



EMC Measurement / Technical Report

FCC Test Specification : Certification for FCC Part 15, Subpart C
Intentional Radiator

Manufacturer : Ezen Telecom, Inc.

Equipment Under Test : Remote Control
(Digital Video Intruder Detection System)
Model No. ESS-700

Test Report No. : FR1239A

Purchase Order No. : KC123

Document History

<i>Revision</i>	<i>Issue Date</i>	<i>Affected Pages</i>	<i>Description of Modifications</i>	<i>Revised By</i>	<i>Approved By</i>
N/C	September 21, 1999		Initial release		



EMC Measurement / Technical Report

Document No. FR1239A

From

Garwood Laboratories, Inc.
World Compliance Division

Test for

Ezen Telecom, Inc.

Remote Control

(Digital Video Intruder Detection System)

Model No. ESS-700

WRITTEN BY	REVIEWED BY	REVIEWED BY
Arnulfo Tapia	Robert Lynch	Ed Nakauchi
<i>Arnulfo Tapia</i> <i>Sr. EMC Technician</i>	<i>Robert Lynch</i> <i>Quality Manager</i>	<i>Ed Nakauchi</i> <i>EMC Engineer</i> <i>NARTE, Certified</i>

<i>Test Personnel</i>	<i>Test Dates</i>
Eric H. Nguyen - Lead EMC Engineer	2, 9 September 1999

<p><i>Test Facility</i></p> <p><i>Address</i></p> <p><i>City, State, Zip Code</i></p> <p><i>Phone</i></p> <p><i>Fax</i></p>	<p>Garwood Laboratories, Inc.-OC</p> <p>565 Porter Way</p> <p>Placentia, CA 92870</p> <p>(714) 572-2027</p> <p>(714) 572-2025</p>
---	---

*This report may be reproduced in full, partial reproduction may only be made with the written consent of the laboratory.
The results in this report apply only to the equipment tested.
This report may not be used to claim product endorsement by NVLAP or any agency of the U.S. government.*



TABLE OF CONTENTS

MEASUREMENT/TECHNICAL REPORT SUMMARY	4
1. GENERAL INFORMATION	5
1.1 <i>Product Description</i>	<i>5</i>
1.2 <i>Related Submittal(s)/ Grant(s)</i>	<i>5</i>
1.3 <i>Tested System Details.....</i>	<i>5</i>
1.4 <i>Test Methodology.....</i>	<i>5</i>
1.5 <i>Test Facility.....</i>	<i>6</i>
2. PRODUCT LABELING.....	7
2.1 <i>FCC ID Label.....</i>	<i>7</i>
2.2 <i>Location of Label on EUT.....</i>	<i>7</i>
2.3 <i>Information to User.....</i>	<i>8</i>
3. SYSTEM TEST CONFIGURATION.....	9
3.1 <i>Justification.....</i>	<i>9</i>
3.2 <i>EUT Exercise Software/Equipment.....</i>	<i>9</i>
3.3 <i>Special Accessories</i>	<i>9</i>
3.4 <i>Equipment Modifications</i>	<i>9</i>
3.5 <i>Configuration of Tested System</i>	<i>10</i>
3.6 <i>Details of Tested System.....</i>	<i>10</i>
4. BLOCK DIAGRAMS OF EUT.....	11
5. TEST MEASUREMENT PHOTOS	12
6. TEST DATA	18
6.1 <i>Conducted Emissions Limits</i>	<i>18</i>
6.2 <i>Conducted Emissions Results.....</i>	<i>18</i>
6.3 <i>Radiated Emissions Limits.....</i>	<i>19</i>
6.4 <i>Radiated Emissions Results.....</i>	<i>20</i>
6.5 <i>Field Strength Calculation.....</i>	<i>21</i>
6.6 <i>Occupied Bandwidth.....</i>	<i>22</i>
APPENDIX A - TEST EQUIPMENT USED	23
APPENDIX B - SUPPLEMENTAL TEST DATA	24
ATTACHMENTS	27



MEASUREMENT / TECHNICAL REPORT SUMMARY

<p>Manufacturer Company Address City, State, Zip Country Contact Name Phone Fax</p>	<p>Ezen Telecom, Inc. Sungnam Techno-park #Ma-709 151, Yatap-Dong, Bundang-Ku Sungnam-City, Kyungi-Province 463-070 Korea Leo Jeong 82-342-707-1235 Ext. 7 82-342-707-1238</p>
<p>Type of Authorization</p>	<p>Certification for an Intentional Radiator</p>
<p>Applicable FCC Rules</p>	<p>Prepared in accordance with the requirements of FCC Rules and Regulations as listed in 47 CFR Ch.1 Parts 0 to 19 (10-1-98 Edition). The following subparts are applicable to the results in this test report:</p> <p>Part 15, Subpart C – Intentional Radiators § 15.231 Periodic operation in the band 40.66 – 40.70 MHz and above 70MHz § 15.201 Equipment authorization requirement § 15.203 Antenna requirement § 15.207 Conducted limits § 15.209 Radiated emission limits; general requirements</p> <p>Part 2, Subpart J – Equipment Authorization Procedures Certification Sections</p>
<p>Equipment Under Test</p>	<p>Remote Control (Digital Video Intruder Detection System) Model No. ESS-700 Note this test report applies only to the wireless remote control transmitter of the Detection System Model ESS-700</p>
<p>Summary Test Results</p>	<p>The EUT complied with all the applicable FCC rules, as listed above. The conducted emission test, § 15.207, is not applicable and was not performed since the EUT is battery operated.</p>

<p>EMC Test Laboratory Facility Address City, State, Zip Code Country Contact Name Title Phone Fax</p>	<p>Garwood Laboratories Incorporated World Compliance Division 565 Porter Way Placentia, CA 92870 USA Jason Armstrong General Manager (714) 572-2027 (714) 572-2025</p>
---	---



1. General Information

1.1 Product Description

<i>Equipment Under Test</i>	Remote Control (Digital Video Intruder Detection System) Model No. ESS-700
<i>Description</i>	The equipment under test is a low power remote control transmitter that in conjunction with a video camera/receiver makes up the Digital Video Intruder System. The battery-operated remote control (EUT) is used to control several functions of the camera/receiver. The loop antenna for the remote control is permanently installed on the printed circuit board.
<i>Clock Frequencies</i>	Transmitting Frequency – 311MHz

1.2 Related Submittal(s)/ Grant(s)

Peripherals tested with the EUT, which contain FCC ID numbers can be located in the table in Section 3.6 of this report.

1.3 Tested System Details

The Tested System was configured with all typical peripherals (or terminations) and operated to generate maximum emissions during the test. Refer to Section 3.5 for the Test Configuration and Section 3.6 the table lists all the details for Tested System components and cabling information. FCC ID numbers are included if available for a tested system component.

1.4 Test Methodology

The test for unwanted emissions was performed according to the general provisions of ANSI C63.4-1992 (American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz).

The EUT was setup on a non-conductive table, 1.0 x 1.5m, in the Open Area Test Site. The test for unwanted emissions was performed at an EUT to receiving antenna distance of 3 meters. Rotating the turntable 360 degrees and varying the antenna height from 1 to 4 meters maximized the radiated emissions. The field strength of the fundamental frequency and harmonics, up to the 10th harmonic, were measured utilizing a BiLog and Double Ridge Guide Horn antenna. Measurements were made in both, vertical and horizontal antenna polarization.



1.5 Test Facility

The open area test site (OATS) and measurement facilities used to collect the test data are located at Garwood Laboratories, Inc. World Compliance Division test facility in Placentia, CA. This facility has been fully described in a report submitted to the FCC and accepted in a letter dated 29 January 1999 (31040/SIT 1300F2) registration #90681.

The test facility is also recognized and accredited from following accreditation organizations:

Acemark Europe, Ltd. Laboratory Number: 0007 Dated: 03/17/97
ISO Guide 25, EN45001, and relevant parts of ISO 9002

Industry Canada Reference: IC 3298 Dated: 03/11/99

I²T Certificate Number: 99-051 Dated: 05/05/99
(Interference Tech International) CE Mark for European Country

NVLAP NVLAP Lab Code: 200119-0 Effective Through
(NIST) CISPR, FCC, AUSTEL 12/31/99

VCCI Registration #'s C574, C575, C576, R561 Effective Through
(Voluntary Control Council for Interference by Information Technology Equipment) 02/04/00



2. Product Labeling

2.1 FCC ID Label

All devices authorized under the certification procedures are required to display an identification label showing the FCC Identifier (FCC ID) under which they are authorized.

FCC ID: XXX-SOS-100

2.2 Location of Label on EUT

The label shall be located in a conspicuous place on the device consistent with the requirements of Section §15.19 of FCC CFR 47.



2.3 Information to user

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

- (a) For a Class A digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

- (b) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/ TV technician for help.



3. System Test Configuration

3.1 Justification

The EUT was used in a system configured for testing in a typical fashion, as a customer would normally use it.

3.2 EUT Exercise Software/Equipment

The following operating mode was used to exercise the functions of the EUT.

- During testing, the remote control was transmitting. A new battery was installed in the EUT before the Open Area Test Site field strength measurements.

3.3 Special Accessories

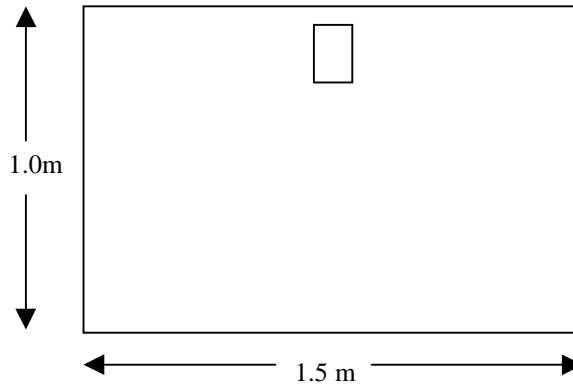
The EUT requires no special accessories to comply with the limits.

3.4 Equipment Modifications

No modifications were made to achieve the required specification limits.



3.5 Configuration of Tested System



The Equipment Under Test (EUT) was tested as a stand-alone unit. Before the field strength measurements, a new battery was inserted in the EUT.

3.6 Details of Tested System

The following table lists all of the components of the tested system. FCC ID numbers are included if available for a tested system component. Refer to the table following Tested System Details for cabling information.

<i>Item No.</i>	<i>Manufacturer</i>	<i>Description</i>	<i>Identification Numbers</i>
1	Ezen Technologies	Remote Control	Model No: ESS-700 Serial No.: ESS002

The following table lists all of the cabling details for the tested system. Refer to 3.5 configuration of tested system.

<i>Cabling of The Tested System</i>					
<i>Item No.</i>	<i>Description</i>	<i>Length (m)</i>	<i>Type Shielded-S Unshielded-US</i>	<i>Connected From</i>	<i>Connected To</i>
A	The EUT has no interfacing cables				



4. BLOCK DIAGRAM(S) OF EUT

Please refer to the Attachment section of this report for a Block Diagram of the EUT.



5. TEST MEASUREMENT PHOTOS

5.1 Radiated Emissions Test Setup



5.2 EUT Construction (Front View)



5.3 EUT Construction (Rear View)



5.4 EUT w/ Front Enclosure Removed



Garwood Laboratories, Inc. - *World Compliance Division*
Electromagnetic Compatibility

5.5 EUT PCB Side 1



5.6 EUT PCB Component Side 2



6. Test Data

6.1 Conducted Emissions Limits

<i>FCC Part 15, Subpart C, §15.207</i>	
<i>Frequency Range (MHz)</i>	<i>Class B Limit (dBμV)</i>
0.45 to 1.705	48
1.705 to 30.0	48

6.2 Conducted Emissions Results

The conducted emissions test was not performed and does not apply since the EUT derives its operating voltage from a battery.



6.3 Radiated Emissions Limits

<i>FCC Part 15, Subpart C, § 15.231</i>		
<i>Fundamental frequency</i>	<i>Field Strength of Fundamental (microvolts/meter)</i>	<i>Field Strength of Spurious Emissions (microvolts/meter)</i>
40.66 - 40.70	2250	225
70 - 130	1250	125
130 - 174	1,250 to 3,750*	125 to 375*
174 - 260	3,750	375
260 - 470	3,750 to 12,500*	375 to 1,250*
Above 470	12,500	1,250

*Linear Interpolations.

The following formula was used for linear interpolations: $(125/3) * f \text{ (MHz)} - (21250/3) = \mu\text{V/m at } 3\text{m}$

The applicable limits for the remote control are those listed for fundamental frequencies falling within the frequency band of 260 – 470 MHz.



6.4 Radiated Emissions Results

The following table lists the fundamental and harmonic emission frequencies, spectrum analyzer measured levels, correction factor (includes cable loss, preamplifier gain and antenna factor), the corrected reading, and the specification limit.

EUT Name: Remote Control (Digital Video Intruder Detection System)
Test Requirement: Field Strength of Emissions from Intentional Radiators
(Reference: FCC PT.15, Subpart C, §15.231)
Fundamental Frequency tuned at: 311 MHz

Antenna Polarity (V or H)	Frequency (MHz)	S.A. Reading (dBμV)	Correction Factor (dB)	Field Strength (dBμV/m)	Field Strength (μV/m)	FCC Limit 3 meters (μV/m)
V	311	69.6	-5.1	64.5	1678.8	587.5
H	311	79.9	-5.1	74.8	5495.4	587.5
V	316	43.8	-4.8	39.0	89.12	587.5
H	316	53.3	-4.8	48.5	266.0	587.5
V	622	47.7	3.3	51.0	354.8	587.5
H	622	47.8	3.3	51.1	358.9	587.5
V	933	41.2	8.8	50.0	316.2	587.5
H	933	50.2	8.8	Peak 59.0 Avg. 52.35	Peak 891.3 Avg. 414.45	587.5
V	1244	60.60	-6.19	54.41	525.4	587.5
H	1244	61.80	-6.19	Peak 55.61 Avg. 48.96	Peak 603.3 Avg. 280.5	587.5
V	1555	53.40	-4.05	49.35	293.4	587.5
H	1555	52.40	-4.05	48.35	261.5	587.5
V	1866	50.70	-1.38	49.32	292.4	587.5
H	1866	49.30	-1.38	47.92	248.9	587.5
V	2177	NDS	1.01-	NDS	NDS	587.5
H	2177	45.0	1.01	46.01	199.8	587.5
V	2488	-	-	NDS	NDS	587.5
H	2488	-	-	NDS	NDS	587.5
V	2799	-	-	NDS	NDS	587.5
H	2799	-	-	NDS	NDS	587.5
V	3110	-	-	NDS	NDS	587.5
H	3110	-	-	NDS	NDS	587.5

- All readings are peak with the specified bandwidth unless otherwise stated.
- Average emission measurements were employed and the provisions in §15.35 for averaging pulsed emissions and for limiting peak emissions were followed.

Total on time calculation: $2.5 \text{ ms} * 3 = 7.5 \text{ ms}$

$1.8 \text{ ms} * 15 = 27 \text{ ms}$

$600\mu\text{s} * 20 = 12\text{ms}$

46.5ms

Duty Cycle Calculation $46.5\text{ms} / 100\text{ms} * 100 = 46.5\%$



6.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG$$

Where: FS = Field strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Attenuation Factor

AG = Amplifier gain

Example:

Assume a receiver reading of 52.5 dB μ V is obtained. The Antenna Factor of 7.4 and a Cable Factor of 1.1 is added. The Amplifier Gain of 29 dB is subtracted, giving a field strength of 32 dB μ V/m.

$$FS = 52.5 + 7.4 + 1.1 - 29 = 32 \text{ dB}\mu\text{V/m}$$



6.6 Occupied Bandwidth

Test Requirement:

The bandwidth of the emission for devices operating above 70MHz and below 900MHz should be no wider than 0.25% of the center frequency. The bandwidth is determined at the points 20 dB down from the modulated carrier.

Occupied Bandwidth Requirement:

$$\text{Center Frequency } 311\text{MHz} * 0.25\% = 777.5\text{kHz}$$

Test Results:

The EUT complied with the Occupied Bandwidth requirement. Detailed plots of the test results are enclosed in Appendix B.



APPENDIX A - TEST EQUIPMENT USED

The absolute performance calibration of equipment requiring calibration is performed on an as needed basis in accordance with ANSI/NCSL Z540-1-1994, which supersedes MIL-STD 45662A. However, calibration periods do not exceed one (1) year. The test equipment is capable of making measurements within tolerances of at least +/- 2dB amplitude and +/- 2% frequency deviation. Equipment certifications showing traceability to NIST (National Institute of Standards and Technology) are maintained on file at Garwood Laboratories, Inc. offices in Placentia CA. All equipment is checked and verified for proper operation before and after each series of tests.

A.1 Specific Equipment Used

<i>Test Instrument</i>	<i>Mfg / Model No.</i>	<i>Serial No.</i>	<i>Cal. Due Date</i>
<i>Radiated Emission Test</i>			
EMI Receiver System	Hewlett Packard	System 3	10/14/99
RF Coax Cable	Times Microwave / LMR 600	20180	03/05/00
BiLog Antenna	Chase / CBL6111A	20062	07/09/00
Pre-Amplifier	ISCI / RFPA/Z FL-2000	20007	03/05/00
Preamplifier (Above 1000MHz)	Hewlett Packard / 8449B	20003	10/14/99
Double Ridge Guide Horn Antenna	Emco / 3115	20056	01/27/00

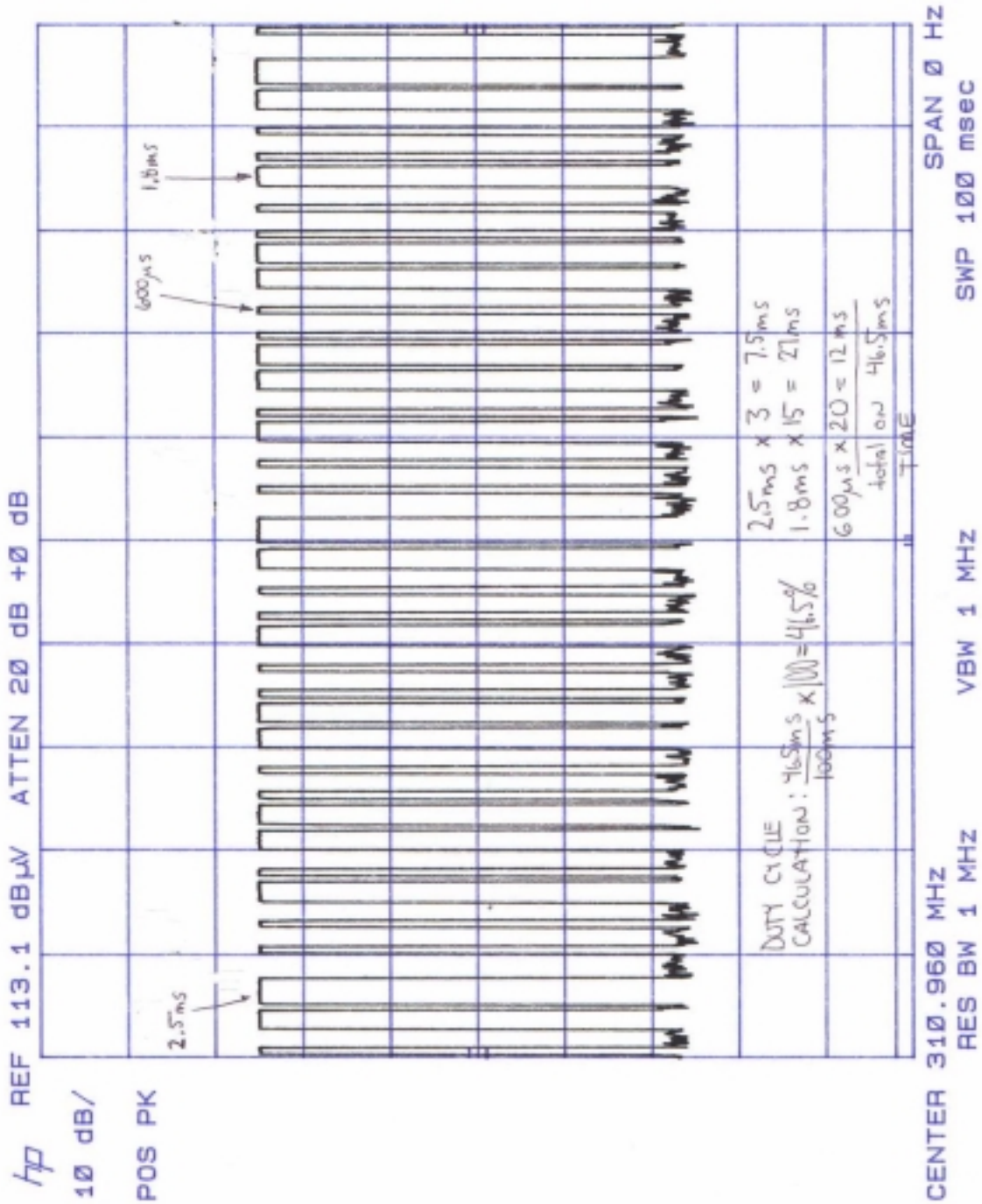


APPENDIX B – SUPPLEMENTAL TEST DATA

<i>Test Type</i>	<i>Basic Standard</i>	<i>Details</i>	<i>Data Format</i>	<i>Page No.</i>
Averaging Pulsed Emissions	FCC Pt.15 Subpart C §15.35	Pulse Train over 100ms	Plotted	B1
Occupied Bandwidth	FCC Pt.15 Subpart C §15.231(c)	Center Frequency 311MHz	Plotted	B2

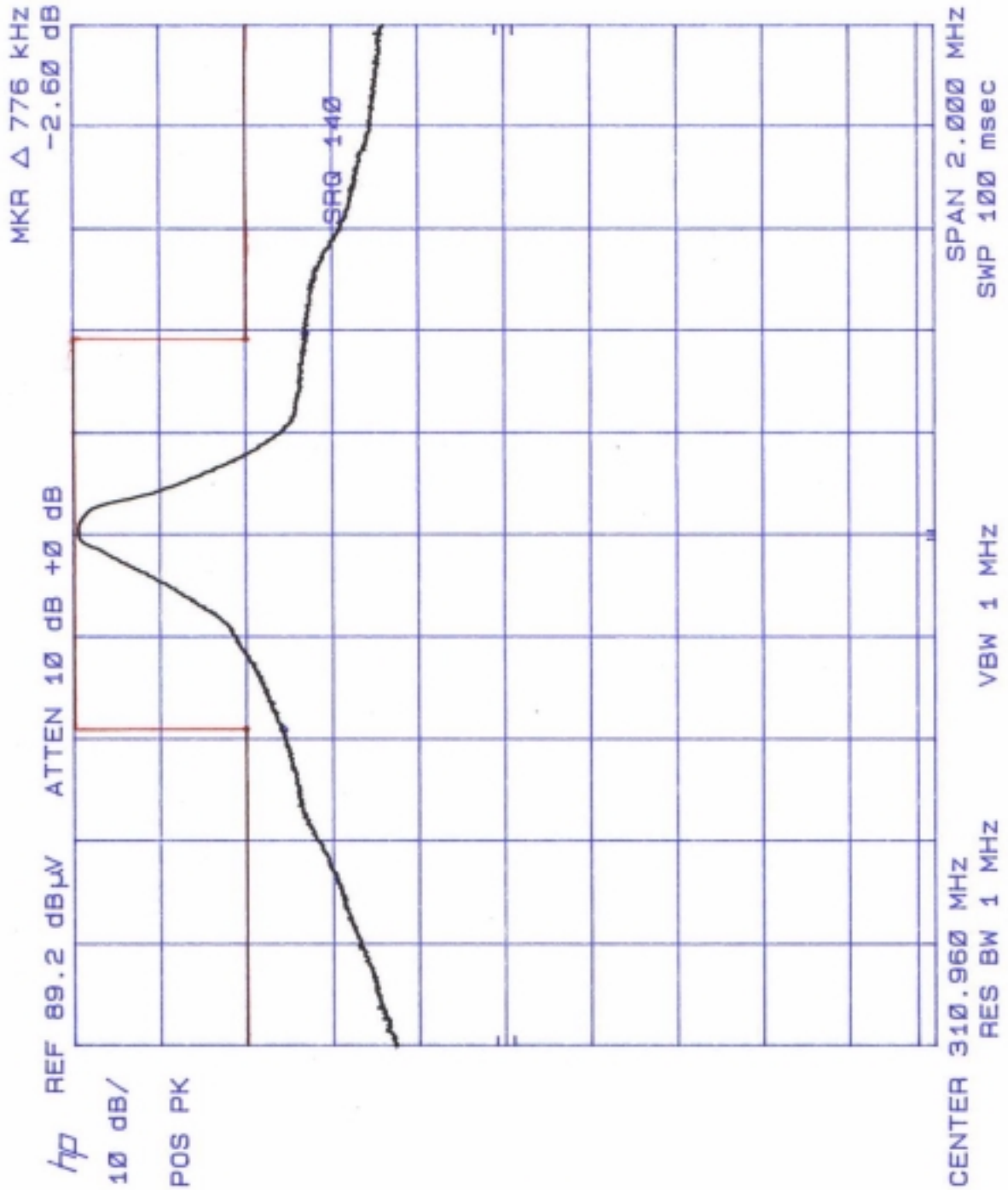


B1





B2





ATTACHMENTS

INDEX OF ATTACHMENTS

<i>Description of Contents</i>	<i>Page No.</i>
Circuit Schematics	Exhibit 1
Parts List	Exhibit 2
PCB Parts Layout	Exhibit 3
Users Manual	Exhibit 4