Certelecom Laboratories Inc.
Safety - EMI - Telecom - ISO Guide 25

ENGINEERING TEST REPORT

ON:
THE DETECTIONS SYSTEMS
"EA102A-304 TRANSCEIVER"

FCC ID: ESV-0251-2

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

PROJECT NO.: 7R00514.4

TESTED FOR:

DETECTION SYSTEMS INC.
130 PERINTON PARKWAY
FAIRPOINT, NY 14450-9099
USA

TESTED BY:

CERTELECOM LABORATORIES INC.
3325 RIVER ROAD, R.R. 5
OTTAWA, ONTARIO K1V 1H2

NVLAP

NVLAP LAB CODE: 100351-0

APRIL 1998

This document contains 32 pages including this one.

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Section 1. Summary of Test Results

Manufacturer: Detection Systems

Model No.: EA102A-304

Serial No.: Sample 2

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.

Abstract:

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

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.
Frequency Tolerance was not performed - EUT operates at 304 MHz
Periodic Alternate Field Strength Requirements were not performed - Not Applicable
Conducted Emissions were not performed - EUT uses 12 Vdc.

It is recommended that the margin of compliance be improved to allow for manufacturing tolerances.

NVLAP

NVLAP LAB CODE: 100351-0

TESTED BY: _____ DATE: May 4, 98
Wayne Clarke, Technologist

TECHNICAL REVIEW: _____ DATE: 6 May 1998
Tom Tidwell, Senior Technologist

APPROVED BY: _____ DATE: 6th May 1998
W. Waterhouse, RF Engineering Lab Manager

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

General Equipment Information

Model Number: EA102A-304

Serial Number Sample 2

☒ Production Unit ☐ Pre-Production Unit

Frequency Range: 304 MHz

Operating Frequency(ies) of Sample: 304.004 MHz

Type of Emission: L1D

Emission Designator: 79K33L1D

Supply Power Requirement: 12 Vdc

Duty Cycle Calculation:

$$= 20 \text{ Log } \frac{\text{on time ms}}{100 \text{ ms}}$$

Long Pulse Duration = 140 µsec
Short Pulse Duration = 80 µsec

NR Long Pulses 11 x 140 µsec = 1540 µsec
NR Short Pulses 50 x 80 µsec = 4000 µsec
5540µsec
5.54 msec

NR Pulse Trans 2

$$= 20 \text{ Log } \frac{2 \times 5.54 \text{ µsec}}{100 \text{ µsec}}$$

$$20 \text{ Log } \frac{11.08}{100}$$

20 Log .1108

20 x -0.95546

= -19.1 dB

Description of E.U.T.

The E.U.T. is a wall mounted security system transceiver which transmits buddy check packets to ensure system integrity

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.

Theory of Operation

The E.U.T. is a wall mounted security system transceiver which transmits buddy check packets to ensure system integrity.

The E.U.T. was set to constant transmit for test purposes.

The normal mode of operation is to transmit 1 message which is comprised of 8 packets, the off time between each message is at least 1 hour or more.

Justification

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

The following combinations were investigated to establish worst case configuration:

(1) Vertical position simulation wall mounting

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) E.U.T. transmitting ID number.

Section 3. Equipment Configuration

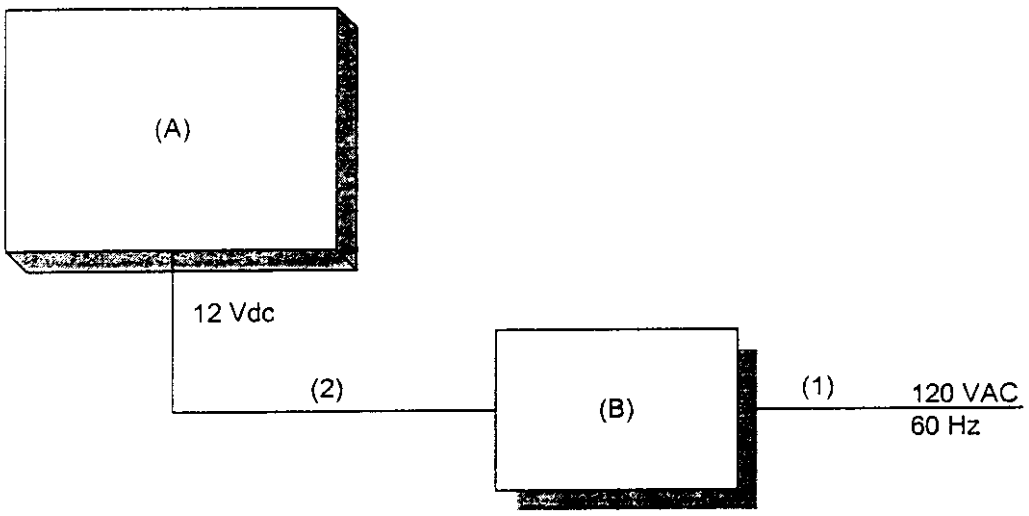
Equipment Configuration List:

Item	Description	Model No.	Serial.	Rev.
(A)	Transmitter	EA102-304	FCC 1	
(B)	Astron Power Supply	VS 50M	CLI 059	

Inter-connection Cables:

Item	Description	Length (m)
(1)	AC Cable	1.8
(2)	2 Cond. 22GA	1.0

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



Section 4. Transmission Requirements

NAME OF TEST: Transmission Requirements	PARA. NO.: 15.231(a)
TESTED BY: Wayne Clarke	DATE: April 4, 1998

Test Conditions:

Test Voltage: 12 Vdc
Temperature: 22°C
Humidity: 20%

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.

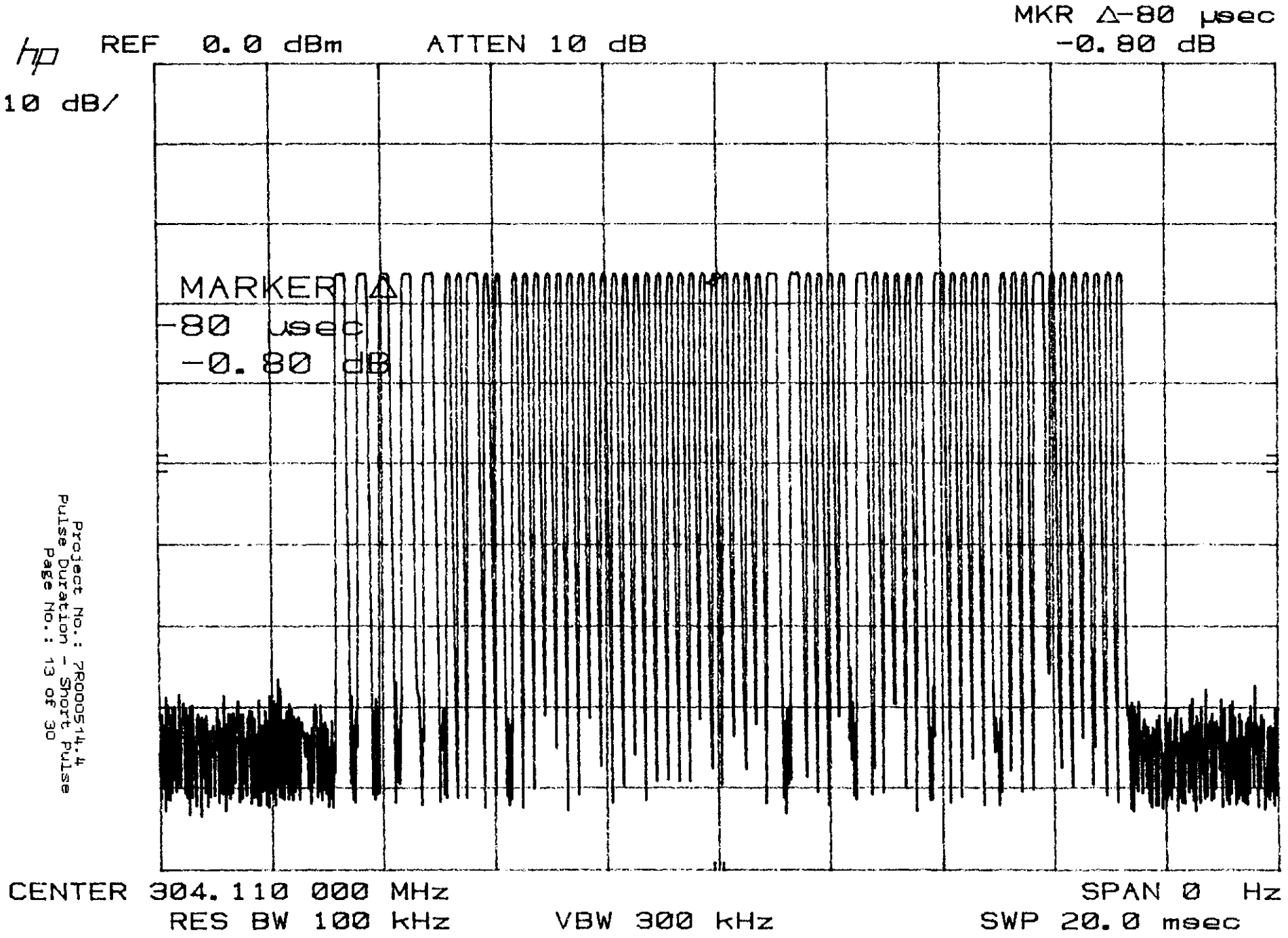
Rationale for Compliance with Transmission Requirements

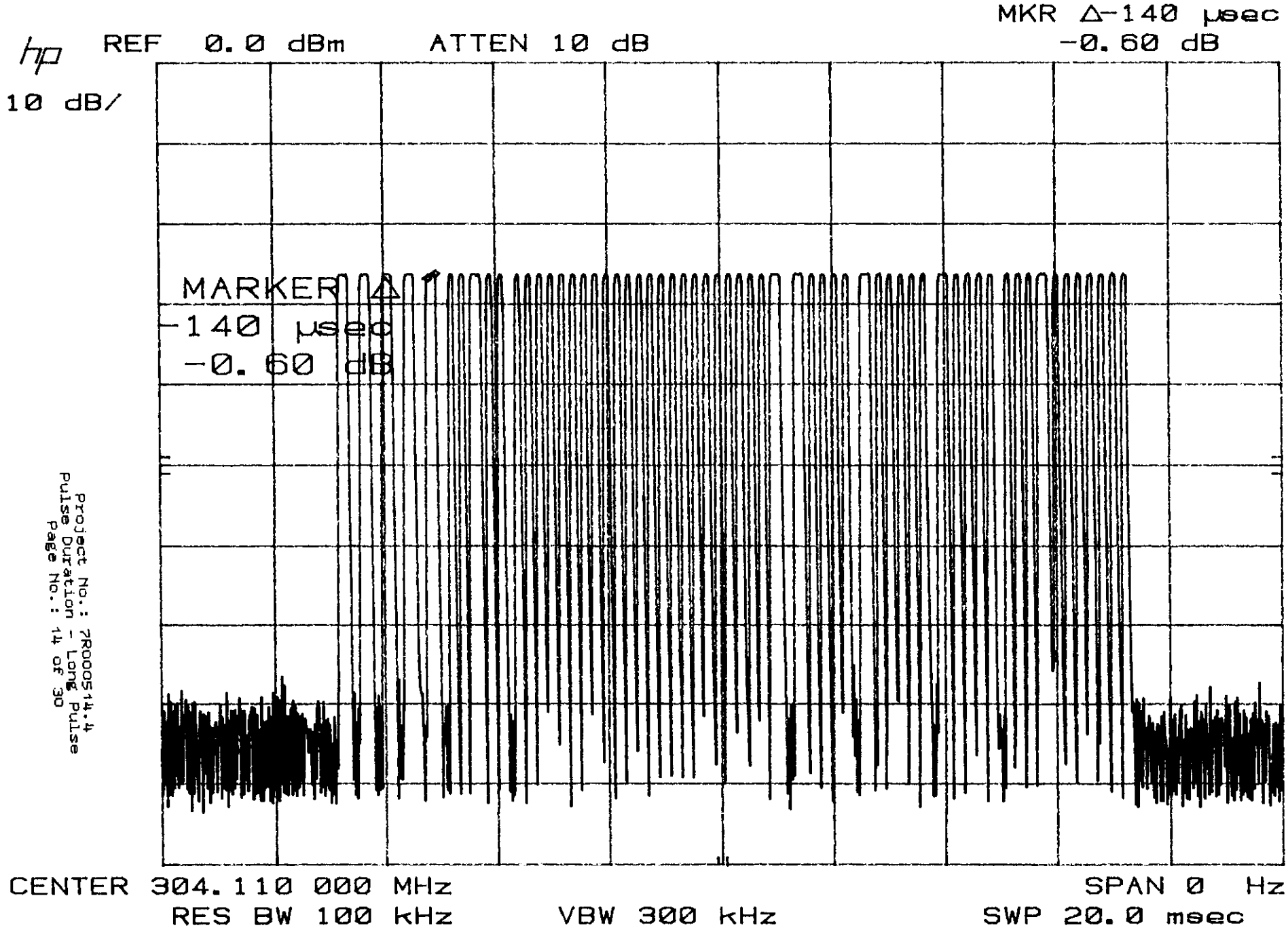
15.231(a)(1) : Complies

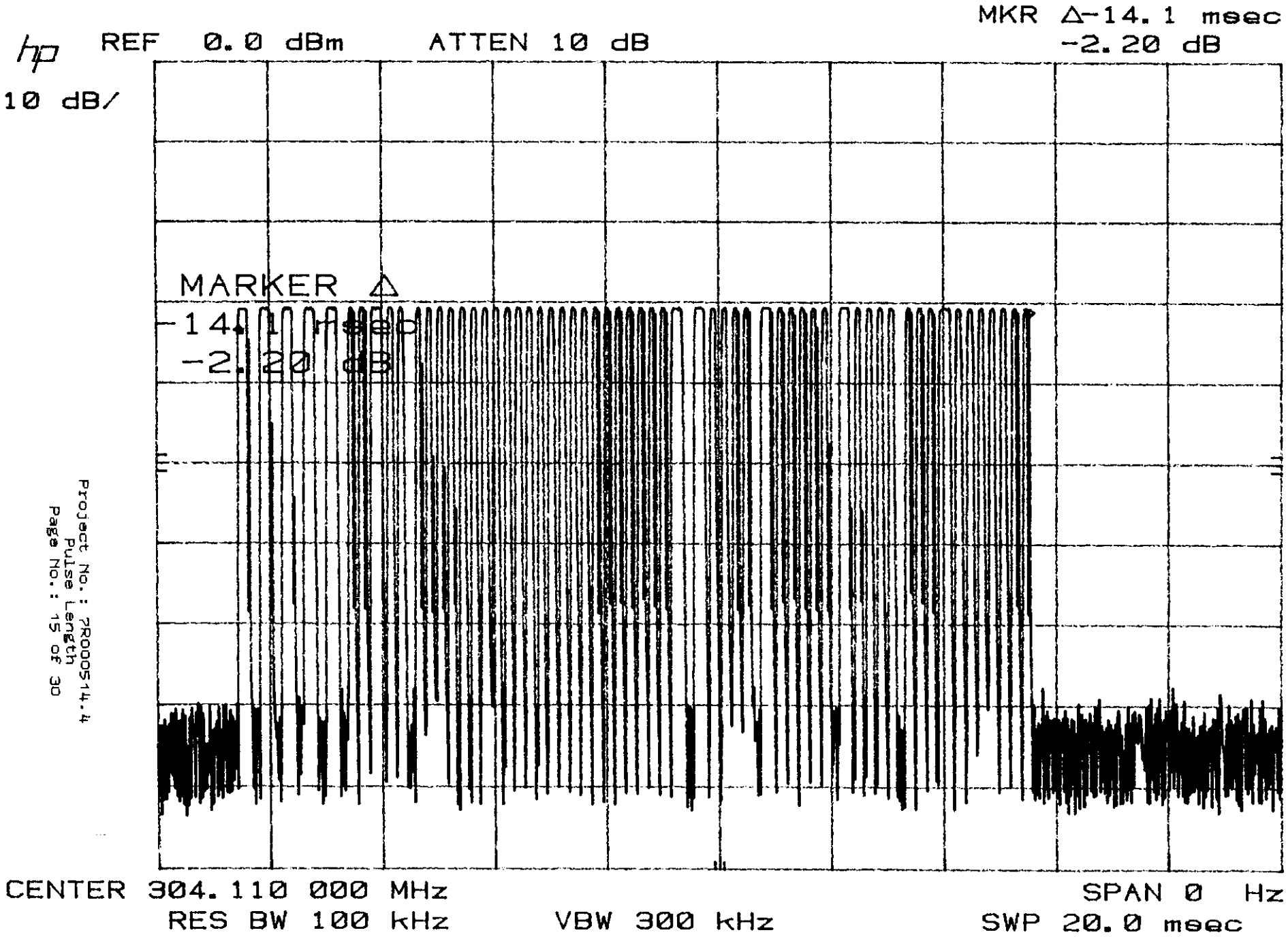
15.231(a)(2) : Not Applicable

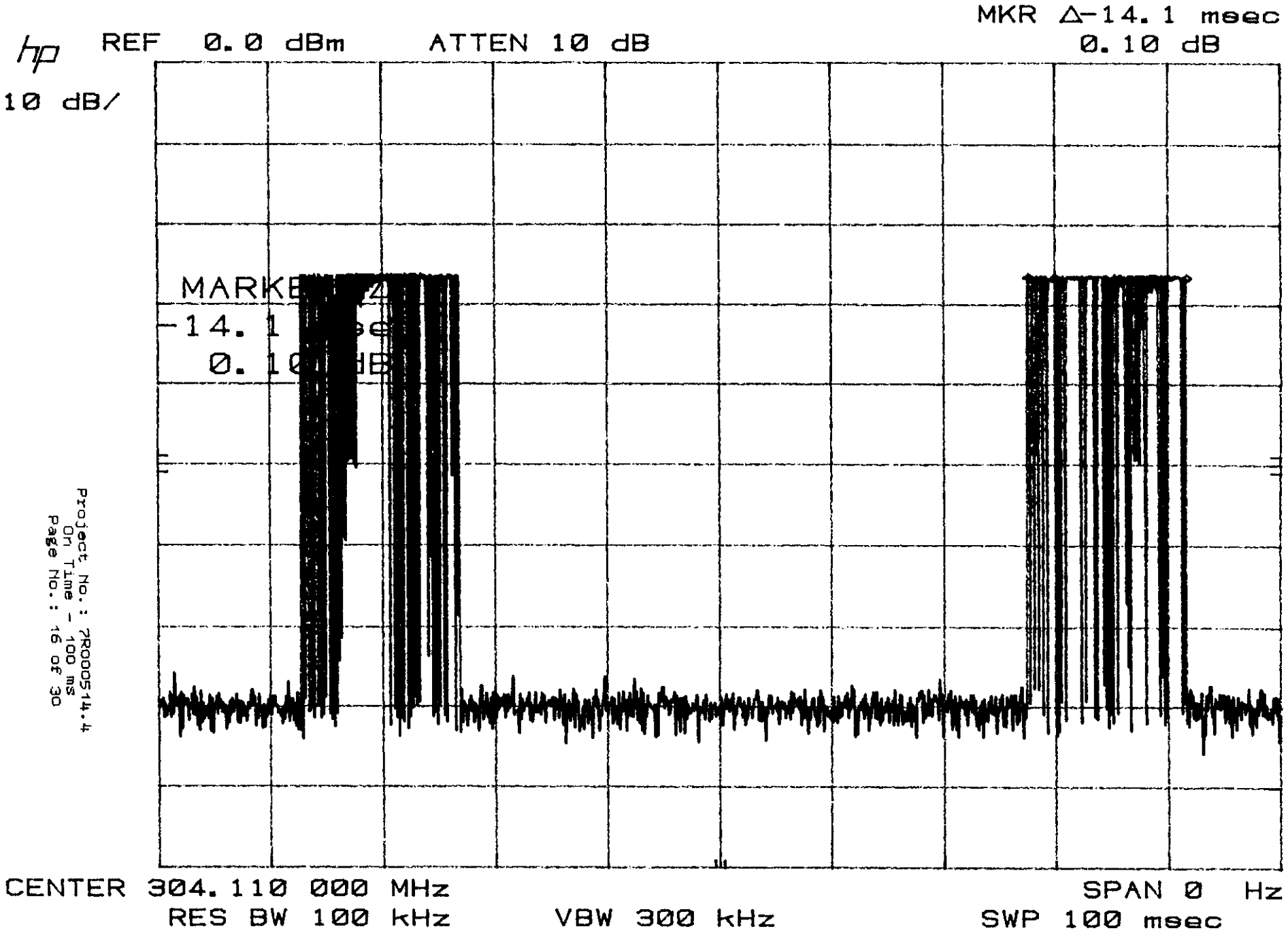
15.231(a)(3) : The off time is at leas 1 hour between the "Buddy Check" messages from the transceiver.

15.231(a)(4) : Not Applicable


MKR Δ-80 µsec
-0.80 dB
REF 0.0 dBm
ATTEN 10 dB
10 dB/
MARKER Δ
-80 µsec
-0.80 dB
Project No.: 7R000514.4
Pulse Duration - Short Pulse
Page No.: 13 of 30
CENTER 304.110 000 MHz
SPAN 0 Hz
RES BW 100 kHz
VBW 300 kHz
SWP 20.0 msec


MKR Δ-140 µsec
REF 0.0 dBm
ATTEN 10 dB
-0.60 dB
10 dB/
MARKER Δ1
-140 µsec
-0.60 dB
Project No.: 7R00014.4
Pulse Duration - Long Pulse
Page No.: 14 of 30
CENTER 304.110 000 MHz
SPAN 0 Hz
RES BW 100 kHz
VBW 300 kHz
SWP 20.0 msec


MKR Δ-14.1 msec
-2.20 dB
hp REF 0.0 dBm ATTEN 10 dB
10 dB/
MARKER Δ
-14.1 msec
-2.20 dB
Project No.: 7R0005I4.4
Pulse Length
Page No.: 15 of 30
CENTER 304.110 000 MHz
SPAN 0 Hz
RES BW 100 kHz
VBW 300 kHz
SWP 20.0 msec


MKR Δ-14.1 msec
0.10 dB
REF 0.0 dBm
ATTEN 10 dB
10 dB/
MARKE
-14.1
0.10
Project No.: 7R000514.4
On Time - 100 ms
Page No.: 16 of 30
CENTER 304.110 000 MHz
SPAN 0 Hz
RES BW 100 kHz
VBW 300 kHz
SWP 100 msec

Section 5. Radiated Emissions

NAME OF TEST: Radiated Emissions	PARA. NO.: 15.231(b)
TESTED BY: Wayne Clarke	DATE: April 4, 1998

Test Conditions: Test Voltage: 12 Vdc
Temperature: 22°C
Humidity: 20%

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.
** Linear interpolation with frequency F in MHz*

For 130 - 174 MHz: FS (microvolts/m) = (56.82 x F) - 6136
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 (μV/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 43.1 dBμV/m @ 3m at 314.71 MHz. This is 2.9 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

Test Distance (meters) : 3		Range: A Tower		Receiver: ESVP/014		RBW(kHz): 120		Detector: PEAK			
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)
303.93		V			51.9	20.9		-19.1	53.7	74.9	21.2
303.93		H			66.0	20.9		-19.1	67.8	74.9	7.1
314.71		V			15.4	21.4			36.8	46.0	3.8
314.71		H			21.7	21.4			43.1	46.0	2.9
607.89		V			19.3	30.6		-19.1	30.8	54.9	24.1
607.89		H			20.6	30.6		-19.1	32.1	54.9	22.8
911.83		V			13.6	34.5		-19.1	29.0	54.9	25.9
911.83		H			8.8	34.5		-19.1	24.2	54.9	30.7
+		V									

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.
\+ EUT was searched to the 10th harmonic.

Section 6. Occupied Bandwidth

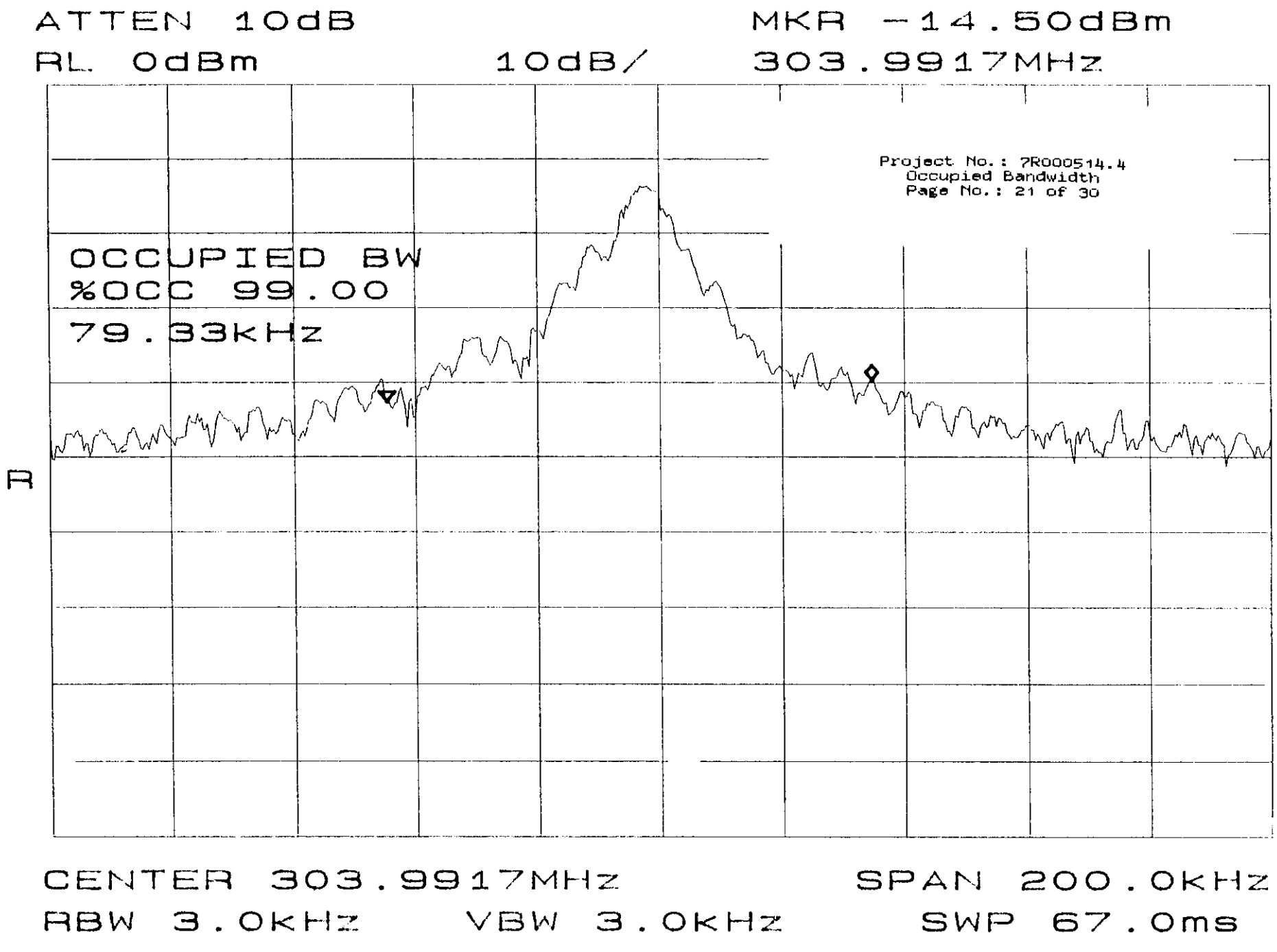
NAME OF TEST: Occupied Bandwidth	PARA. NO.: 15.231(c)
TESTED BY: Wayne Clarke	DATE: April 4, 1998

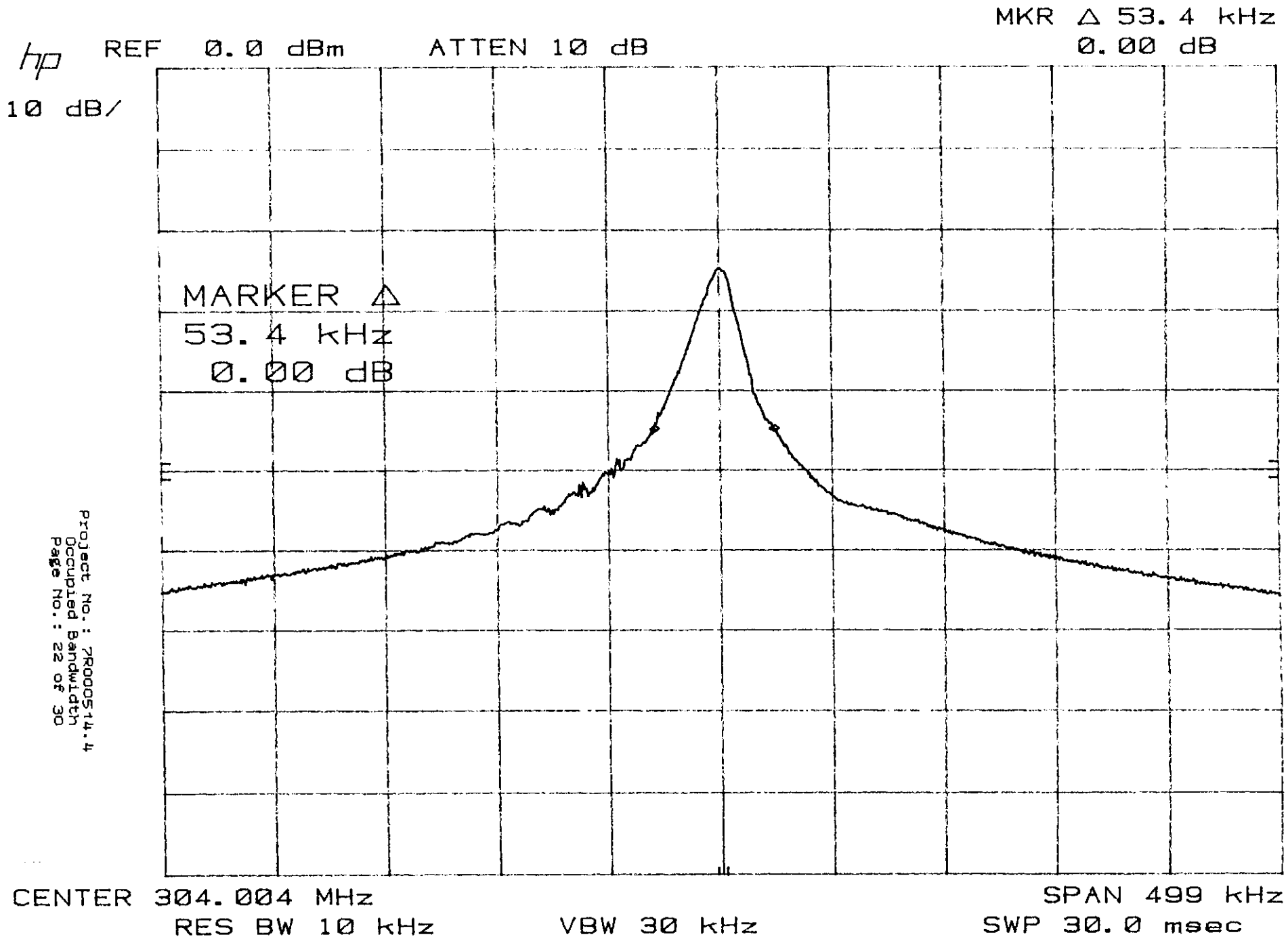
Test Conditions: Test Voltage: 12 Vdc
Temperature: 22°C
Humidity: 20%

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.


ATTEN 10dB
MKR -14.50dBm
RL 0dBm
10dB/
303.9917MHz
Project No.: 7R000514.4
Occupied Bandwidth
Page No.: 21 of 30
OCCUPIED BW
%OCC 99.00
79.33kHz
R
CENTER 303.9917MHz
SPAN 200.0kHz
RBW 3.0kHz
VBW 3.0kHz
SWP 67.0ms


MKR Δ 53.4 kHz
0.00 dB
REF 0.0 dBm
ATTEN 10 dB
10 dB/
MARKER Δ
53.4 kHz
0.00 dB
Project No.: 7R00054.4
Occupied Bandwidth
Page No.: 22 of 30
CENTER 304.004 MHz
SPAN 499 kHz
RES BW 10 kHz
VBW 30 kHz
SWP 30.0 msec

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:

Test Conditions:

Test Voltage: _____VAC
Temperature: _____°C
Humidity: _____%

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 from -30 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(d)
TESTED BY:	DATE:

Test Conditions:

Test Voltage: _____VAC
Temperature: _____°C
Humidity: _____%

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:

Test Conditions:

Test Voltage: _____VAC
Temperature: _____°C
Humidity: _____%

Minimum Standard:

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

NOT APPLICABLE

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.

Measurement Data:

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

NOT APPLICABLE

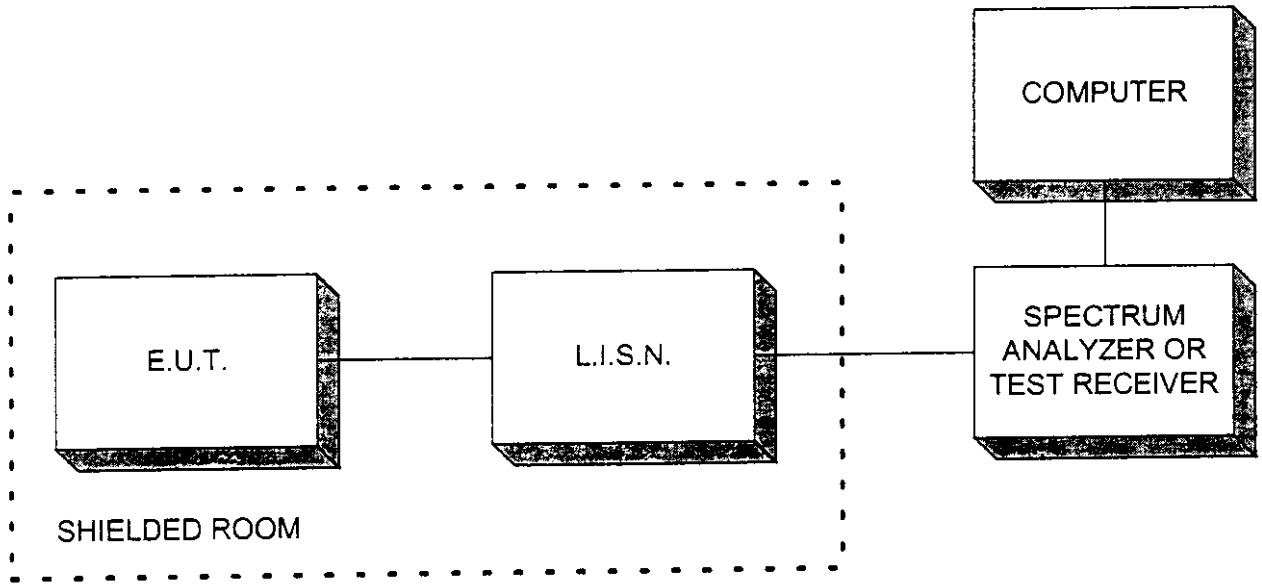
Conducted Photographs (Worst Case Configuration)

SIDE VIEW

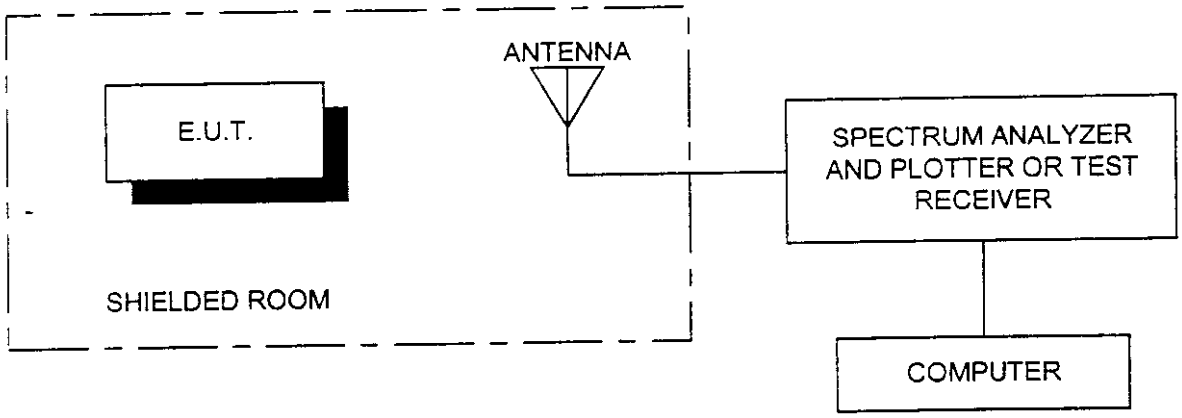
FRONT VIEW

Section 10. Block Diagrams

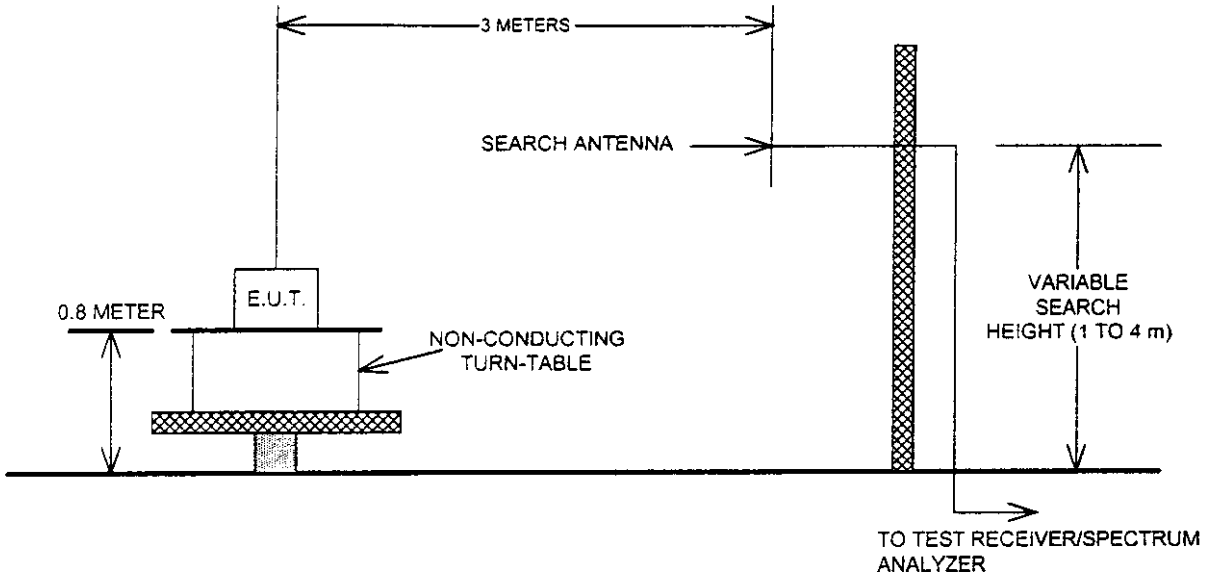
Conducted Emissions



Radiated Prescan

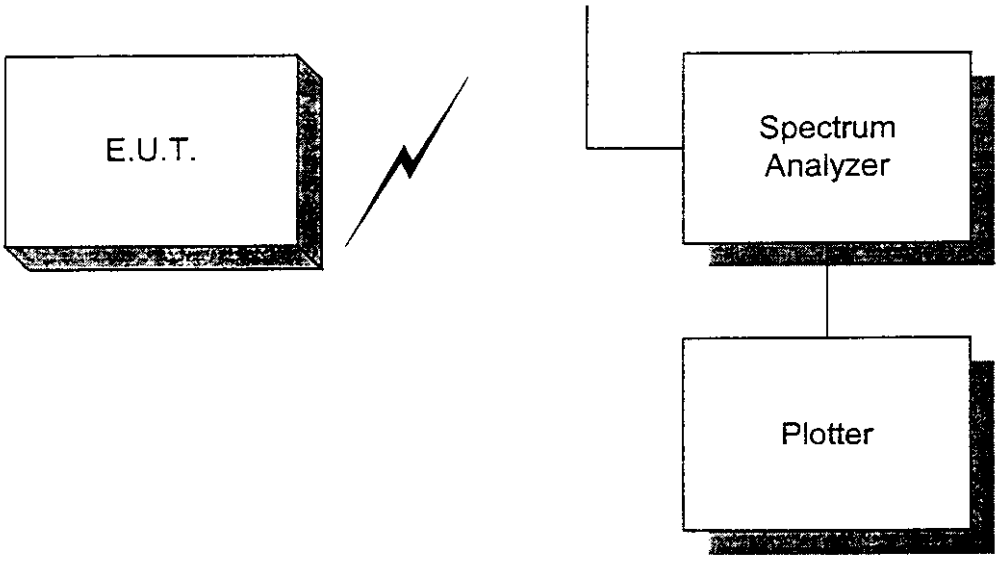


Outdoor Test Site For Radiated Emissions



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

Occupied Bandwidth



Section 11. Test Equipment List

Equipment List - Radiated Emissions

CAL Cycle	Equipment	Manufacturer	Model #	Serial/Asset #	Last Cal.	Next Cal.
	Biconilog Antenna	EMCO	3143	9404-1039	NCR	NCR
1Year	Dipole Antenna Set	EMCO	3121C	1029	Oct. 28/97	Oct. 28/98
1Year	Receiver	Rohde & Schwarz	ESVP	892661/014	Mar. 31/98	Mar. 31/99
1Year	Spectrum Analyzer	Hewlett-Packard	8566B	2311A02238	Sept. 30/97	Sept. 30/98
1Year	Spectrum Analyzer Display	Hewlett-Packard	8566B	2314A04759	Sept. 30/97	Sept. 30/98
1Year	Quasi-Peak Adapter	Hewlett Packard	85650A	2043A00302	Sept. 30/97	Sept.30/98
	Plotter	Hewlett Packard	7470A	2210A08836	N/A	N/A
2 Year	Horn Antenna	EMCO	3115	4336	Oct. 30/97	Oct. 30/99
1 Year	Low Noise Amplifier	Avantek	AWT-8035	1005	Oct. 24/97	Oct. 24/98

Note: N/A = Not Applicable
NCR = No Cal Required

ANNEX A

RESTRICTED BANDS

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			