Electrical (EMC)

DATE: 16 July 2000

I.T.L. (PRODUCT TESTING) LTD.

EMC Test

for

Team Concepts Electronics Ltd.

Equipment under test:

Computerized Analog Toy

900M VER. 5.2 (Analog Toy)

Approved by:_____
Y. Mordukhovitch, Test Engineer

Approved by: _____
I. Raz, EMC Laboratory Manager

.

Measurement/Technical Report for

Team Concepts Electronics Ltd.

Equipment under test:

Computerized Analog Toy

M/N 900M VER 5.2

FCC ID: C44TCE2098TOYS

DATE: 18 July 2000

This report concerns: Original Grant x Class II change ___

Class B verification ___ Class A verification___ Class I change ____

Equipment type: Radio Telemetry Transmitter

Request Issue of Grant:

__**x**__ Immediately upon completion of review

Limits used:

CISPR 22 _____ Part 15 __x__

Measurement procedure used is ANSI C63.4-1992.

Application for Certification prepared by:

Ishaiahou Raz
ITL (Product Testing) Ltd.
POB 211
Or Yehuda 60251
Israel
Tel: 972-3-533 9022
Fax: 972-3-533 9019

Applicant for this device: (different from "prepared by")

Team Concepts Electronics Ltd
5/F Yan Hing Centre
9-13 Wong Chuk Yeung Street
Fo Tan, Shatin
N.T. Hong Kong
Tel: 852 2697 8138
Fax: 852 2691 0405

TABLE OF CONTENTS

1. General Information

1.1 Product Description

This document describes the "Smart Alex" system operation.
The product includes a transmitter operating between 925.3 MHz to 927.05MHz and a receiver operating between 902.8MHz to 904.55MHz
This is an inteligent interactive toy, designed especially for interactive games and educational programs with kids of all ages. The toy has the appearance of a book, an inteligent book, with a face, eyes, mouth, legs and hands. The toy is connected to PC via an RF link so that it is completely mobile within the home surrounding range. This toy has full voice capabilities in both way, thus being interactive, it can talk with the kids playing with it, read him stories, give him assignments, realy play with him, and on the other side here the kid, understand his talk and respond to him.

1.2 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4:1992. Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.3 Test Facility

The open area test site and conducted measurement facility used to collect the data is located at Kfar Bin Nun, Israel. This site has been fully described in reports dated April 10, 1995 and May 8, 1995, submitted to the FCC office, and accepted in a letter dated July 23, 1998 (31040/SIT 1300F2).

1.4 Measurement Uncertainty

Radiated Emission

The Open Site complies with the ±4 dB Normalized Site Attenuation requirements of ANSI C63.4-1992. In accordance with Paragraph 5.4.6.2 of this standard, this tolerance includes instrumentation calibration errors, measurement technique errors, and errors due to site anomalies.

B. Conducted Emission:

The uncertainty for this test is 2dB.

2. Product Labeling

MODEL: 900M VER.5.2 (Analog Toy)
FCC ID: C44TCE2098TOYS
This device complies with part 15 of the FCC rules.
Operation is subject to the following two conditions:
1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

Team Concepts Electronics Ltd.

Made In China

FCC ID Label {Length: 4.5cm height: 2.4cm}

Figure 1. FCC Label

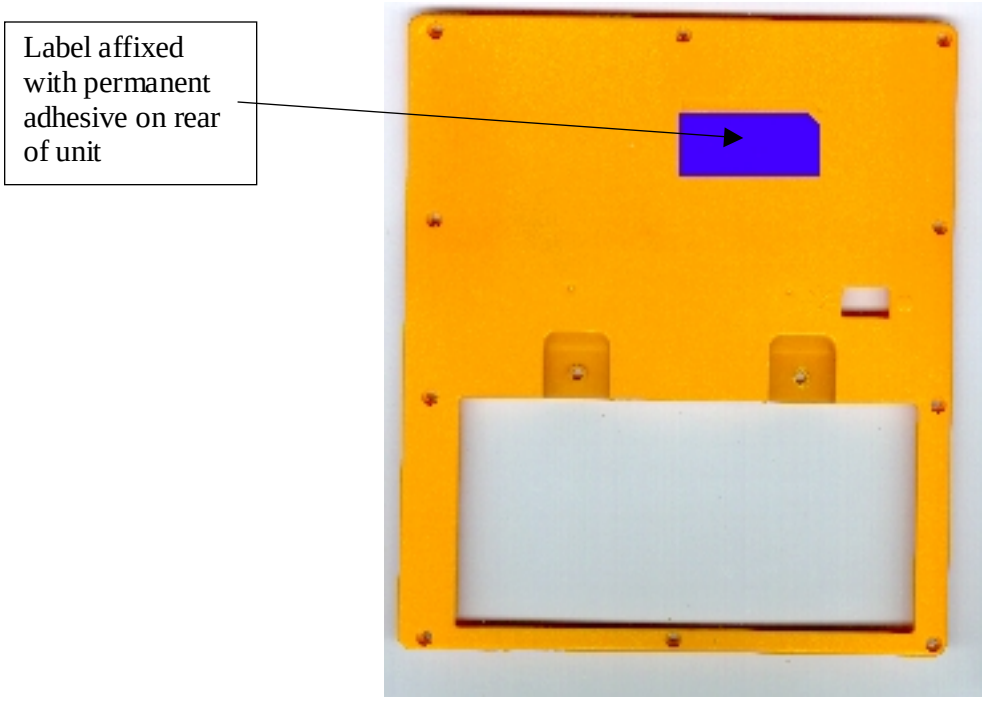

Figure 2. Location of Label on EUT

3. System Test Configuration

3.1 Justification

Typical system setup includes base connected via RS-232 cable to PC and receives power from the external wall mount power adapter. Toy is a stand-alone device operated from internal battery rack. RS-232 cable length is 1 (± 0.5) meter and the power cable before the connection to RS-232 cable is 0.3 (± 0.2) meter. The base and toy communicate via RF in American ISM frequency band. The distance between the base and toy on the open air is up to 70 meters and in close space is about 20 – 30 meters (depends on walls type and geometry).

3.2 EUT Exercise Software

During the FCC tests, the software used was the "Creator Living Toy™ system checker" (Lochecker.exe, ver 4.0). The system was operated using PC running software drivers, that a part of the main IDE software that controls the toy and base. Both base and toy were running in mode that fully simulates the system operation during the play: 20 seconds toy speaks, 10 seconds listen.

3.3 Special Accessories

No special accessories were needed to achieve compliance.

3.4 Equipment Modifications

To achieve compliance no corrective actions were required.

3.5 Configuration of Tested System

The configuration of the tested system is described below.

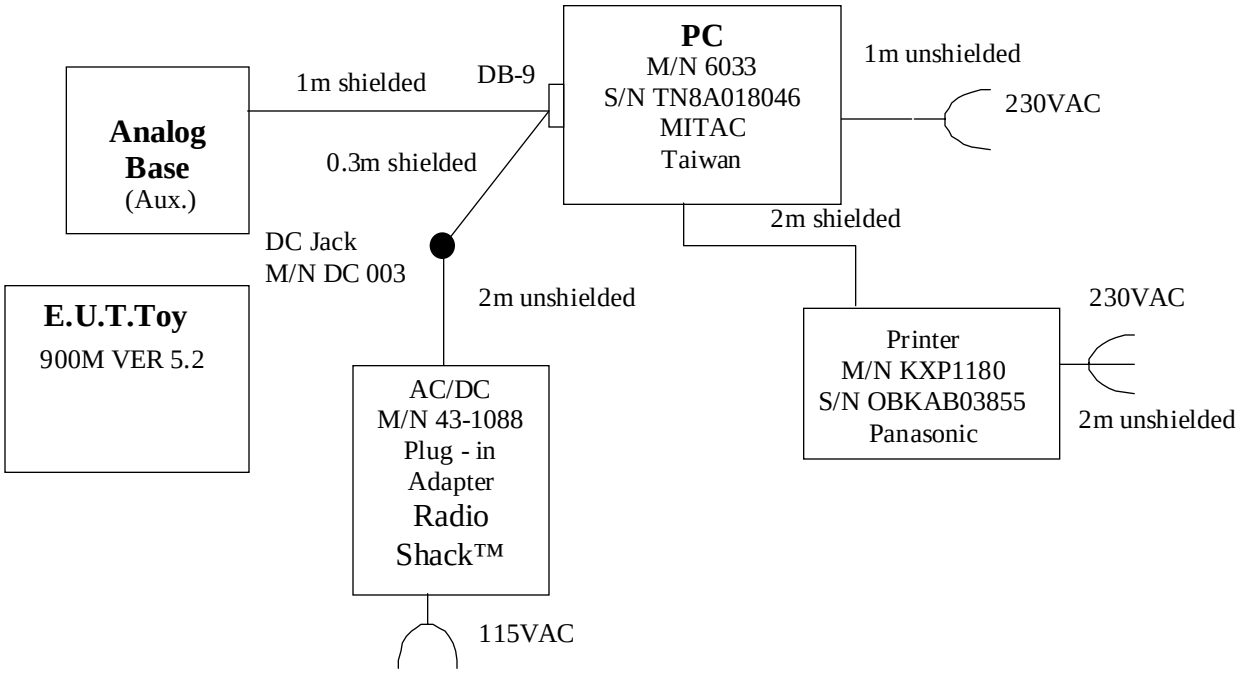

Figure 3. Configuration of Tested System

4. Block Diagram

4.1 Schematic Block/Connection Diagram

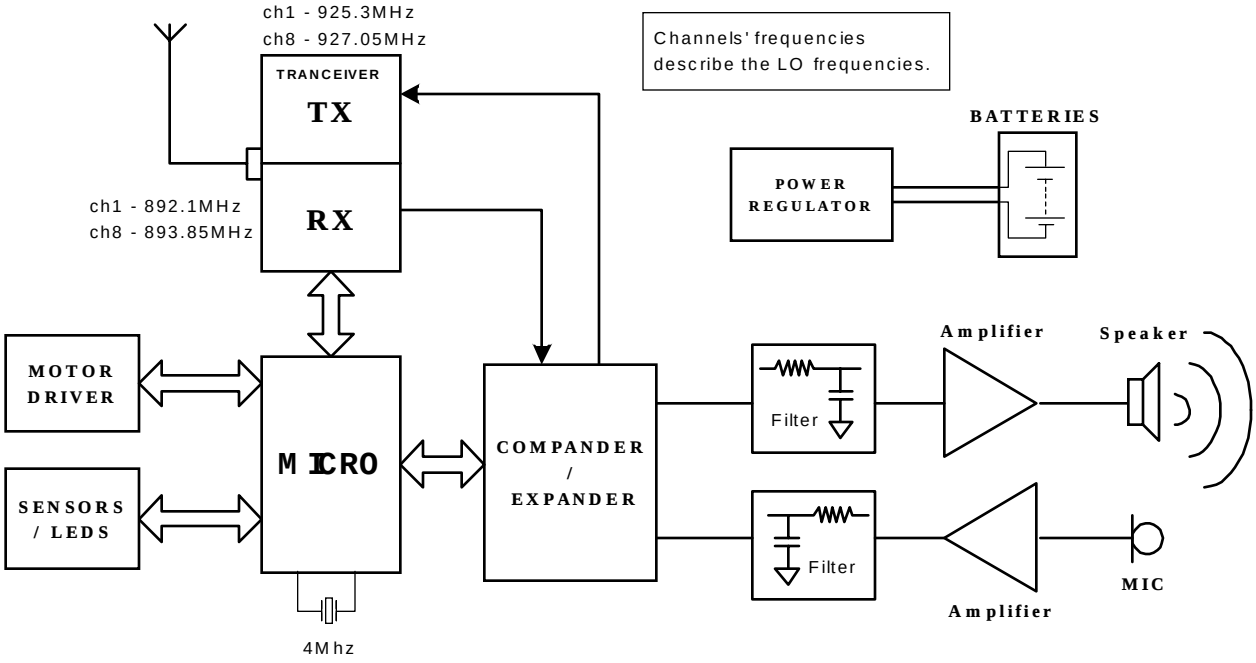

Figure 4. Block Diagram Analog Toy

5. Radiated Emission Data

5.1 Radiated Emission

4MHz-1000 MHz, Below 1GHz F.C.C. Part 15, Subpart C, Section 15.249

The E.U.T. operation mode and test set-up are as described in Section 3.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The effect of varying the position of the cables was investigated to find the configuration that produces maximum emission. The configuration tested is shown in Figure 3.1.

The frequency range 4MHz-1000 MHz was scanned, and the list of the highest emissions was verified and updated accordingly.

The emissions were measured using a computerized EMI receiver complying to CISPR 16 requirements. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.

Verification of the E.U.T emissions was based on the following methods:

Turning the E.U.T on and off.
Using a frequency span less than 10 MHz.
Observation of the signal level during turntable rotation. Background noise is not affected by the rotation of the E.U.T.

5.2 Measured Data

JUDGEMENT: Passed by 2.6 dBµV/m

The EUT met the requirements of the F.C.C. Part 15, Subpart C, Section 15.249 specification.

The worst case was 2.6 dB for 927.06 MHz, horizontal polarization for channel 8.

The worst case was 3.0 dB for 925.31 MHz, horizontal polarization for channel 1.

The details of the highest emissions are given in Figure 5 to Figure 8.

Radiated Emission

E.U.T Description	Computerized Analog Toy
Type	900M VER. 5.2 (Analog Toy)
Serial Number:	T1001

Specification: F.C.C., Part 15, Subpart C: Section15.249

Antenna Polarization: Horizontal
Frequency range: 4 MHz to 1000 MHz
Test Distance: 3 meters
Detector: Quasi-peak
TX operation Frequency 925.3MHz
RX operation Frequency 902.8 MHz

Channel 1

Frequency (MHz)	Peak Amp (dBµV/m)	QP Amp (2) (dBµV/m)	Correction (dB)	Specification (dBµV/m)	Margin (1) (dB µV/m)
59.98	26.7	22.3	10.6	40	-17.7
80.00	27.6	22.2	10.6	40	-17.8
119.96	30.8	25.0	13.6	43.5	-18.5
188.02	32.9	27.9	16.5	43.5	-15.6
219.99	36.1	30.2	18.6	46	-15.8
256.01	37.8	32.6	21.0	46	-13.4
925.31	91.2	91.0	27.6	94	-3.0

Figure 5. Radiated Emission. Antenna Polarization: HORIZONTAL. Detector: Quasi-peak

Notes:
1. Margin refers to the test results obtained minus specified requirement; thus a negative result indicates that the product passes the test, and a positive number indicates failure.
2. This level includes the reading plus all correction factors.

Radiated Emission

E.U.T Description	Computerized Analog Toy
Type	900M VER. 5.2 (Analog Toy)
Serial Number:	T1001

Specification: F.C.C., Part 15, Subpart C: Section15.249

Antenna Polarization: Vertical — Frequency range: 4 MHz to 1000 MHz

Test Distance: 3 meters — Detector: Quasi-peak

TX operation Frequency 925.3MHz — RX operation Frequency 902.8 MHz

Channel 1

Frequency (MHz)	Peak Amp (dBµV/m)	QP Amp (2) (dBµV/m)	Correction (dB)	Specification (dBµV/m)	Margin (1) (dB µV/m)
59.98	27.9	22.2	10.6	40	-17.8
80.00	27.5	22.0	10.6	40	-18.0
119.96	31.5	24.8	13.6	43.5	-18.7
188.02	33.1	27.6	16.5	43.5	-15.9
219.99	36.5	30.1	18.6	46	-15.9
256.01	38.0	32.5	21.0	46	-13.5
925.31	89.5	89.2	27.6	94	-4.8

Figure 6. Radiated Emission. Antenna Polarization: VERTICAL. Detector: Quasi-peak

Notes: 1. Margin refers to the test results obtained minus specified requirement; thus a negative result indicates that the product passes the test, and a positive number indicates failure.

2. This level includes the reading plus all correction factors.

Radiated Emission

E.U.T Description	Computerized Analog Toy
Type	900M VER. 5.2 (Analog Toy)
Serial Number:	T1001

Specification: F.C.C., Part 15, Subpart C: Section15.249

Antenna Polarization: Horizontal Frequency range: 4 MHz to 1000 MHz

Test Distance: 3 meters Detector: Quasi-peak

TX operation Frequency 927.05MHz RX operation Frequency 904.55 MHz

Channel 8

Frequency (MHz)	Peak Amp (dBµV/m)	QP Amp (2) (dBµV/m)	Correction (dB)	Specification (dBµV/m)	Margin (1) (dB µV/m)
60.0	27.0	22.3	10.6	40	-17.7
80.0	27.4	22.4	10.6	40	-17.6
120.0	30.5	24.7	13.6	43.5	-18.8
160.0	31.3	26.5	15.3	43.5	-17.0
220.0	36.5	30.4	18.6	46	-15.6
892.1	37.1	32.6	27.1	46	-13.4
927.06	91.6	91.4	27.6	94	-2.6

Figure 7. Radiated Emission. Antenna Polarization: HORIZONTAL. Detector: Quasi-peak

Notes: 1. Margin refers to the test results obtained minus specified requirement; thus a negative result indicates that the product passes the test, and a positive number indicates failure.

2. This level includes the reading plus all correction factors.

Radiated Emission

E.U.T Description	Computerized Analog Toy
Type	900M VER. 5.2 (Analog Toy)
Serial Number:	T1001

Specification: F.C.C., Part 15, Subpart C:
Section 15.249

Antenna Polarization: Vertical
Frequency range: 4 MHz to 1000 MHz
Test Distance: 3 meters
Detector: Quasi-peak
TX operation Frequency 927.05MHz
RX operation Frequency 904.55 MHz

Channel 8

Frequency (MHz)	Peak Amp (dBµV/m)	QP Amp (2) (dBµV/m)	Correction (dB)	Specification (dBµV/m)	Margin (1) (dB µV/m)
60.0	27.3	22.8	10.6	40	-17.2
80.0	27.8	22.9	10.6	40	-17.1
120.0	30.8	25.1	13.6	43.5	-18.4
160.0	31.9	26.9	15.3	43.5	-16.6
220.0	37.0	30.8	18.6	46	-15.2
892.1	37.5	33.0	27.1	46	-13.0
927.06	89.8	89.6	27.6	94	-4.4

Figure 8. Radiated Emission. Antenna Polarization: VERTICAL. Detector: Quasi-peak

Notes: 1. Margin refers to the test results obtained minus specified requirement; thus a negative result indicates that the product passes the test, and a positive number indicates failure.

2. This level includes the reading plus all correction factors.

5.3 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
Receiver	HP	8542E	3427A00103/34	December 24, 1999	1 year
Loop Antenna	EMCO	6507	2950	January 1 2000	1 year
Antenna - Biconical HP	ARA	BCD-235/B	1041	April 10, 2000	1 year
Antenna - Log Periodic	ARA	LPD-2010/A	1038	April 8, 2000	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	ThinkJet2225	2738508357.0	N/A	N/A

5.4 Field Strength Calculation

In the frequency range below 2.9GHz the field strength is calculated directly by the EMI Receiver software, and a "Correction Factors" data disk, using the following equation:

$$[dB\mu v/m]\ FS = RA + AF + CF$$

FS:	Field Strength [dBμv/m]
RA:	Receiver Amplitude [dBμv]
AF:	Receiving Antenna Correction Factor [dB/m]
CF:	Cable Attenuation Factor [dB]

No external pre-amplifiers are used.

In the frequency range above 2.9GHz, the field strength is manually calculted using the following equation

$$[dB\mu v/m]\ FS = RA + AF + CF + PRAF$$

PRAF: Preamplifier Gain Factor

6. Radiated Emission Data

6.1 Radiated Emission Above 1 GHz

1GHz-9.4GHz, F.C.C. Part 15, Subpart C, Section 15.249

The E.U.T operation mode and test set-up are as described in Section 3.

A preliminary measurement to characterise the E.U.T was performed inside the shielded room, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The effect of varying the position of the cables was investigated to find the configuration that produces maximum emission. The configuration tested is shown in Figure 3.1.

In the frequency range 1-2.9 GHz, a computerized EMI receiver complying to CISPR 16 requirements was used. The test distance was 3 meters.

In the frequency range 2.9-9.4 GHz, a spectrum analyzer including a low noise amplifier was used. The test distance was 3 meters. During peak measurements, the I.F. bandwidth was 1 MHz, and video bandwidth 3 MHz.

The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.

Verification of the E.U.T emissions was based on the following methods: turning the E.U.T on and off; using a frequency span less than 10 MHz; observation of the signal level during turntable rotation. (Background noise is not affected by the rotation of the E.U.T.)

6.2 Test Data

JUDGEMENT: Passed by 1.6 dBµV/m

The EUT met the requirements of the F.C.C. Part 15, Subpart C, Section 15.249 specification.

The worst case was 1.6 Db for 6500 MHz, vertical polarization on Channel 1 and Channel 8.

The details of the highest emissions are given in Figure 9 to Figure 16.

Radiated Emission Above 1 GHz

E.U.T Description	Computerized Analog Toy
Type	900M VER. 5.2 (Analog Toy)
Serial Number:	T1001

Specification: F.C.C., Part 15, Subpart C:
Section 15.249

Antenna Polarization: Horizontal — Frequency range: 1 GHz to 9.4 GHz
Test Distance: 3 meters — Detector: Peak
TX operation Frequency 925.3MHz — RX operation Frequency 902.8MHz

Channel 1

Freq. (MHz)	Peak Reading (dBµ)	(2) Peak Result (dBµV/m)	Spec. (dB µV/m)	(1) Margin (dBµV/m)	Correction Factor (dB) Ant.	Cable	Gain
1850.59	11.4	50.5	74.0	-23.5	29.2	9.9	N/A
2775.89	11.6	56.1	74.0	-17.9	32.1	12.4	N/A
3000	35.0	40.9	54.0 (3)	-13.1	32.8	2.9	-29.8
3750	37.0	43.0	54.0 (3)	-11.0	33.8	3.3	-31.1
4200	37.1	44.1	54.0 (3)	-9.9	34.5	3.6	-31.1
5000	37.4	48.4	54.0 (3)	-5.6	36.2	3.9	-31.0
6250	36.0	47.0	54.0 (3)	-7.0	37.1	4.5	-30.6
6500	39.0	51.4	54.0 (3)	-2.6	38.3	4.6	-30.5

Figure 9. Radiated Emission above 1 GHz Antenna Polarization: HORIZONTAL. Detector: Peak

Note:

1. Margin refers to the test peak results obtained, minus the specification requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.
2. This level includes the reading plus all correction factors.
3. The average limit was used.

Radiated Emission Above 1 GHz

E.U.T Description	Computerized Analog Toy
Type	900M VER. 5.2 (Analog Toy)
Serial Number:	T1001

Specification: F.C.C., Part 15, Subpart C:
Section 15.249

Antenna Polarization: Horizontal — Frequency range: 1 GHz to 9.4 GHz
Test Distance: 3 meters — Detector: Average
TX operation Frequency 925.3MHz — RX operation Frequency 902.8MHz

Channel 1

Freq. (MHz)	Average Reading (dBµ)	(2) Average Result (dBµV/m)	Spec. (dB µV/m)	(1) Margin (dBµV/m)	Correction Factor (dB) Ant.	Cable	Gain
1805.59	-0.8	38.3	54.0	-15.7	29.2	9.9	N/A
2775.89	1.0	43.5	54.0	-10.5	32.1	12.4	N/A

Figure 10. Radiated Emission above 1 GHz Antenna Polarization: HORIZONTAL. Detector: Average

Note:

1. Margin refers to the test peak results obtained, minus the specification requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.
2. This level includes the reading plus all correction factors.

Radiated Emission Above 1 GHz

E.U.T Description	Computerized Analog Toy
Type	900M VER. 5.2 (Analog Toy)
Serial Number:	T1001

Specification: F.C.C., Part 15, Subpart C:
Section 15.249

Antenna Polarization: Vertical — Frequency range: 1 GHz to 9.4 GHz
Test Distance: 3 meters — Detector: Peak
TX operation Frequency 925.3MHz — RX operation Frequency 902.8MHz

Channel 1

Freq. (MHz)	Peak Reading (dBµ)	(2) Peak Result (dBµV/m)	Spec. (dB µV/m)	(1) Margin (dBµV/m)	Correction Factor (dB) Ant.	Cable	Gain
1850.60	11.7	50.8	74.0	-23.2	29.2	9.9	N/A
2775.92	11.6	56.1	74.0	-17.9	32.1	12.4	N/A
3000	39.0	41.9	54.0 (3)	-12.1	32.8	2.9	-29.8
3750	35.3	44.0	54.0 (3)	-10.0	33.8	3.3	-31.1
4200	34.6	45.1	54.0 (3)	-8.9	34.5	3.6	-31.1
5000	34.5	49.4	54.0 (3)	-4.6	36.2	3.9	-31.0
6250	34.0	48.0	54.0 (3)	-6.0	37.1	4.5	-30.6
6500	34.0	52.4	54.0 (3)	-1.6	38.3	4.6	-30.5

Figure 11. Radiated Emission above 1 GHz Antenna Polarization: VERTICAL. Detector: Peak

Note:

1. Margin refers to the test peak results obtained, minus the specification requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.
2. This level includes the reading plus all correction factors.
3. The average limit was used.

Radiated Emission Above 1 GHz

E.U.T Description	Computerized Analog Toy
Type	900M VER. 5.2 (Analog Toy)
Serial Number:	T1001

Specification: F.C.C., Part 15, Subpart C:
Section 15.249

Antenna Polarization: Vertical — Frequency range: 1 GHz to 9.4 GHz
Test Distance: 3 meters — Detector: Average
TX operation Frequency 925.3MHz — RX operation Frequency 902.8MHz

Channel 1

Freq. (MHz)	Average Reading (dBµ)	(2) Average Result (dBµV/m)	Spec. (dB µV/m)	(1) Margin (dBµV/m)	Correction Factor (dB) Ant.	Cable	Gain
1850.60	-1.5	37.6	54.0	-16.4	29.2	9.9	N/A
2775.92	1.1	43.4	54.0	-10.6	32.1	12.4	N/A

Figure 12. Radiated Emission above 1 GHz Antenna Polarization: VERTICAL. Detector: Average

Note:

3. Margin refers to the test peak results obtained, minus the specification requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.
4. This level includes the reading plus all correction factors.

Radiated Emission Above 1 GHz

E.U.T Description	Computerized Analog Toy
Type	900M VER. 5.2 (Analog Toy)
Serial Number:	T1001

Specification: F.C.C., Part 15, Subpart C:
Section 15.249

Antenna Polarization: Horizontal — Frequency range: 1 GHz to 9.4 GHz
Test Distance: 3 meters — Detector: Peak
TX operation Frequency 927.05MHz — RX operation Frequency 904.55MHz

Channel 8

Freq. (MHz)	Peak Reading (dBµV)	(2) Peak Result (dBµV/m)	Spec. (dB µV/m)	(1) Margin (dBµV/m)	Correction Factor (dB) Ant.	Cable	Gain
1805.06	11.6	50.8	74.0	-23.2	29.3	9.9	N/A
2775.10	11.3	55.8	74.0	-18.2	32.1	12.4	N/A
3000	35.0	40.9	54.0(3)	-13.1	32.8	2.9	-29.8
3750	37.0	43.0	54.0(3)	-11.0	33.8	3.3	-31.1
4200	37.1	44.1	54.0(3)	-9.9	34.5	3.6	-31.1
5000	37.4	48.4	54.0(3)	-5.6	36.2	3.9	-31.0
6250	36.0	47.0	54.0(3)	-7.0	37.1	4.5	-30.6
6500	39.0	51.4	54.0(3)	-2.6	38.3	4.6	-30.5

Figure 13. Radiated Emission above 1 GHz Antenna Polarization: HORIZONTAL. Detector: Peak

Note:

1. Margin refers to the test peak results obtained, minus the specification requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.
2. This level includes the reading plus all correction factors.
3. The average limit was used.

Radiated Emission Above 1 GHz

E.U.T Description	Computerized Analog Toy
Type	900M VER. 5.2 (Analog Toy)
Serial Number:	T1001

Specification: F.C.C., Part 15, Subpart C:
Section 15.249

Antenna Polarization: Horizontal	Frequency range: 1 GHz to 9.4 GHz
Test Distance: 3 meters	Detector: Average
TX operation Frequency 927.05MHz	RX operation Frequency 904.55MHz

Channel 8

Freq. (MHz)	Average Reading (dBµ)	(2) Average Result (dBµV/m)	Spec. (dB µV/m)	(1) Margin (dBµV/m)	Correction Factor (dB) Ant.	Cable	Gain
1805.59	-0.3	38.9	54.0	-15.1	29.3	9.9	N/A
2775.89	1.1	43.4	54.0	-10.6	32.1	12.4	N/A

Figure 14. Radiated Emission above 1 GHz Antenna Polarization: HORIZONTAL. Detector: Average

Note:

1. Margin refers to the test peak results obtained, minus the specification requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.
2. This level includes the reading plus all correction factors.

Radiated Emission Above 1 GHz

E.U.T Description	Computerized Analog Toy
Type	900M VER. 5.2 (Analog Toy)
Serial Number:	T1001

Specification: F.C.C., Part 15, Subpart C:
Section 15.249

Antenna Polarization: Vertical — Frequency range: 1 GHz to 9.4 GHz
Test Distance: 3 meters — Detector: Peak
TX operation Frequency 927.05MHz — RX operation Frequency 904.55MHz

Channel 8

Freq. (MHz)	Peak Reading (dBµ)	(2) Peak Result (dBµV/m)	Spec. (dB µV/m)	(1) Margin (dBµV/m)	Correction Factor (dB) Ant.	Cable	Gain
1854.09	11.6	50.8	74.0	-23.2	29.3	9.9	N/A
2781.13	11.1	55.6	74.0	-18.4	32.1	12.4	N/A
3000	39.0	41.9	54.0(3)	-12.1	32.8	2.9	-29.8
3750	35.3	44.0	54.0(3)	-10.0	33.8	3.3	-31.1
4200	34.6	45.1	54.0(3)	-8.9	34.5	3.6	-31.1
5000	34.5	49.4	54.0(3)	-4.6	36.2	3.9	-31.0
6250	34.0	48.0	54.0(3)	-6.0	37.1	4.5	-30.6
6500	34.0	52.4	54.0(3)	-1.6	38.3	4.6	-30.5

Figure 15. Radiated Emission above 1 GHz Antenna Polarization: VERTICAL. Detector: Peak

Note:

1. Margin refers to the test peak results obtained, minus the specification requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.
2. This level includes the reading plus all correction factors.
3. The average limit was used.

Radiated Emission Above 1 GHz

E.U.T Description	Computerized Analog Toy
Type	900M VER. 5.2 (Analog Toy)
Serial Number:	T1001

Specification: F.C.C., Part 15, Subpart C:
Section 15.249

Antenna Polarization: Vertical — Frequency range: 1 GHz to 9.4 GHz
Test Distance: 3 meters — Detector: Average
TX operation Frequency 927.05MHz — RX operation Frequency 904.55MHz

Channel 8

Freq. (MHz)	Average Reading (dBµ)	(2) Average Result (dBµV/m)	Spec. (dB µV/m)	(1) Margin (dBµV/m)	Correction Factor (dB) Ant.	Cable	Gain
1854.09	-0.3	38.8	54.0	-15.2	29.3	9.9	N/A
2781.13	1.1	43.4	54.0	-10.6	32.1	12.4	N/A

Figure 16. Radiated Emission above 1 GHz Antenna Polarization: VERTICAL. Detector: Average

Note:

1. Margin refers to the test peak results obtained, minus the specification requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.
2. This level includes the reading plus all correction factors.

6.3 Test Instruments used, Radiated Measurement Above 1 GHZ

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
Spectrum Analyzer	HP	859LL	3826A01204	August 2, 1999	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	ThinkJet2225	2738508357.0	N/A	N/A
Antenna – Log Periodic	A.H. System	SA5-200/511	253	January 27, 2000	1 year
Low Noise Amplifier	DBS	0411N313	003	December 24, 1999	1 year
Receiver	HP	8542E	3427A00103/34	December 24, 1999	1 year

6.4 Field Strength Calculation

In the frequency range below 2.9GHz the field strength is calculated directly by the EMI Receiver software, and a "Correction Factors" data disk, using the following equation:

$$[dB\mu v/m]\ FS = RA + AF + CF$$

FS:	Field Strength [dBμv/m]
RA:	Receiver Amplitude [dBμv]
AF:	Receiving Antenna Correction Factor [dB/m]
CF:	Cable Attenuation Factor [dB]

In the frequency range above 2.9GHz, the field strength is manually calculated using the following equation

$$[dB\mu v/m]\ FS = RA + AF + CF + PRAF$$

PRAF: Preamplifier Gain Factor

7. Photographs of Tested E.U.T.

Figure 17 Assembled Product, Front/Top View

Figure 18 Rear View without cover

Figure 19 Battery Cover

Figure 20 Rear Cover

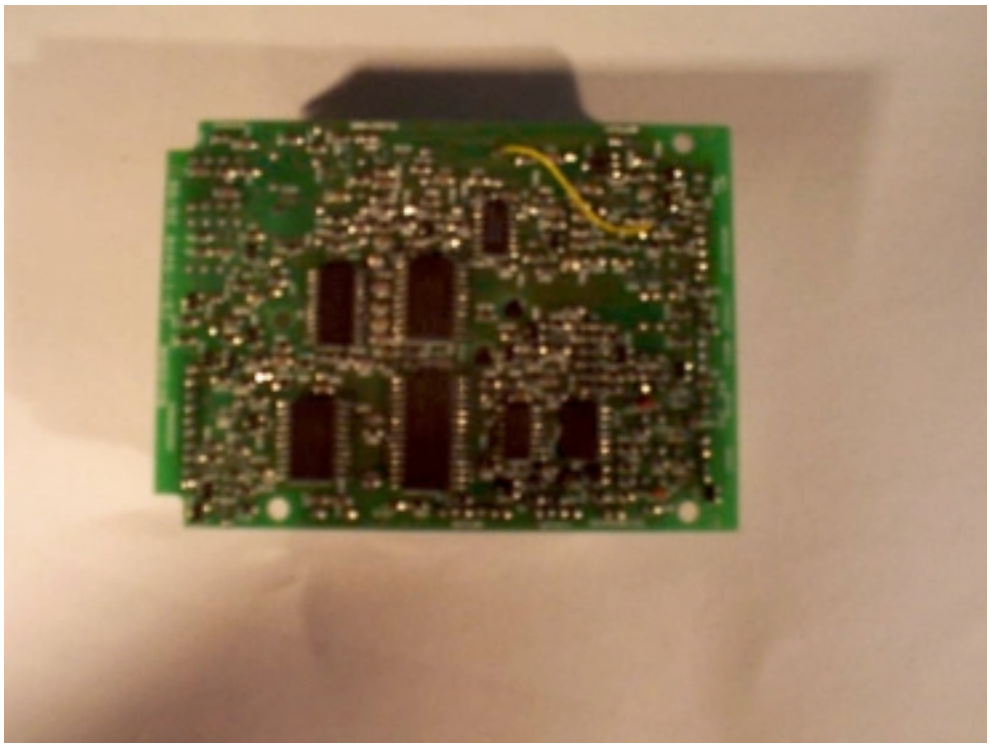

Figure 21 Toy PCB side 1

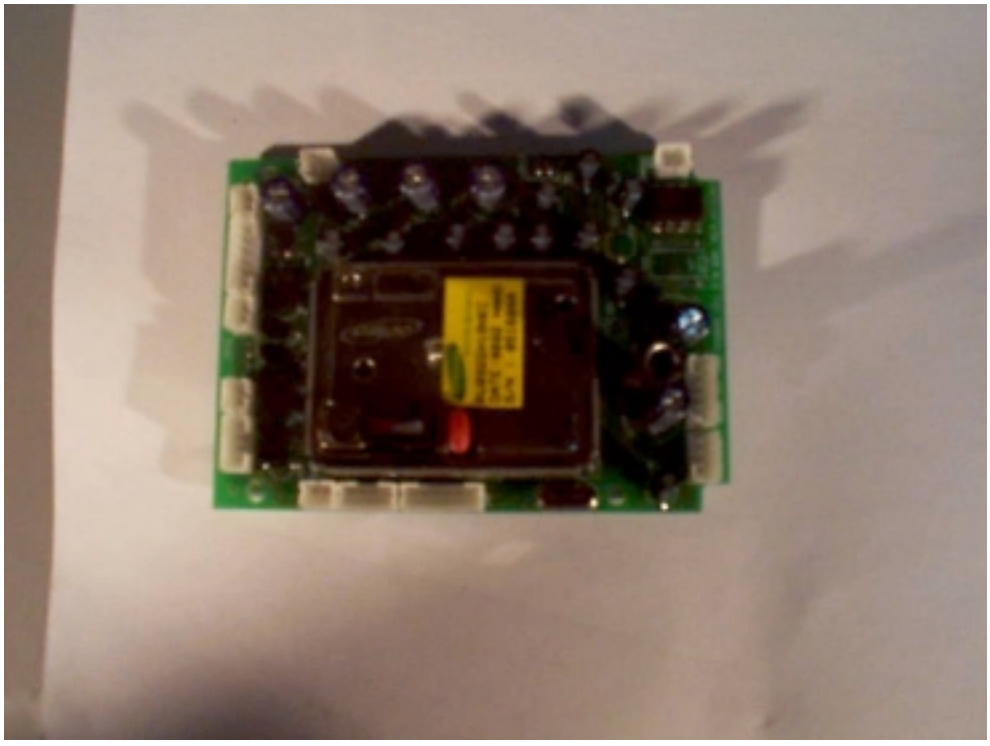

Figure 22 Toy PCB side 2

Figure 23 Disassembled Plastic Box

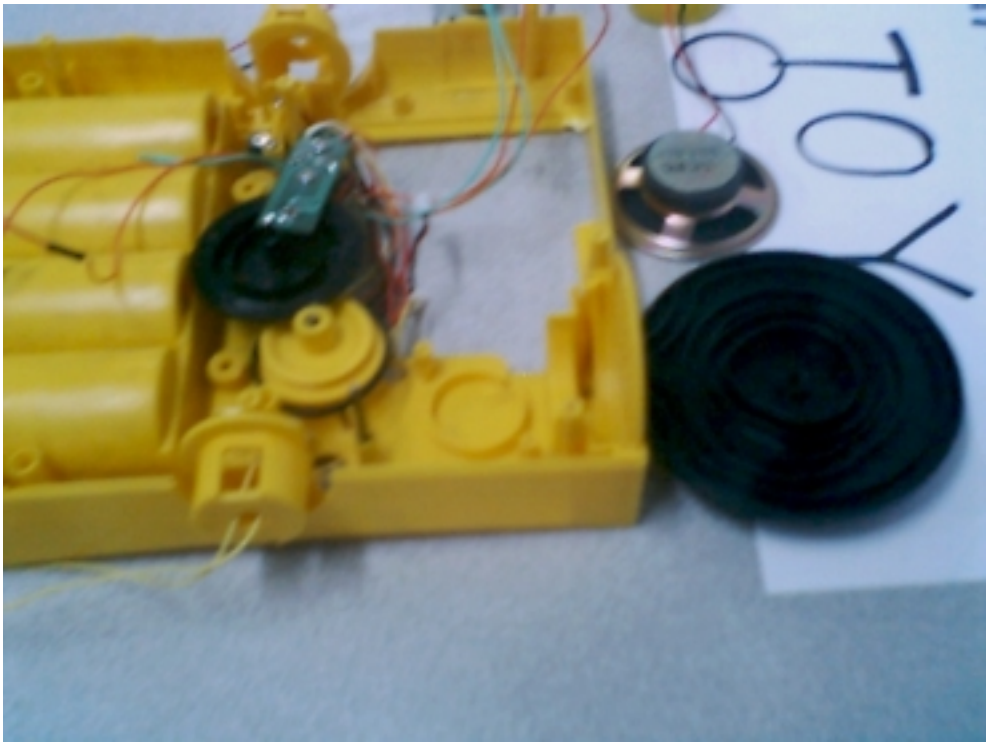

Figure 24 Construction Picture with Disassembled Speaker

Figure 25 Sensor

Figure 26 Radiated Emissions Front View

Figure 27 Radiated Emissions Side View

8. Signatures of the E.U.T's Test Engineers

Test	Test Engineer Name	Signature	Date
Radiated Emissions	Y. Mordukhovitch		

9. APPENDIX A - CORRECTION FACTORS

9.1 Correction factors for CABLE

from EMI receiver to test antenna at 3 meter range.

FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.5
20.0	0.7
30.0	1.0
40.0	1.2
50.0	1.3
60.0	1.5
70.0	1.6
80.0	1.7
90.0	1.8
100.0	1.9
150.0	2.4
200.0	2.7
250.0	3.0
300.0	3.3
350.0	3.7
400.0	4.0
450.0	4.3
500.0	4.7
600.0	4.9
700.0	5.4
800.0	5.8
900.0	6.3
1000.0	6.7

FREQUENCY (MHz)	CORRECTION FACTOR (dB)
1200.0	7.5
1400.0	8.2
1600.0	9.0
1800.0	9.6
2000.0	10.7
2300.0	11.1
2600.0	11.8
2900.0	12.8

NOTES:

1. The cable type is RG-214.

2. The overall length of the cable is 27 meters.

3. The above data is located in file 27MO3MO.CBL on the disk marked "Radiated Emission Tests EMI Receiver".

9.2 Correction factors for CABLE

from EMI receiver to test antenna at 10 meter range.

FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.6
20.0	1.1
30.0	1.3
40.0	1.6
50.0	1.7
60.0	1.9
70.0	2.0
80.0	2.2
90.0	2.3
100.0	2.4
150.0	3.1
200.0	3.6
250.0	4.2
300.0	4.5
350.0	4.8
400.0	5.2
450.0	5.5
500.0	6.2
600.0	6.4
700.0	7.0
800.0	7.5
900.0	8.1
1000.0	8.6

FREQUENCY (MHz)	CORRECTION FACTOR (dB)
1200.0	9.7
1400.0	10.5
1600.0	11.5
1800.0	12.6
2000.0	13.5
2300.0	14.3
2600.0	15.5
2900.0	16.4

NOTES:

1. The cable type is RG-214.

2. The overall length of the cable is 34 meters.

3. The above data is located in file 34M10MO.CBL on the disk marked "Radiated Emissions Tests EMI Receiver".

9.3 Correction factors for LOG PERIODIC ANTENNA

Type LPD 2010/A
at 3 and 10 meter ranges.

Distance of 3 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.1
250.0	10.2
300.0	11.4
400.0	14.5
500.0	15.2
600.0	17.3
700.0	19.0
850.0	20.1
1000.0	22.2

Distance of 10 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.0
250.0	10.1
300.0	11.2
400.0	14.4
500.0	15.2
600.0	17.2
700.0	19.0
850.0	20.1
1000.0	22.1

NOTES:

1. *Antenna serial number is 1038.*
2. *The above lists are located in file number 38M3O.ANT for a 3 meter range, and file number 38M100.ANT for a 10 meter range.*
3. *The files mentioned above are located on the disk marked "Radiated Emission Test EMI Receiver".*

9.4 Correction factors for BICONICAL ANTENNA

Type BCD-235/B, at 3 and 10 meter ranges

3 meter range

FREQUENCY (MHz)	AFE (dB/m)
30.0	14.8
40.0	11.9
50.0	10.2
60.0	9.1
70.0	8.5
80.0	8.9
90.0	9.6
100.0	10.3
110.0	11
120.0	11.5
130.0	11.7
140.0	12.1
150.0	12.6
160.0	12.8
170.0	13
180.0	13.5
190.0	14
200.0	14.8
210.0	15.3
220.0	15.8
230.0	16.2
240.0	16.6
250.0	17.6
260.0	18.2
270.0	18.4
280.0	18.7
290.0	19.2
300.0	19.9

10 meter range

FREQUENCY (MHz)	AFE (dB/m)
30.0	12.1
40.0	10.6
50.0	10.6
60.0	8.9
70.0	8.5
80.0	9.6
90.0	9.4
100.0	9.6
110.0	10.3
120.0	10.7
130.0	12.6
140.0	12.7
150.0	12.7
160.0	13.8
170.0	13.7
180.0	14.9
190.0	13.4
200.0	13.1
210.0	14.0
220.0	14.5
230.0	15.8
240.0	16.0
250.0	16.6
260.0	16.7
270.0	18.3
280.0	18.5
290.0	19.3
300.0	20.9

NOTES:

1. *Antenna serial number is 1041.*
2. *The above list is located in file 41BC10M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver".*

9.5 Correction factors for BICONICAL ANTENNA Type 3109

3 meter range

FREQUENCY (MHz)	AFE (dB/m)
20.0	18.4
30.0	14.0
40.0	12.3
50.0	10.6
60.0	8.3
70.0	8.7
80.0	7.2
90.0	8.6
100.0	10.1
110.0	11.2
120.0	11.8
130.0	12.3
140.0	12.7
150.0	12.5
160.0	12.4
170.0	12.1
180.0	12.2
190.0	12.8
200.0	13.7
210.0	14.5
220.0	15.4
230.0	15.9
240.0	16.3
250.0	16.7
260.0	17.1
270.0	17.2
280.0	17.5
290.0	18.1
300.0	18.9

NOTES:

1. Antenna serial number is 3244.

2. The above list is located in file 44BIC3M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver"

9.6 Correction factors for BICONICAL ANTENNA Type 3109

10 meter range

FREQUENCY (MHz)	AFE (dB/m)
20.0	16.4
30.0	13.2
40.0	11.9
50.0	10.4
60.0	8.6
70.0	9.0
80.0	6.8
90.0	7.5
100.0	9.4
110.0	10.8
120.0	11.7
130.0	12.2
140.0	12.5
150.0	12.3
160.0	12.1
170.0	12.2
180.0	12.5
190.0	13.2
200.0	14.0
210.0	14.4
220.0	14.8
230.0	15.0
240.0	15.1
250.0	15.2
260.0	15.7
270.0	15.9
280.0	16.5
290.0	17.0
300.0	17.8

NOTES:

1. Antenna serial number is 3244.

2. The above list is located in file 44BIC10M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver"

9.7 Correction factors for SAS ANTENNA, 3 meter range

Type SAS-200/511

FREQUENCY (MHz)	AFE (dB/m)	FREQUENCY (MHz)	AFE (dB/m)
1.0	24.9	7.0	38.6
1.5	27.8	7.5	39.2
2.0	29.9	8.0	39.9
2.5	31.2	8.5	40.4
3.0	32.8	9.0	40.8
3.5	33.6	9.5	41.1
4.0	34.3	10.0	41.7
4.5	35.2	10.5	42.4
5.0	36.2	11.0	42.5
5.5	36.7	11.5	43.1
6.0	37.2	12.0	43.4
6.5	38.1	12.5	44.4

NOTES:

1. Antenna serial number is 253.

2. The above list is located in file SASLP3M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver"