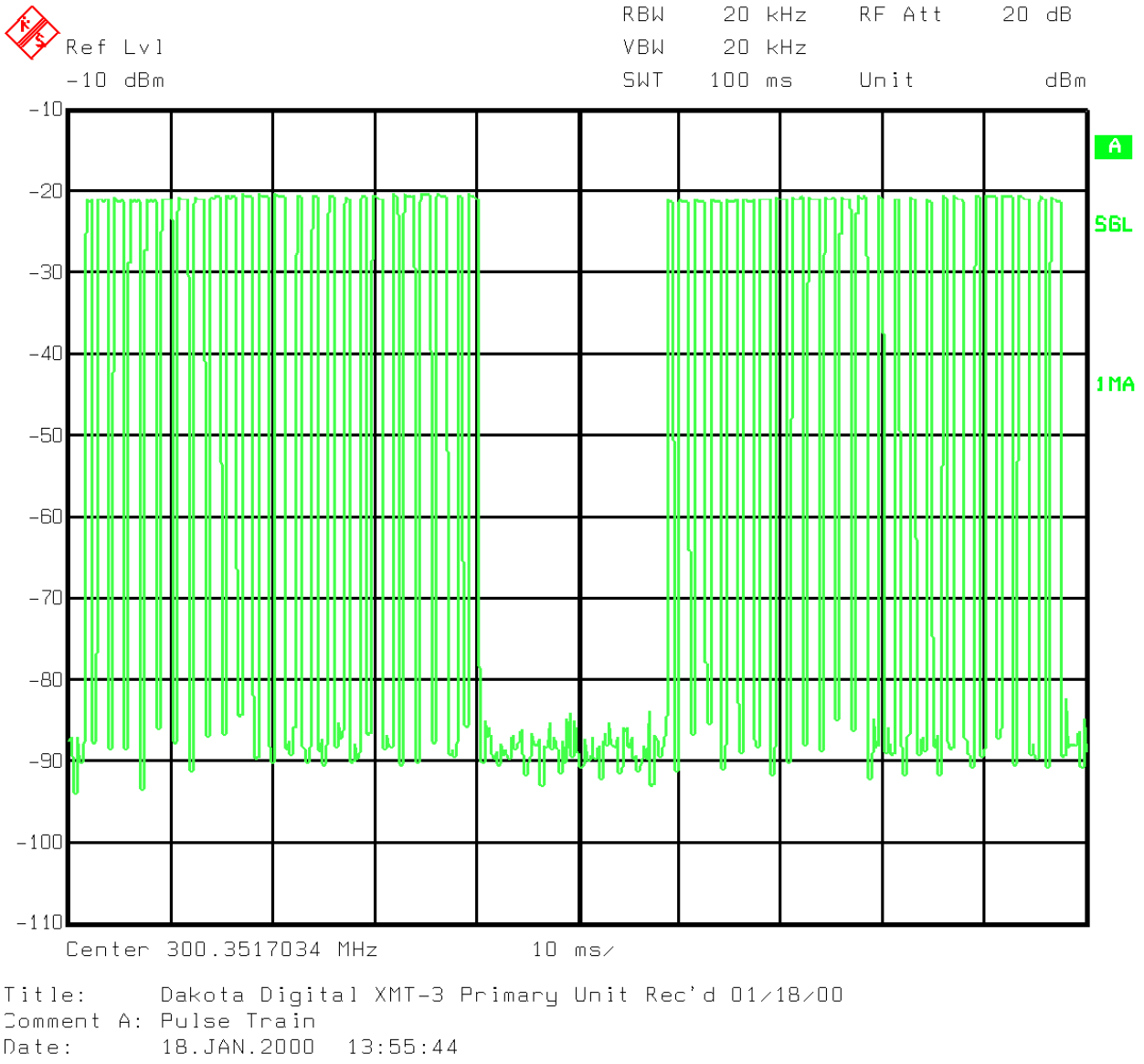
15.231(a)(2) : Unit is activated manually

15.231(a)(3) : Unit does not transmit at regular, predetermined intervals

15.231(a)(4) : N/A

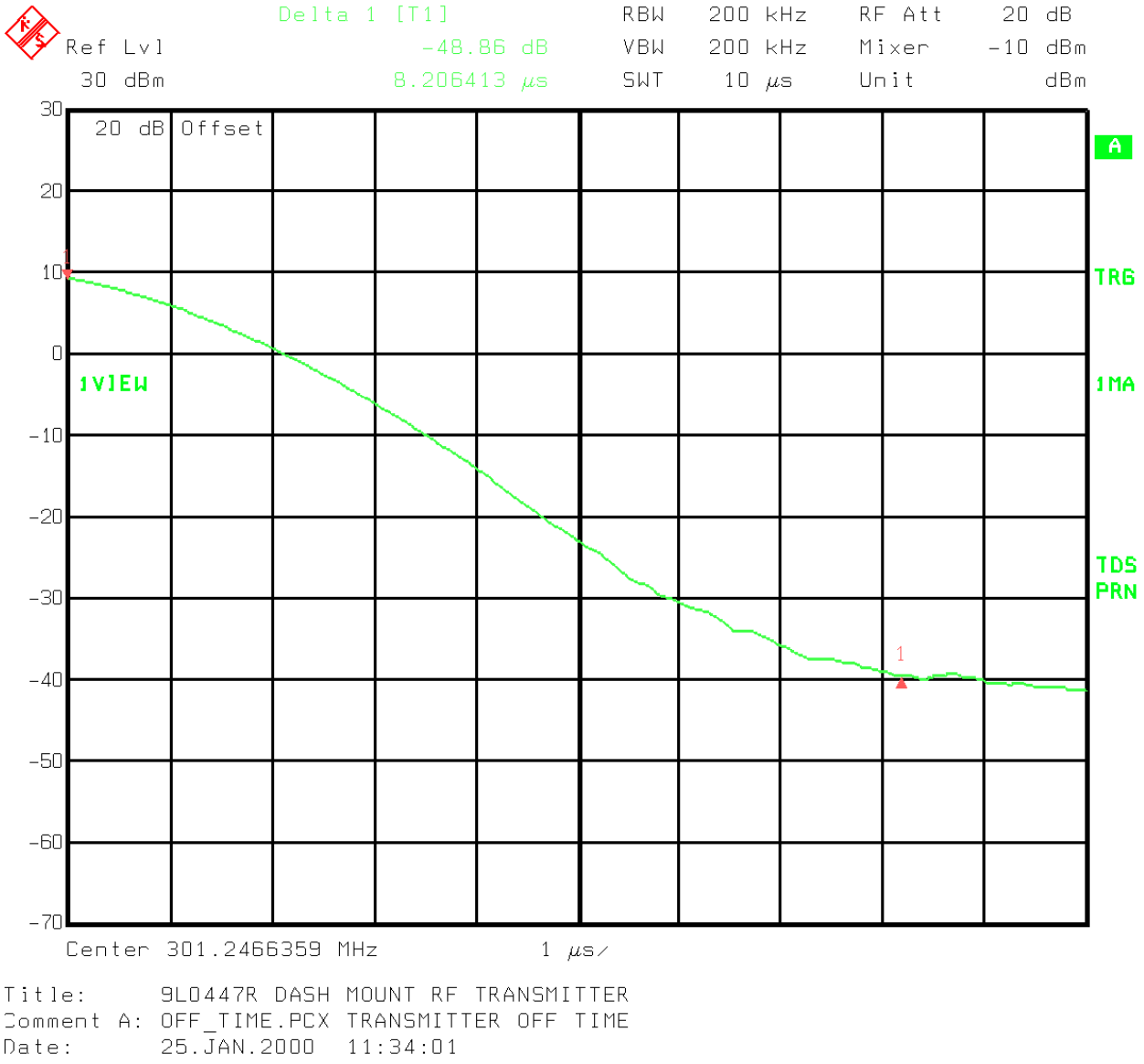


Graph 1 - One transmitted pulse train



Graph 2 - Worst-case 100 msec. transmission period

TIME FROM BUTTON RELEASE OR AUTOMATIC DE-ACTIVATION TO RF OFF



Graph 3 - Transmit release time

Section 5. Radiated Emissions

NAME OF TEST: Radiated Emissions	PARA. NO.: 15.231(b)
TESTED BY: David Light	DATE: 01/19/00

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 (microvolts/m) = (56.82 x F) - 6136*
** Linear interpolation with frequency F in MHz*	*For 260 - 470 MHz: FS (microvolts/m) = (41.67 x F) - 7083*

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

Frequency (MHz)	Field Strength (mV/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 71.7 dBµV/m @ 3m at 300 MHz. This is 3 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.

Test Data - Radiated Emissions

Microwave Radiated Emissions Data

Complete X Preliminary ___ Page 1 of 1

Client: Dakota Digital Test #: RE-4 W.O.#: 9L0447R

EUT: XMT-3 S/N: None Photo ID: 9L0447R

Technician: D. Light Specification: CFR 47, Part 15.231 Lab: AOATS Date: 01/19/00

Equipment Used: G2032-G2017-G2624-CABLE 1A-G2207-G1714

Configuration: Continuous transmit

Bandwidth: 100 kHz Video Bandwidth: 100 kHz Antenna Distance 3 m Detector:

Climatic Conditions:
Temperature: 18 C
Relative Humidity: 50 %
Atmospheric Pressure: 999 mbar

EUT Power: ___ 115 V.A.C. ___ 60 Hz ___ Peak ***See Note**
___ 208 V.A.C. ___ 50 Hz X Average
___ 230 V.A.C.
X Other 12 VDC ___ 1 Phase ___ 3 Phase

Freq. (MHz)	Meter Reading (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV/m)	Average Conv.	Spec. Limit dBuV/m	Pol.	Comments:
40	36	12.4	1.4	24.6	25.2	19.57	54.7	V	NF=Noise Floor
150	30	12.3	3.4	24.4	21.3	15.67	43.5	V	NF
250	28	15.7	4.6	24.1	24.2	18.57	46	V	NF
40	36	12.4	1.4	24.6	25.2	19.57	54.7	H	NF
150	30	12.3	3.4	24.4	21.3	15.67	43.5	H	NF
250	28	15.7	4.6	24.1	24.2	18.57	46	H	NF
300.815	41.2	20.4	4.7	0	66.3	60.67	74.74	V	Fundamental
601.65	51.3	19.9	7.1	24.1	54.2	48.57	54.7	V	
902.43	34.8	22.3	8.9	24.3	41.7	36.07	54.7	V	
300.815	52.2	20.4	4.7	0	77.3	71.67	74.74	H	Fundamental
601.65	52	19.9	7.1	24.1	54.9	49.27	54.7	H	
902.43	44.5	22.3	8.9	24.3	51.4	45.77	54.7	H	
									Scanned 30-1000 MHz
	***Note** - 5.63 dB was subtracted from the peak reading to convert to an								
	AVERAGE reading based upon the duty cycle of the waveform. Please								
	refer to data provide in report								

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Radiated Photographs (Worst Case Configuration)

FRONT VIEW

REAR VIEW

Test Data -Microwave Radiated Emissions

Microwave Radiated Emissions Data

Complete X Preliminary ___ Page 1 of 1

Client: Dakota Digital Test #: REMW-2 W.O.#: 9L0447R

EUT: XMT-3 S/N: None Photo ID 9L0447R

Technician: D. Light Specification: CFR 47, Part 15.231 Lab: AC1 Date: 01/19/00

Equipment Used: 494-G2626-G2200-CF26-CF45-CF30

Configuration: Continuous transmit

Bandwidth: 1 MHz Video Bandwidth: 1 MHz Antenna Distance 3 m Detector:

Climatic Conditions:
Temperature: 22 C
Relative Humidity: 45 %
Atmospheric Pressure: 999 mbar

EUT Power: ___ 115 V.A.C. ___ 60 Hz ___ Peak
___ 208 V.A.C. ___ 50 Hz X Avg. ***See Note**
___ 230 V.A.C.
X Other 12 VDC ___ 1 Phase ___ 3 Phase

Freq. (GHz)	Meter Reading (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV/m)	Average Conv.	Spec. Limit dBuV/m	Pol.	Comments:
1.202	40	22.7	.9	30.4	33.2	27.57	54	V	NF=Noise Floor
1.502	53	24.3	1.63	31.3	47.63	42.00	54	V	
1.802	49.1	28.5	2	32	47.6	41.97	54.7	V	
2.102	52.4	28.5	2	32	50.9	45.27	54.7	V	
2.402	45	29	2.15	31.6	44.55	38.92	54.7	V	NF
2.702	46	29	2.15	32.5	44.65	39.02	54	V	
3.002	40.5	29.7	2.58	32.4	40.38	34.75	54.7	V	NF
1.202	45	22.7	.9	30.4	38.2	32.57	54	H	
1.502	56.3	24.3	1.62	31.3	50.92	45.29	54	H	
1.802	56	28.5	2	32	54.5	48.87	54.7	H	
2.102	54.5	28.5	2	32	53	47.37	54.7	H	
2.402	45	29	2.15	31.6	44.55	38.92	54.7	H	NF
2.702	45	29	2.15	32.5	43.65	38.02	54	H	NF
3.002	40.5	29.7	2.58	32.4	40.38	34.75	54.7	H	NF
									Scanned to the 10th
									Harmonic of the fundamental
	***Note** - 5.63 dB was subtracted from the peak reading to convert to an								
	AVERAGE reading based upon the duty cycle of the waveform. Please								
	refer to data provide in report								

DATACOMMON\FORMS\TESTDATASHEETS\MICRORE REV 030597

Microwave Radiated Photographs (Worst Case Configuration)

FRONT VIEW

REAR VIEW

Section 6. Occupied Bandwidth

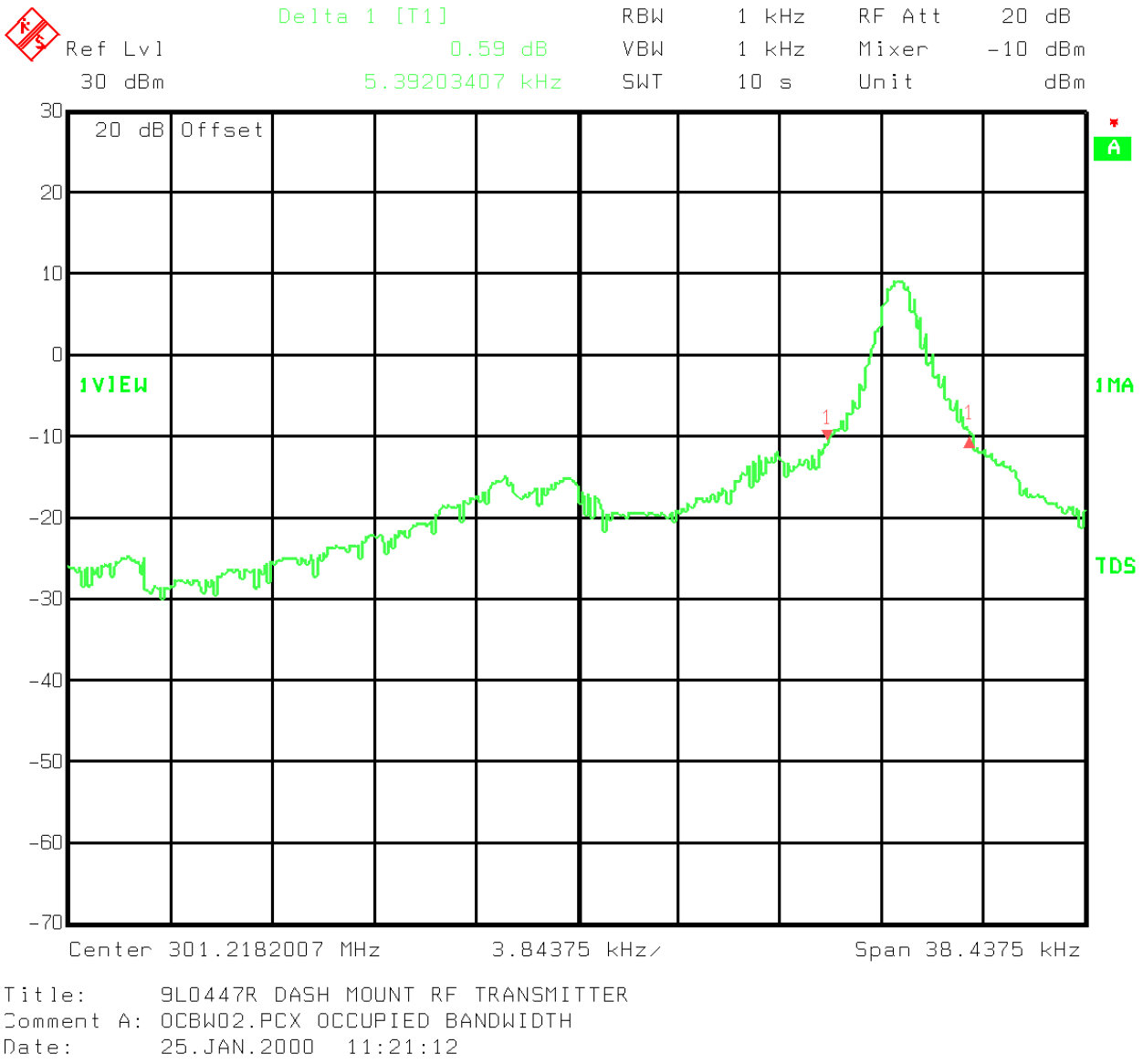
NAME OF TEST: Occupied Bandwidth	PARA. NO.: 15.231(c)
TESTED BY: Ron Gaytan	DATE: 01/25/00

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.

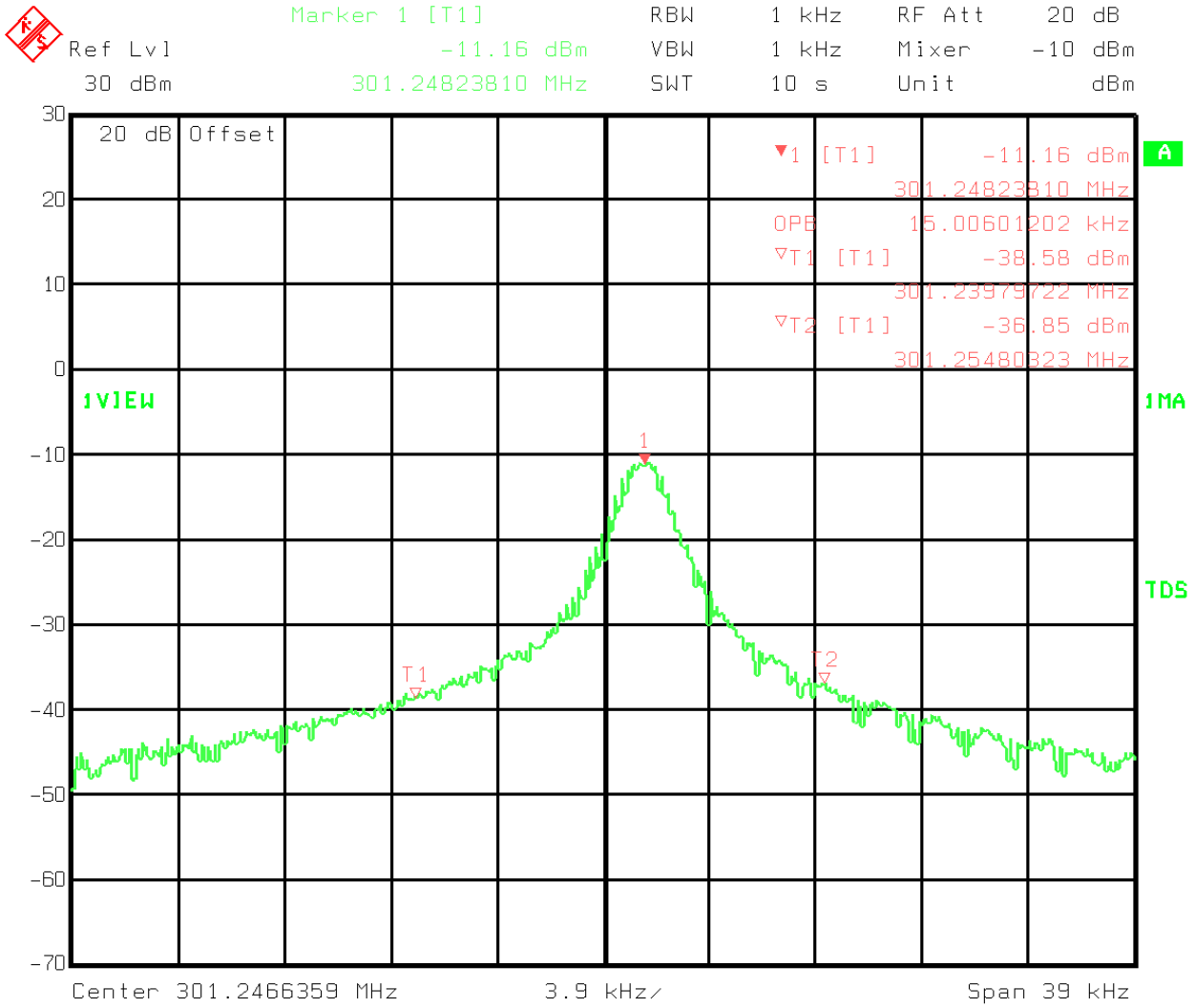
Test Results: Complies. See attached graph.

Test Data: See attached graph.

Limit = 301 MHz x .25% = .7525 MHz
The RBW of the spectrum analyzer was set to the lowest value without reducing the amplitude of the transmitted waveform.



Graph 4 - 20 dB Bandwidth



Graph 5 - 99% Power Occupied Bandwidth

Section 7. Frequency Tolerance
Devices in the Frequency Band 40.66 - 40.77 MHz

NAME OF TEST: Frequency Tolerance	PARA. NO.: 15.231(d)
TESTED BY:	DATE:

Minimum Standard: 15.231(d) For devices operating within 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 ±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.

Not Applicable

Test Results: Complies/Does Not Comply. See attached graph and data.

Test Data: See attached graph.

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.

Not Applicable

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.

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 RF Voltage**	
	mV	**dBmV**
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: (Procedure 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.

Measurement Data:

Conductor	Frequency (MHz)	CISPR (dBµV)	Average (dBµV)	BB/NB	BB Correction (dB)	Result (dBµV)

Not Applicable - Battery Powered

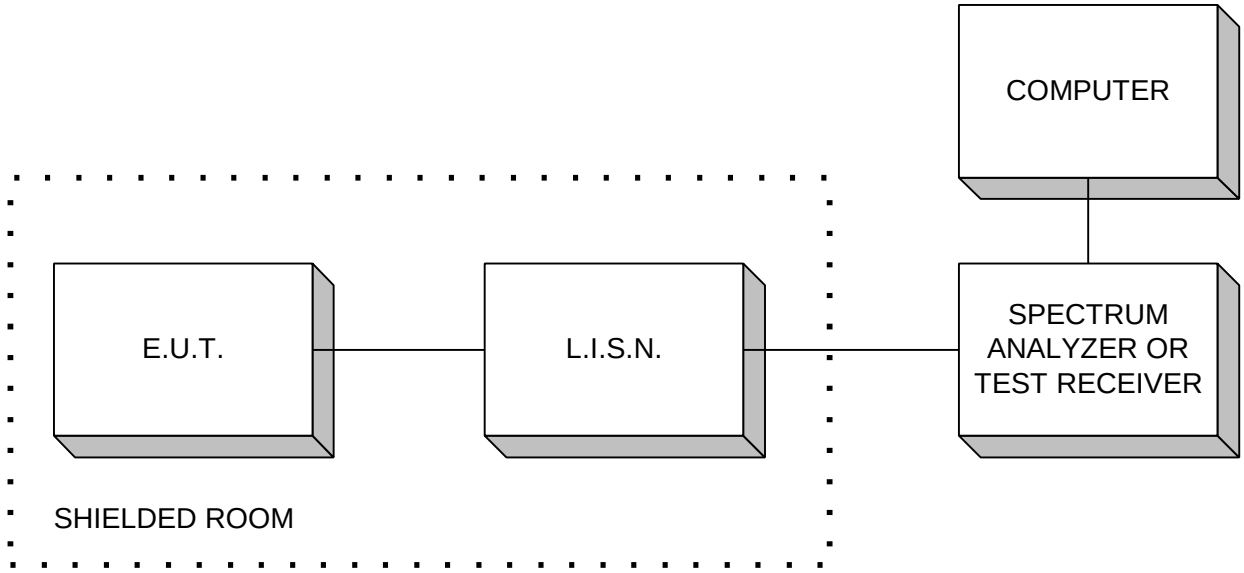
Conducted Photographs (Worst Case Configuration)

SIDE VIEW

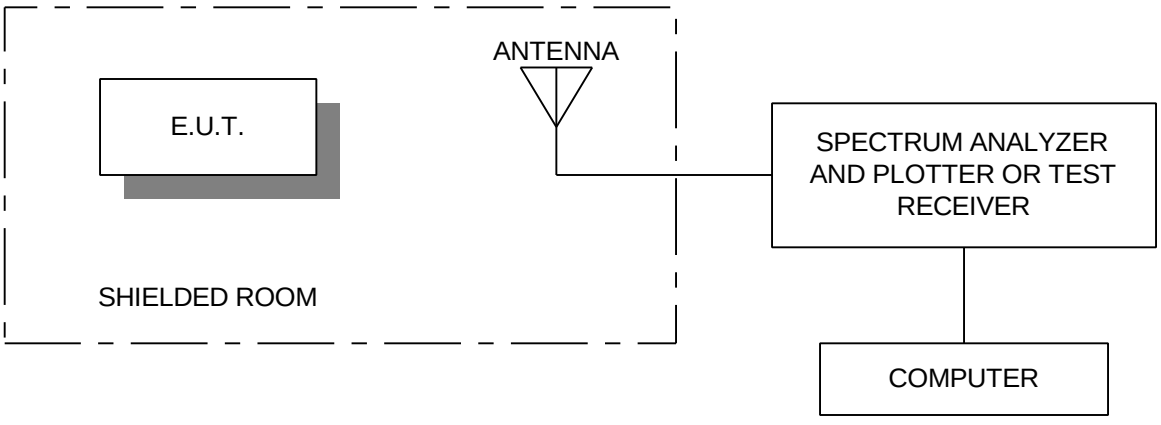
FRONT VIEW

Section 10. Block Diagrams

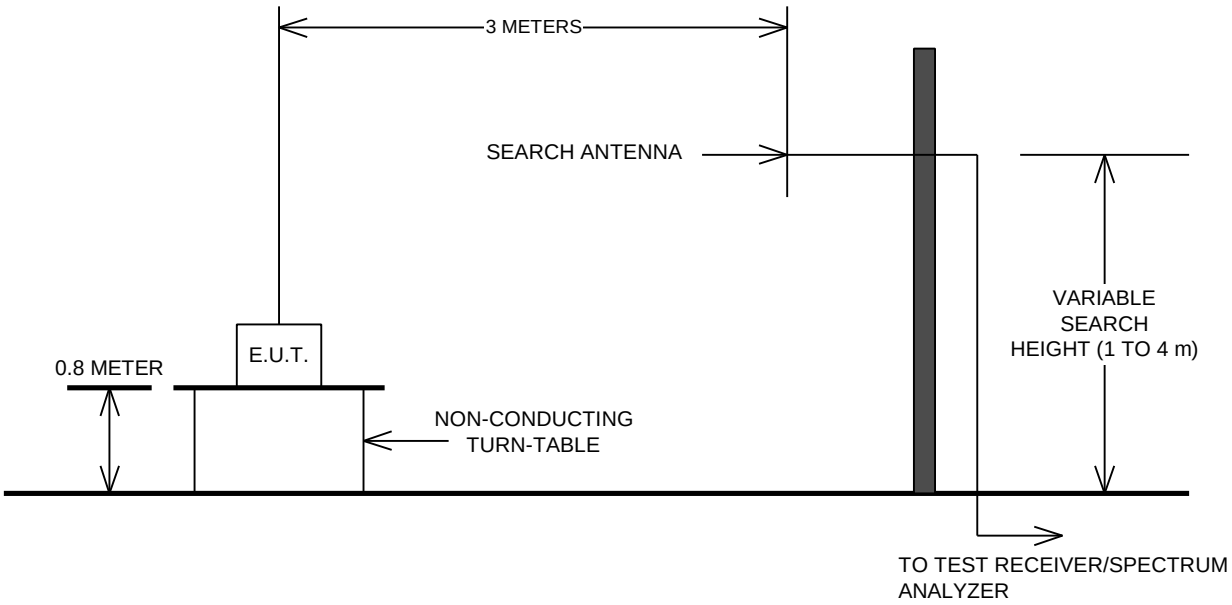
Conducted Emissions



Radiated Prescan

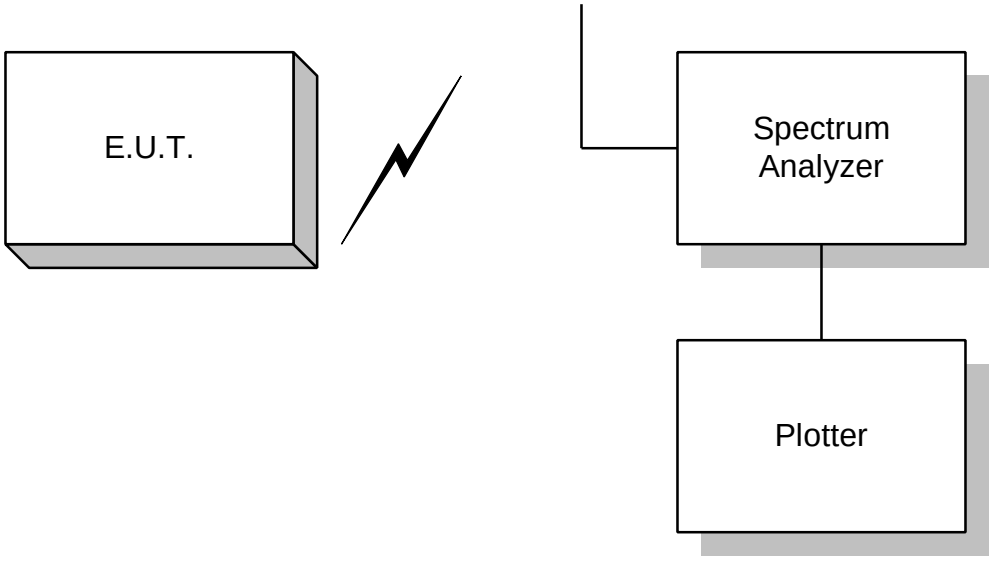


Outdoor Test Site For Radiated Emissions



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

Occupied Bandwidth



Section 11. Test Equipment List

KTL ID	Description	Manufacturer Model Number	Serial Number	Calibration Date
1A	CABLE	KTL Site A OATS	N/A	12/22/99
CF26	CABLE, 1m	KTL Semi-Flex	N/A	01/13/99
CF30	CABLE, 1m	KTL Semi-Flex, Storm	N/A	01/13/99
CF45	CABLE, 4M	STORM PR90-010-144	N/A	10/15/99
494	ANTENNA, HORN	A.H. SYSTEMS SAS-200/571	162	CBU
G1714	TUNABLE NOTCH FILTER	K&L 3TNF-250/500-N/N	81	CBU
G2017	ANTENNA, LOG PERIODIC	A.H. SYSTEMS SAS-200/510	556	01/25/99
G2032	ANTENNA-BICONICAL	ICC BCON-30300	N/A	01/21/99
G2200	AMPLIFIER	HEWLETT PACKARD 8449A	2749A00159	06/11/99
G2207	PREAMP, 25dB	ICC LNA25	398	08/27/99
G2624	SPECTRUM ANALYZER	HP 8563E	3551A04428	11/03/99
G2626	SPECTRUM ANALYZER	HEWLETT PACKARD 8566B	2618A02843	04/21/99
AC1	Anechoic Chamber #1			CNR
AOATS		Site A O.A.T.S. (Open Area Test Site) 10 Meter Site		
	Turntable, 4 foot	RF Consultants (Automated)		CNR
	Antenna Mast, 4 Meter	EMCO Part # 1050 (Automated)		CNR

Calibration interval on all items is typically 12 months from the calibration date shown. Where relevant, measuring equipment is subjected to in-service checks between testing.

LEGEND:

CNR Calibration not required N/A Not Applicable CBU Calibrated before use

ANNEX A – ADDITIONAL INFORMATION

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			