NVLAP
Accredited Since 1993

QUALIFICATION TEST REPORT

[X] EMISSIONS -FCC Part 15

Test Report Number: FPT 9810 0601
Model No: Locator

Date of Issue: 23 October 1998
Date of Test Article Receipt: 6 October 1998

Type of product: Intentional Radiator

Manufacturer: Fisher-Price, Inc.

Address: 636 Girard Avenue, East Aurora, New York 14052-1885

Test Results: [X] Complies [ ] Does Not Comply

Barry Wallen — Lab Director (NVLAP Signatory)

Michael E. Mussler — Compliance Engineer

Accredited by NIST NVLAP for FCC Part 15

Section 1 Executive Summary 5

Section 2 Emissions Test Standards 7
Part 2.1 FCC Part 15 Subpart B - Conducted Emissions 7
Part 2.2 FCC Part 15 Subpart B –Radiated Emissions 7
Part 2.3 FCC Part 15 Subpart C –Intentional Radiated Fields 9

Section 3 Test Setup Photographs 11
Part 3.1 Radiated Emissions Setup - Front View 11
Part 3.2 Radiated Emissions Setup - Rear View 12

Section 4 ORIGINAL TEST DATA / PLOTS 13
Part 4.1 Radiated Emissions - Plot 13
Part 4.2 Radiated Emissions - Tabular Data 14
4.3 Pulse Characteristics of the Locator Units 16

Section 5 Product Information 23
5.1 EUT Description and Block Diagram 23
5.2 EUT Diagram as Tested 25

Section 1 Executive Summary

The test article was in compliance with all the test standards listed below.

FCC Part 15 Subpart A	**General**
FCC Part 15 Subpart B	**Conducted & Radiated Emissions**
FCC Part 15 Subpart C	**Intentional Radiators**

All test methods were performed in accordance with the standards listed above.

Section 2 Emissions Test Standards

The emissions tests were performed according to following standards:

FCC Part 15, Subpart B [ ] Class A [X] Class B
FCC Part 15, Subpart C, Paragraph 15.209

Part 2.1 FCC Part 15 Subpart B - Conducted Emissions

Measurement of *conducted emissions* was not performed as the EUT was battery operated.

Part 2.2 FCC Part 15 Subpart B –Radiated Emissions

Measurement or *radiated emissions (electric* field) in the frequency range of 30 MHz-1000 MHz were tested in a horizontal and vertical polarization as indicated below:

Environmental conditions in the lab:

Date(s) of Test:	mm/dd/yy	10/6-8/98 and 10/15/98
Temperature:	79°F	
Rel. Humidity	18%	
Test Voltage	none (Battery operation)	

Test location:
[X] Criterion Technology Open Area Test Site
[X] Pre-Scan In Semi-Anechoic Chamber
[ ] Not applicable

Test distance (antenna - EUT):

[ ]	1 meter	[ ]Preliminary Measurement	[ ]Final Measurement
[X]	3 meters	[X]Preliminary Measurement	[X]Final Measurement
[ ]	10 meters	[ ]Preliminary Measurement	[ ]Final Measurement
[ ]	30 meters	[ ]Preliminary Measurement	[ ]Final Measurement

[ ] Not applicable

Test instruments:		**Calibration Due Date**
[X]	Hewlett Packard Spectrum Analyzer, Model 8566B	12/17/98
[ ]	Hewlett Packard Quasi Peak Adapter, Model 85650A	12/17/98
[ ]	Hewlett Packard Tracking Generator, Model 85645A	12/17/98
[ ]	Rohde and Schwarz Receiver, Model, ESHS-30	8/26/99
[X]	Rohde and Schwarz Model Receiver, ESVS-30	9/1//99
[X]	Chase, BiLog Antenna, Model 1121	5/30/99
[X]	Antenna Research, Model 1181A (sn: 1056)	4/15/99
[X]	Amp3 and High Freq cbl set	9/30/99
[X]	Mini Circuits Pre-Amp, Amp 2	6/2/99
[X]	EMCO Loop Antenna, Model 6502	10/7/99

Test accessories:
[ ] Other
[X] Not applicable

Results

Radiated Emissions (Electric Field) 30 MHz - 10000 MHz (exclusive of the fundamental and harmonics)

The requirements are	[X] PASS	[ ] FAIL	[ ] N/A	
Min. limit margin	-11.33 dB	at	893.1358 MHz	
Max. limit exceeding	dB	at	MHz	

Remarks:

1.) Reference Appendix B for Data Sheets

2.) The lowest internal clock/oscillator frequency used in the device is 4.0 MHz. A pre-scan was done in the Semi-Anechoic Chamber to identify emissions from 4.0 MHz to 30 MHz. None were encountered.

3.) The fundamental frequency of the intentional radiator is 907.3275 MHz. Emissions were examined to the tenth harmonic of the fundamental with the only emissions of note being the 2nd and 3rd harmonics.

Part 2.3 FCC Part 15 Subpart C –Intentional Radiated Fields

Measurement or *radiated emissions (electric* field) in the frequency range of 900 MHz-10000 MHz were tested in a horizontal and vertical polarization as indicated below:

Environmental conditions in the lab:

Date(s) of Test:	mm/dd/yy	10/6/98 through 10/8/98 and 10/15/98
Temperature:	79°F	
Rel. Humidity	18%	
Test Voltage	none (Battery operation)	

Test location:
[ ] Criterion Technology Open Area Test Site
[ ] Pre-Scan In Semi-Anechoic Chamber
[ ] Not applicable

Test distance (antenna - EUT):

[ ]	1 meter	[ ]Preliminary Measurement	[ ]Final Measurement
[X]	3 meters	[X]Preliminary Measurement	[X]Final Measurement
[ ]	10 meters	[ ]Preliminary Measurement	[ ]Final Measurement
[ ]	30 meters	[ ]Preliminary Measurement	[ ]Final Measurement
[ ]	Not applicable		

Test instruments:		**Calibration Due Date**
[X]	Hewlett Packard Spectrum Analyzer, Model 8566B	12/17/98
[ ]	Hewlett Packard Quasi Peak Adapter, Model 85650A	12/17/98
[ ]	Hewlett Packard Tracking Generator, Model 85645A	12/17/98
[ ]	Rohde and Schwarz Receiver, Model, ESHS-30	8/26/99
[X]	Rohde and Schwarz Model Receiver, ESVS-30	9/1//99
[X]	Chase, BiLog Antenna, Model 1121	5/30/99
[X]	Antenna Research, Model 1181A (sn: 1056)	4/15/99
[X]	Amp3 and High Freq cbl set	9/30/99
[X]	Mini Circuits Pre-Amp, Amp 2	6/2/99
[ ]	EMCO Loop Antenna, Model 6502	10/7/99

Test accessories:
[ ] Other
[ ] Not applicable

Results

Radiated Emissions (Electric Field) 30 MHz - 1000 MHz

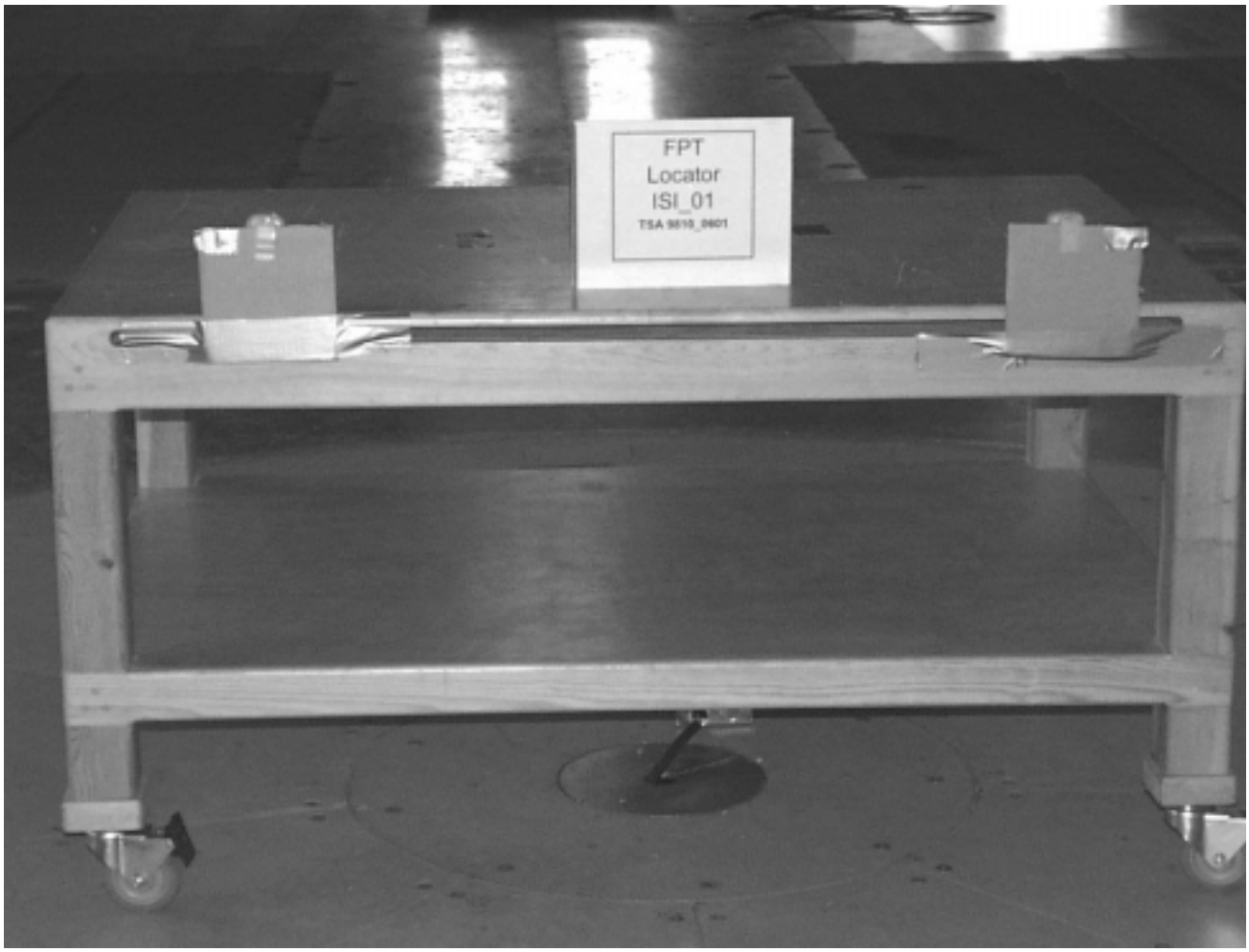
The requirements are 15.209 & 249	[X] PASS	[ ] FAIL	[ ] N/A
Min. limit margin - Fundamental	-5.44 dB	at	907.310 MHz
Min. limit margin - 2nd Harmonic	-4.89 dB	at	1814.600 MHz
Min. limit margin - 3rd Harmonic	-4.68 dB	at	2721.955 MHz
Max. limit exceeding	dB	at	MHz

Remarks: Reference Appendix B for Data Sheets

Section 3 Test Setup Photographs

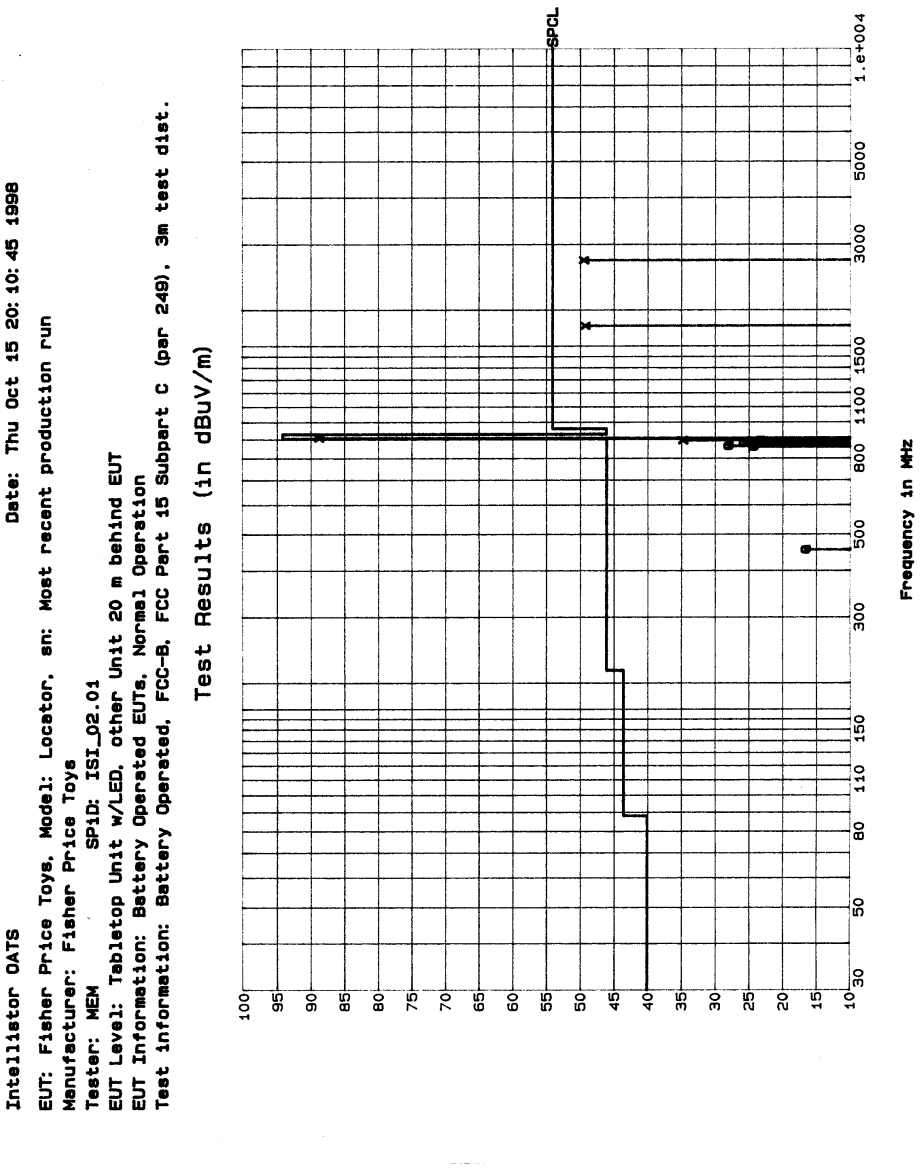
Part 3.1 Radiated Emissions Setup - Front View

Part 3.2 Radiated Emissions Setup - Rear View



Section 4 ORIGINAL TEST DATA / PLOTS

Part 4.1 Radiated Emissions - Plot



Part 4.2 Radiated Emissions - Tabular Data

Criterion Technology OATS Thu Oct 22 09:44:19 1998
EUT: Fisher Price Toys, Model: Locator, sn: Most recent production run
Manufacturer: Fisher Price Toys
Tester: MEM Special ID: ISI_02.01
EUT Level: Tabletop Unit w/LED, other Unit 20 m behind EUT
EUT Information: Battery Operated EUTs, Normal Operation
Test information: Battery Operated, FCC-B, FCC Part 15 Subpart C (par 249), 3m test dist.

Table 1: Scan List, sorted by margin to limit SPCL, -40.0dB filter

Freq, MHz	Value	Sts	SPCL	TT	Hght	Az	Comment
2721.9550	49.32	m	-4.68	26	191	H	3fo
1814.6000	49.11	m	-4.89	122	123	V	2fo
907.3100	88.56	m	-5.44	182	184	H	14.177clk
893.1358	34.67	m	-11.33	182	184	H	14.177clk
862.3130	27.99	q	-18.01	181	151	V	.
878.9759	25.69	q	-20.31	-2	100	V	14.177clk
874.9999	24.54	q	-21.46	181	151	V	14.344clk
858.0767	24.24	q	-21.76	270	151	V	.
893.0497	23.33	q	-22.67	182	184	H	.
453.6650	16.57	q	-29.43	-3	151	H	14.177clk

Table 2: Scan List for SPCL, sorted by Frequency, -40.0dB filter

Freq, MHz	Value	Sts	SPCL	TT	Hght	Az	Comment
453.6650	16.57	q	-29.43	-3	151	H	14.177clk
858.0767	24.24	q	-21.76	270	151	V	.
862.3130	27.99	q	-18.01	181	151	V	.
874.9999	24.54	q	-21.46	181	151	V	14.344clk
878.9759	25.69	q	-20.31	-2	100	V	14.177clk
893.0497	23.33	q	-22.67	182	184	H	.
893.1358	34.67	m	-11.33	182	184	H	14.177clk
907.3100	88.56	m	-5.44	182	184	H	14.177clk
1814.6000	49.11	m	-4.89	122	123	V	2fo
2721.9550	49.32	m	-4.68	26	191	H	3fo

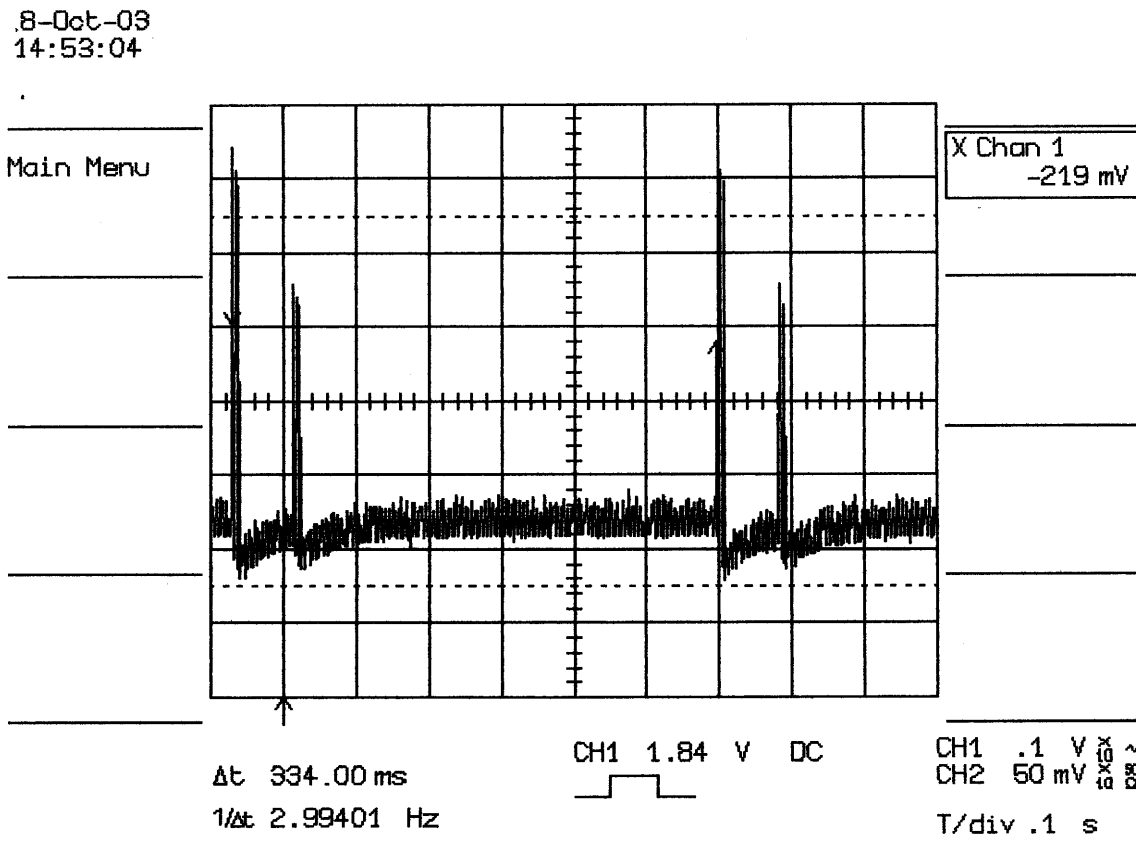
Table 3: Complete Scan List Sorted by Frequency

Freq, MHz	I-val	Final	Sts	TT	Hght	Az	Time	Comment
453.6650	20.63	16.57	q	-3	151	H	Thu Oct 15 18:55:48 1998	14.177clk
836.4448	0.00	-200.00	s	0	0	b	.....	14.177clk
857.5487	0.00	-200.00	s	0	0	b	.....	.
858.0767	22.41	24.24	q	270	151	V	Thu Oct 15 19:20:12 1998	.
862.3130	26.27	27.99	q	181	151	V	Thu Oct 15 19:15:47 1998	.
864.7989	0.00	-200.00	s	0	0	b	.....	14.177clk
874.9999	22.94	24.54	q	181	151	V	Thu Oct 15 19:10:49 1998	14.344clk
878.9759	24.16	25.69	q	-2	100	V	Thu Oct 15 18:40:48 1998	14.177clk
889.3441	0.00	-200.00	s	0	0	b	.....	14.344clk
893.0497	22.00	23.33	q	182	184	H	Thu Oct 15 19:34:06 1998	.
893.1358	33.34	34.67	m	182	184	H	Thu Oct 15 19:32:52 1998	14.177clk
899.1297	0.00	-200.00	s	0	0	b	.....	.
900.3410	0.00	-200.00	s	0	0	b	.....	.

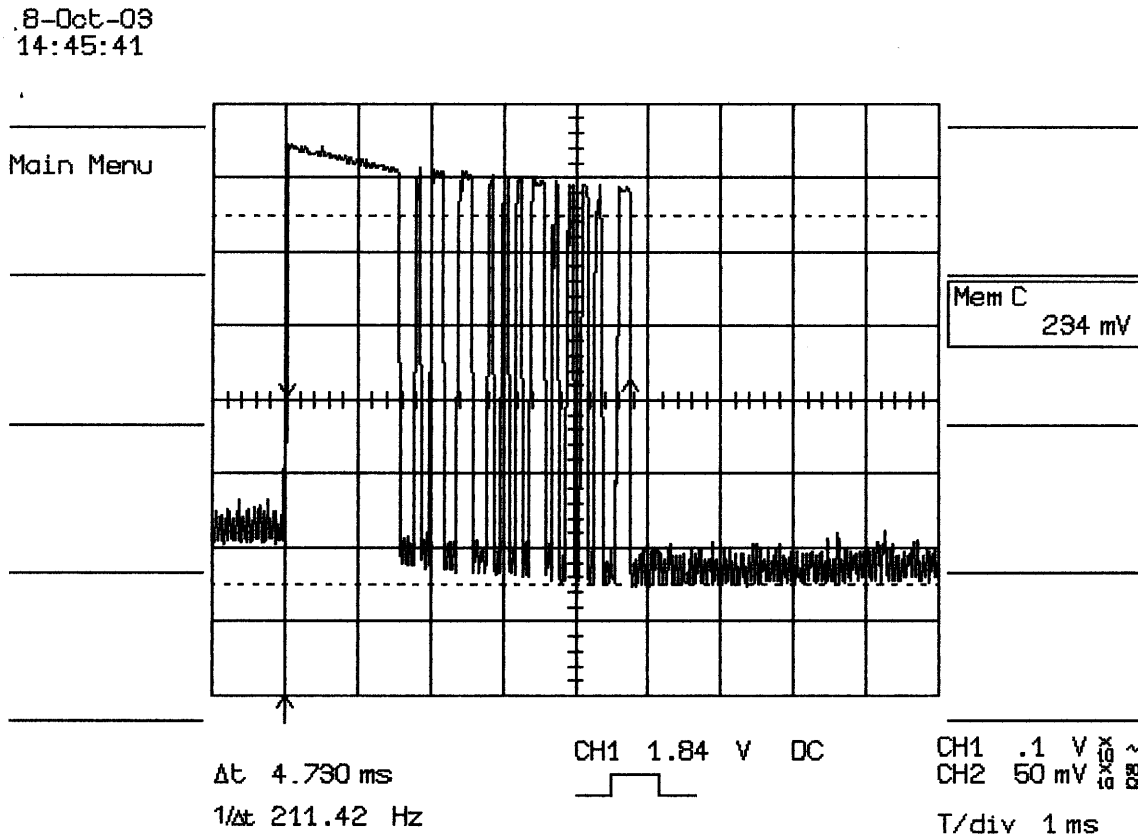
4.3 Pulse Characteristics of the Locator Units

The following plots were taken in the pre-scan chamber at the spectrum analyzer video detector.

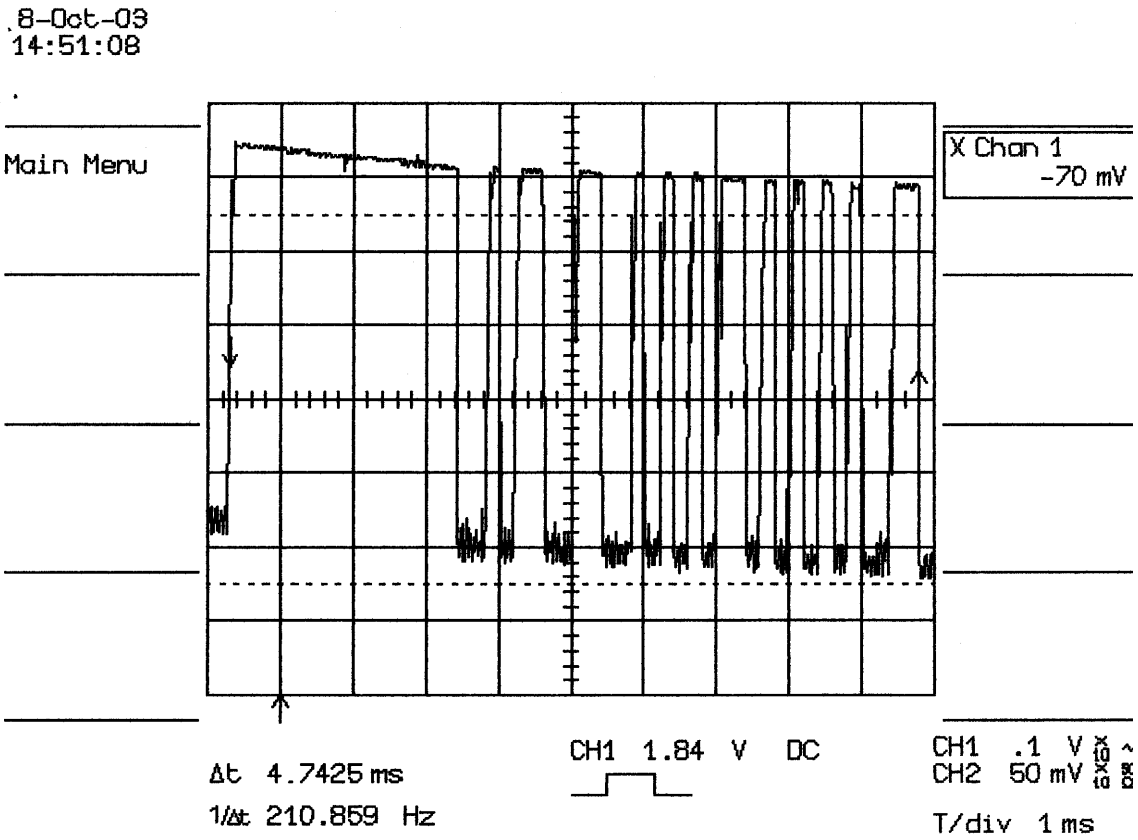
4.3.1 EUT Pulse Timing Plot (Parent and Child Units)



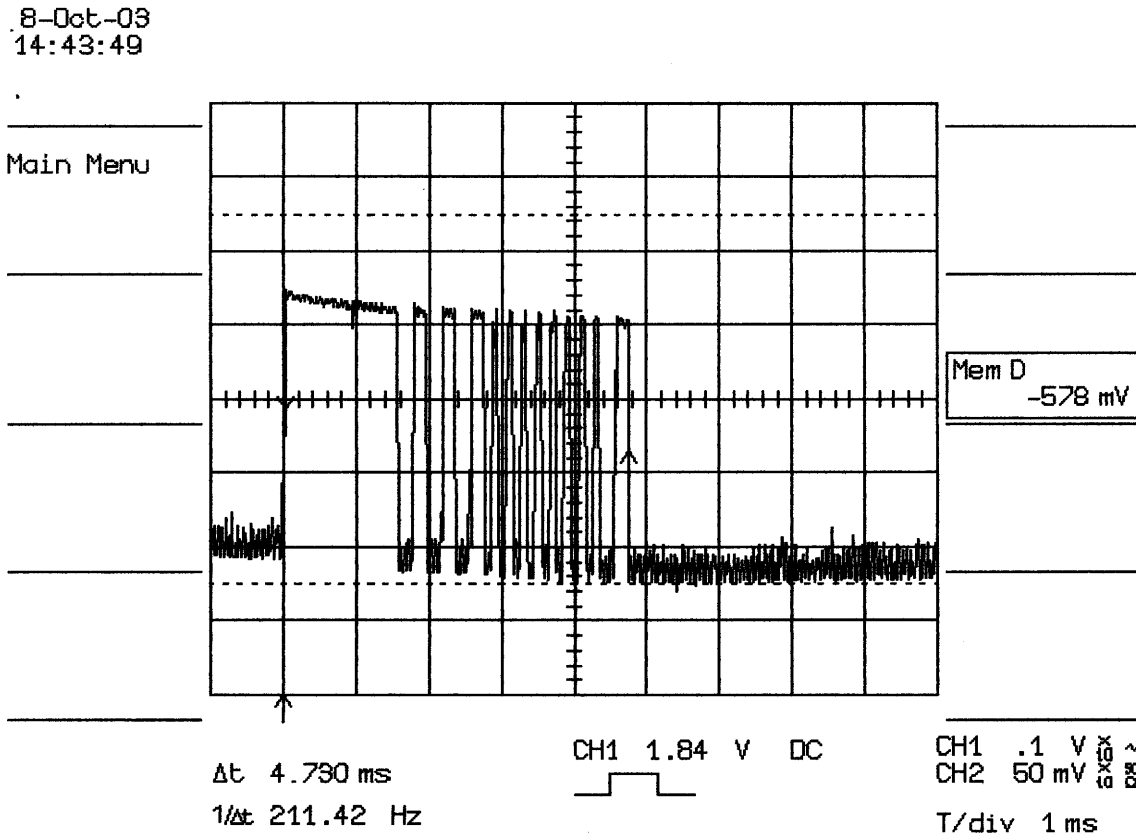
4.3.2 EUT Pulse Timing Plot (Parent Unit)



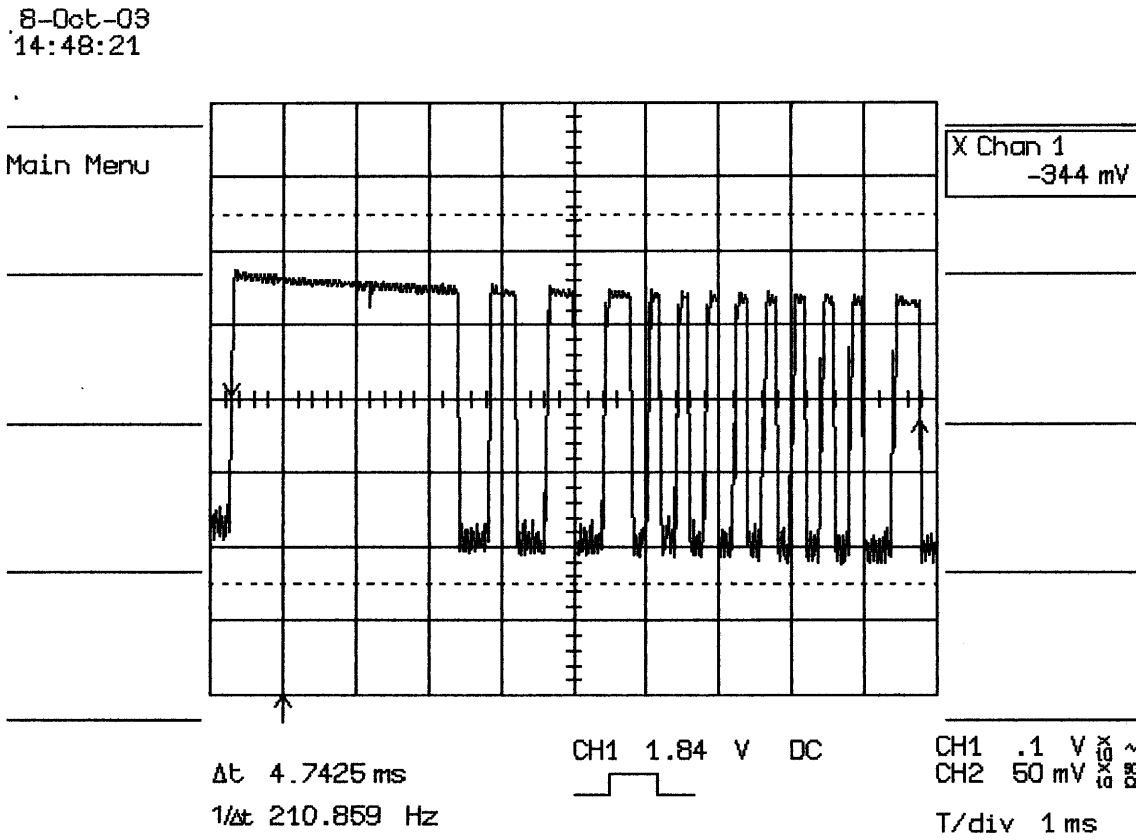
4.3.3 EUT Pulse Timing Plot (Parent Unit Pulse Train Expanded)



4.3.4 EUT Pulse Timing Plot (Child Unit)



4.3.5 EUT Pulse Timing Plot (Child Unit Pulse Train Expanded)



4.3.6 Average Level Calculation

The average level was calculated from the measured peak level per the instructions in ANSI C63.4-1992, Appendix I4:

Test Number: FPT 9810_0601

Pulse No.	Parent Device Pulse Timing (milli sec.)	Child Device Pulse Timing (milli sec.)	
t1	1.560	1.560	Pulse Train Duration (milli sec.) =
t2	0.091	0.192	4.74
t3	0.193	0.198	
t4	0.193	0.192	Pulse Train Duration (Pd) < 100 mSec
t5	0.091	0.089	
t6	0.091	0.094	
t7	0.091	0.094	Duty Cycle (%) = P total / Pd x 100
t8	0.193	0.095	59.00
t9	0.095	0.095	
t10	0.095	0.095	
t11	0.095	0.094	
t12	0.095	0.095	Correction Factor (dB) = 20 log (Duty Cycle)
t13	0.189	0.188	-4.58
P total	2.788	2.797	

Freq. of Emission (MHz)	Pk. Det. Level (dBuV/m)	Avg. Corr. Factor (dB)	Average Level (dBuV/m)	Specification Limit (dBuV/m)	Comment
1814.66	60.87	-4.58	56.29	54.00	2fo, See Avg. Det. Data
2722.03	57.62	-4.58	53.04	54.00	3fo, See Avg. Det. Data
3629.37	41.54	-4.58	36.96	54.00	4fo
4536.57	44.69	-4.58	40.11	54.00	5fo
5444.05	40.31	-4.58	35.73	54.00	6fo
6351.19	39.22	-4.58	34.64	54.00	7fo
7258.50	27.61	-4.58	23.03	54.00	8fo
8166.06	15.14	-4.58	10.56	54.00	noise floor
9073.40	16.96	-4.58	12.38	54.00	noise floor

The calculated average level is 2.29 dB above the average limit at the second harmonic frequency of 1814.66 MHz. The measured peak levels are below the specification limit. The measurement was repeated using the average detector. The average detector results are below the average limit and are shown in the radiated emissions test data (Tables 1, 2, and 3).

Section 5 Product Information

5.1 EUT Description and Block Diagram

CIRCUIT DESCRIPTION

The Locator is a 900 Mhz digital transmitter and receiver. The system is a pair of units with one as the "parent" unit and one as the "child" unit. The child unit has an LED and switch that are not loaded and there is a difference in the software. In the software the parent unit transmits periodically then listens for the child unit and the child unit transmits only when it receives the parent signal. In normal operation the transmitter sends a data burst. The child unit receives the data and if it is correct it responds by transmitting a response burst. This process is repeated at about a 3hz rate.

There are 16 bits of Manchester coded data at 5kbit/sec rate with 8 bits of on as a preamble. The modulation format is "on-off " keying with at least 50db on off ratio.

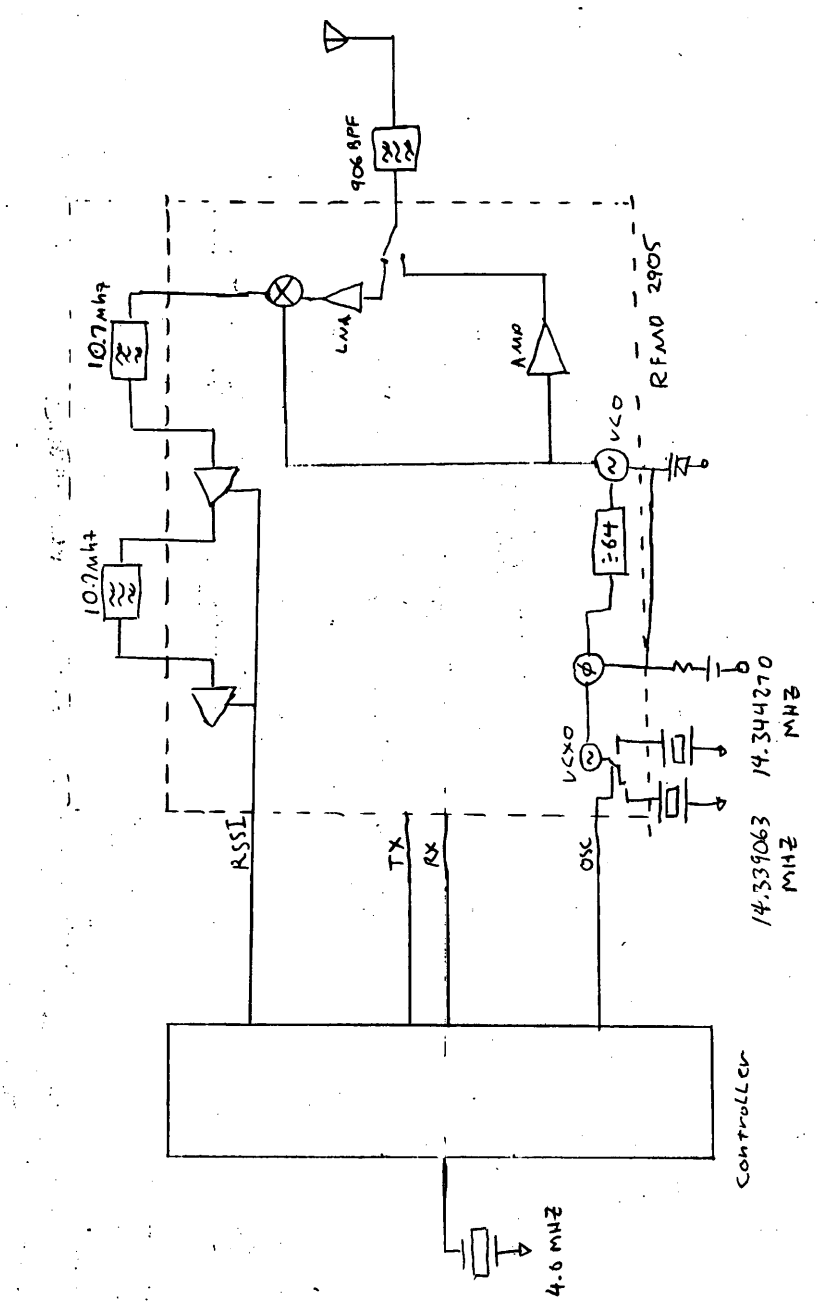
The transmitter uses an RFMD 2905 chip as both a transmitter and receiver. The transmitter is a times 64PLL and power amp integrated on the chip. For receive the PLL switches crystals to the LO frequency which is 10.7 Mhz above the transmit frequency and turns the output amp off. The output of the chip goes through a 2mhz wide ceramic filter before connecting to the antenna.

	Channel 1	Channel 2
Transmit frequency	907.0000	907.3333
Transmit crystal	14.171875	14.177083
Receive LO frequency	917.7000	918.0333
Receive crystal	14.339063	14.344270
Microcontroller crystal	4mhz	4mhz

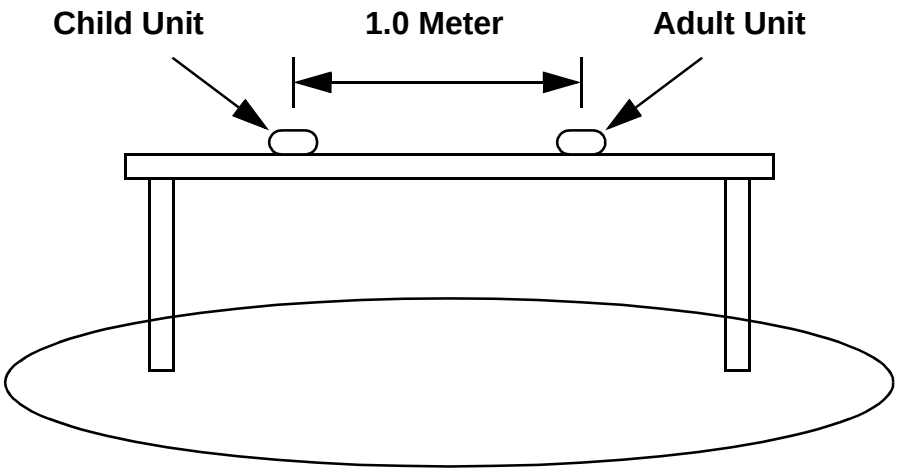
The PC board is 4 layer with a full ground plane on layer 3 and partial plane on layers 1 and 4. The antenna is a 2.9 inch wire placed along one side of the case with all other wires routed along the other side of the case.

The antenna and all circuit control functions are inaccessible to the user.

Figure 5.1.1 **EUT Block Diagram**



5.2 EUT Diagram as Tested



Rear View of Test Setup