FCC PART 15, SUBPART B AND C
TEST METHOD: ANSI C63.4-1992

for

TANKSCAN MIR MONITOR

Model: TANKSCAN TL10 SERIES

Prepared for

BARTON INSTRUMENT SYSTEMS
900 SOUTH TURNBULL CANYON ROAD
CITY OF INDUSTRY, CALIFORNIA 91749-1882

Prepared by: Kyle Fujimoto

KYLE FUJIMOTO

Approved by: Scott McCutchan

SCOTT McCUTCHAN

COMPATIBLE ELECTRONICS INC.
114 OLINDA DRIVE
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DATE: MAY 10, 1999

	REPORT BODY	APPENDICES				TOTAL
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GENERAL REPORT SUMMARY

This electromagnetic emission test report is generated by Compatible Electronics Inc., which is an independent testing and consulting firm. The test report is based on testing performed by Compatible Electronics personnel according to the measurement procedures described in the test specifications given below and in the "Test Procedures" section of this report.

The measurement data and conclusions appearing herein relate only to the sample tested and this report may not be reproduced in any form unless done so in full with the written permission of Compatible Electronics.

This report must not be used to claim product endorsement by NVLAP or any other agency of the U.S. Government.

Device Tested:	TankScan MIR Monitor Model: TANKSCAN TL10 SERIES S/N: N/A
Product Description:	See Expository Statement.
Modifications:	The EUT was not modified during the testing.
Manufacturer:	Barton Instrument Systems 900 South Turnbull Canyon Road City of Industry, California 91749-1882
Test Date:	May 4, 1999
IC File # for Canada	IC2154-D
Test Specifications:	EMI requirements FCC Title 47, Part 15 Subpart C, Sections 15.205 and 15.249
Test Procedure:	ANSI C63.4: 1992
Test Deviations:	The test procedure was not deviated from during the testing.

SUMMARY OF TEST RESULTS

TEST	DESCRIPTION	RESULTS
1	Conducted RF Emissions, 450 kHz - 30 MHz	This test was not performed because the EUT runs off four “AA” batteries only and cannot be powered by any device that runs off of the AC public mains.
2	Radiated RF Emissions, 10 kHz - 9300 MHz	Complies with the limits of FCC Title 47, Part 15, Subpart B and Subpart C, sections 15.205 and 15.249

1. PURPOSE

This document is a qualification test report based on the Electromagnetic Interference (EMI) tests performed on the TankScan MIR Monitor Model: TANKSCAN TL10 SERIES. The EMI measurements were performed according to the measurement procedure described in ANSI C63.4: 1992. The tests were performed in order to determine whether the electromagnetic emissions from the equipment under test, referred to as EUT hereafter, are within the specification limits defined by FCC Title 47, Part 15, Subpart B and Subpart C, sections 15.205 and 15.249.

2. ADMINISTRATIVE DATA

2.1 Location of Testing

The EMI tests described herein were performed at the test facility of Compatible Electronics, 114 Olinda Drive, Brea, California 92823.

2.2 Traceability Statement

The calibration certificates of all test equipment used during the test are on file at the location of the test. The calibration is traceable to the National Institute of Standards and Technology (NIST).

2.3 Cognizant Personnel

Barton Instrument Systems

Bill Lee Engineer

Compatible Electronics Inc.

Kyle Fujimoto Test Engineer
Scott McCutchan Lab Manager

2.4 Date Test Sample was Received

The test sample was received on May 4, 1999

2.5 Disposition of the Test Sample

The test sample was returned to Barton Instrument Systems on May 4, 1999.

2.6 Abbreviations and Acronyms

The following abbreviations and acronyms may be used in this document.

RF	Radio Frequency
EMI	Electromagnetic Interference
EUT	Equipment Under Test
P/N	Part Number
S/N	Serial Number
HP	Hewlett Packard
ITE	Information Technology Equipment
CML	Corrected Meter Limit
LISN	Line Impedance Stabilization Network

3. APPLICABLE DOCUMENTS

The following documents are referenced or used in the preparation of this EMI Test Report.

SPEC	TITLE
FCC Title 47, Subpart C.	FCC Rules – Radio frequency devices (including digital devices) – Intentional Radiators
ANSI C63.4 1992	Methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz.
FCC Title 47, Subpart B.	FCC Rules – Radio frequency devices (including digital devices) – Unintentional Radiators

4. DESCRIPTION OF TEST CONFIGURATION

4.1 Description of Test Configuration - EMI

Setup and operation of the equipment under test.

Specifics of the EUT and Peripherals Tested

The TankScan MIR Monitor Model: TANKSCAN TL10 SERIES (EUT) was tested as a stand alone unit. The EUT was mounted on top of a copper cylinder to simulate the tanks that the EUT will mount into. The EUT was continuously transmitting. The antenna is an 8.1 centimeter monopole and is soldered into the PCB.

Final radiated data as well as the final conducted data was taken in the mode above. Please see Appendix D for the data sheets.

4.1.1 Cable Construction and Termination

There are no external cables attached to the EUT.

5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT

5.1 EUT and Accessory List

EQUIPMENT	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	FCC ID
TANKSCAN MIR MONITOR (EUT)	BARTON INSTRUMENT SYSTEMS	TANKSCAN TL10 SERIES	N/A	**OKZ-TL10**

5.2 EMI Test Equipment

EQUIPMENT TYPE	MANU-FACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. DATE	CAL. DUE DATE
Spectrum Analyzer	Hewlett Packard	8566B	3638A08768	Dec. 11, 1998	Dec. 11, 1999
Preamplifier	Com Power	PA-102	01414	Jan. 16, 1999	Jan. 16, 2000
Quasi-Peak Adapter	Hewlett Packard	85650A	2811A01362	April 9, 1999	April 9, 2000
Biconical Antenna	Com Power	AB-100	01543	Oct. 15, 1998	Oct. 15, 1999
Log Periodic Antenna	Com Power	AL-100	01011	Oct. 15, 1998	Oct. 15, 1999
Antenna Mast	Com Power	AM-100	N/A	N/A	N/A
Turntable	Com Power	TT-100	N/A	N/A	N/A
Computer	Hewlett Packard	HP98561A	2522A05178	N/A	N/A
Printer	Hewlett Packard	2225A	2925S33268	N/A	N/A
Plotter	Hewlett Packard	7440A	8726K38417	N/A	N/A
Microwave Preamplifier	Hewlett Packard	8449B	3008A008766	Jan. 30, 1999	Jan. 30, 2000
Horn Antenna	Antenna Research	DRG-118/A	1053	Dec. 8, 1995	N/A
Loop Antenna	Com-Power	AL-130	25309	April 13, 1999	April 13, 2000

6. TEST SITE DESCRIPTION

6.1 Test Facility Description

Please refer to section 2.1 and 7.1 of this report for EMI test location.

6.2 EUT Mounting, Bonding and Grounding

The EUT was mounted on a 1.0 by 1.5 meter non-conductive table 0.8 meters above the ground plane.

The EUT was grounded to the copper cylinder to simulate its actual usage when mounted to a tank.

7. TEST PROCEDURES

The following sections describe the test methods and the specifications for the tests. Test results are also included in this section.

7.1 Radiated Emissions (Spurious and Harmonics) Test

The spectrum analyzer was used as a measuring meter along with the quasi-peak adapter. Amplifiers were used to increase the sensitivity of the instrument. The Com Power Preamplifier Model: PA-102 was used for frequencies from 30 MHz to 1 GHz, and the Hewlett Packard Microwave Preamplifier Model: 8449B was used for frequencies above 1 GHz. The spectrum analyzer was used in the peak detect mode with the "Max Hold" feature activated. In this mode, the spectrum analyzer records the highest measured reading over all the sweeps. The quasi-peak adapter was used only for those readings which are marked accordingly on the data sheets. The measurement bandwidths and transducers used for the radiated emissions test were:

FREQUENCY RANGE	EFFECTIVE MEASUREMENT BANDWIDTH	TRANSDUCER
10 kHz to 150 kHz	200 Hz	Active Loop Antenna
150 kHz to 30 MHz	9 kHz	Active Loop Antenna
30 MHz to 300 MHz	120 kHz	Biconical Antenna
300 MHz to 1 GHz	120 kHz	Log Periodic Antenna
1 GHz to 9.3 GHz	1 MHz	Horn Antenna

The open field test site of Compatible Electronics, Inc. was used for radiated emission testing. This test site is set up according to ANSI C63.4: 1992. Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The turntable supporting the EUT is remote controlled using a motor. The turntable permits EUT rotation of 360 degrees in order to maximize emissions. Also, the antenna mast allows height variation of the antenna from 1 meter to 4 meters. Data was collected in the worst case (highest emission) configuration of the EUT. At each reading, the EUT was rotated 360 degrees and the antenna height was varied from 1 to 4 meters (for E field radiated field strength). The gunsight method was used when measuring with the horn antenna in order to ensure accurate results.

The presence of ambient signals was verified by turning the EUT off. In case an ambient signal was detected, the measurement bandwidth was reduced temporarily and verification was made that an additional adjacent peak did not exist. This ensures that the ambient signal does not hide any emissions from the EUT. The EUT was tested at a 3 meter test distance to obtain final test data.

8. CONCLUSIONS

The TankScan MIR Monitor Model: TANKSCAN TL10 SERIES meets all of the specification limits defined in FCC Title 47, Part 15, Subpart B and Subpart C, sections 15.205 and 15.249.

APPENDIX A

MODIFICATIONS TO THE EUT

MODIFICATIONS TO THE EUT

The modifications listed below were made to the EUT to pass FCC 15.249 specifications.

All the rework described below was implemented during the test in a method that could be reproduced in all the units by the manufacturer.

Modifications:

No modifications were made to the EUT.

APPENDIX B

ADDITIONAL MODELS COVERED UNDER THIS REPORT

ADDITIONAL MODELS COVERED UNDER THIS REPORT

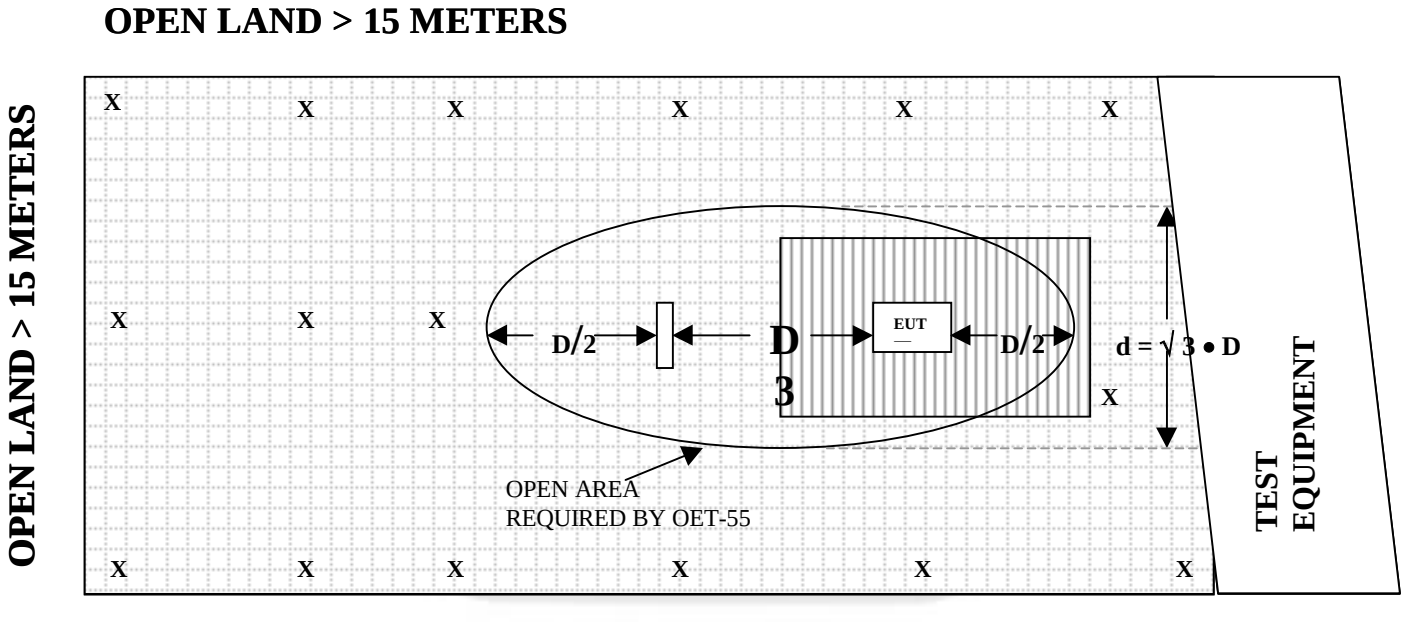
USED FOR THE PRIMARY TEST	TankScan MIR Monitor Model: TANKSCAN TL10 SERIES S/N: N/A

There were no additional models covered under this report.

APPENDIX C

DIAGRAMS, CHARTS AND PHOTOS

FIGURE 1: PLOT MAP AND LAYOUT OF RADIATED SITE



FRONT VIEW

BARTON INSTRUMENT SYSTEMS
TANKSCAN MIR MONITOR
Model: TANKSCAN TL10 SERIES
FCC SUBPART C - RADIATED EMISSIONS – 5-4-99

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

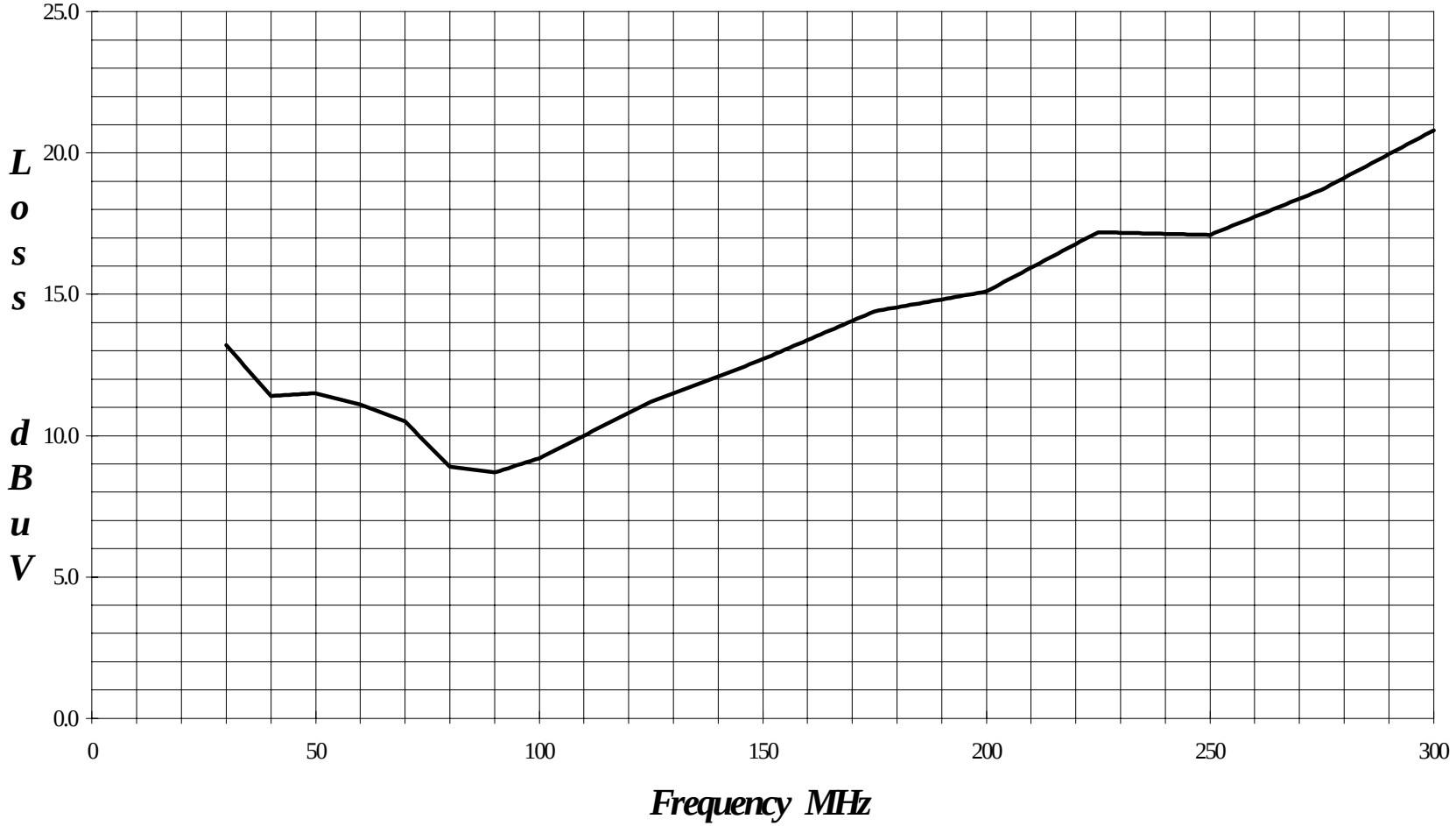
REAR VIEW

BARTON INSTRUMENT SYSTEMS
TANKSCAN MIR MONITOR
Model: TANKSCAN TL10 SERIES
FCC SUBPART C - RADIATED EMISSIONS – 5-4-99

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

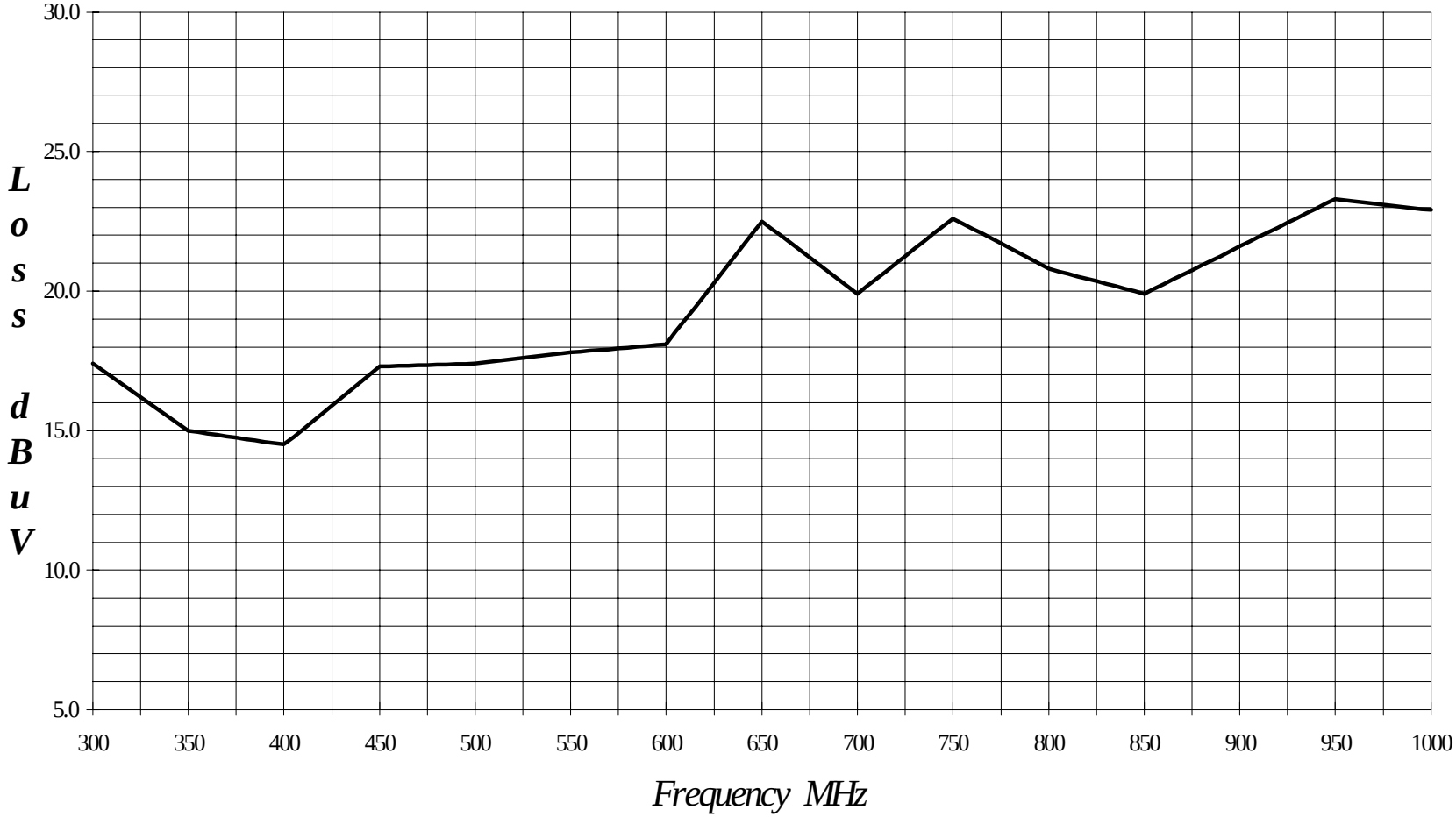
***Cal*: 10/15/98**

LAB "B" BICONICAL ANTENNA AB-100 S/N 01543



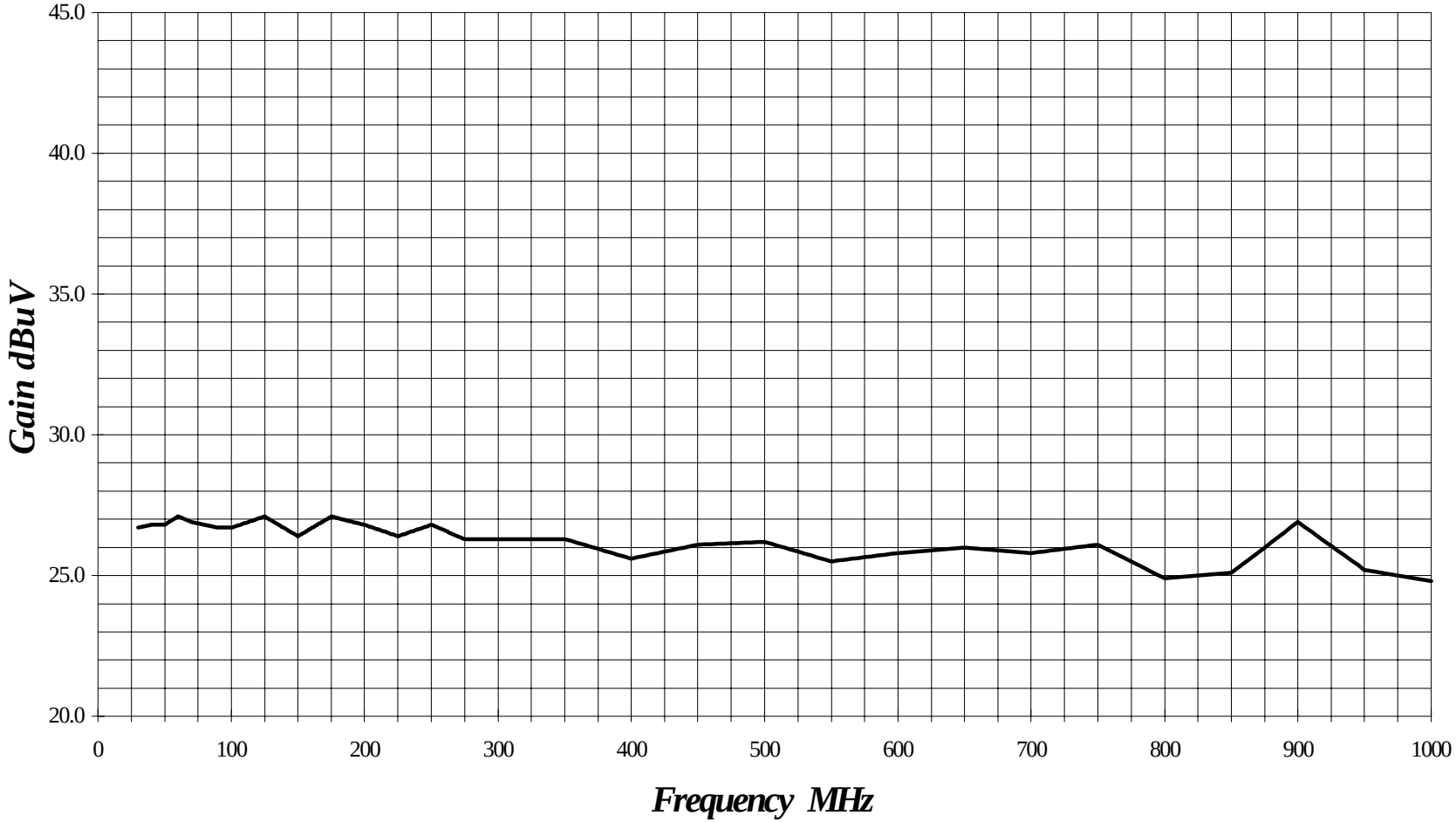
***Cal*: 10/15/98**

LAB "B" LOG PERIODIC ANTENNA AL-100 S/N 01011



Lab "B" Effective: **5/3/99** *Effective Gain = Preamplifier Gain – Cable Loss*

PREAMPLIFIER EFFECTIVE GAIN AT 3 METERS PA-102 S/N: 1414



HEWLETT PACKARD 8449B

MICROWAVE PREAMPLIFIER

S/N: 3008A008766

CALIBRATION DATE: JANUARY 30, 1999

FREQUENCY (GHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
1.0	36.9	9.5	34.3
1.1	36.3	10.0	33.7
1.2	36.4	10.5	34.1
1.3	36.2	11.0	33.7
1.4	36.3	11.5	34.0
1.5	35.7	12.0	33.9
1.6	35.9	12.5	34.4
1.7	35.7	13.0	32.9
1.8	35.6	13.5	31.6
1.9	35.5	14.0	31.8
2.0	35.4	14.5	31.9
2.5	35.6	15.0	32.2
3.0	35.2	15.5	32.8
3.5	35.2	16.0	32.4
4.0	34.3	16.5	32.1
4.5	34.1	17.0	32.3
5.0	34.3	17.5	30.3
5.5	33.0	18.0	31.5
6.0	34.1	18.5	31.2
6.5	34.5	19.0	32.2
7.0	34.3	19.5	32.0
7.5	33.9	20.0	32.0
8.0	34.5	20.5	33.2
8.5	34.5	21.0	30.9
9.0	34.4	22.0	32.1

ANTENNA RESEARCH ASSOCIATES, INC.
11317 Frederick Avenue, Beltsville, MD 20705

E-FIELD ANTENNA FACTOR CALIBRATION

E(dB V/m) = Vo(dB V) + AFE(dB/m)

Model number : DRG-118/A

Frequency GHz	AFE dB/m	Gain dBi
1	22.3	8.0
2	26.7	9.5
3	29.7	10.1
4	29.5	12.8
5	32.3	12.0
6	32.4	13.4
7	36.1	11.0
8	37.4	10.9
9	36.8	12.5
10	39.5	10.7
11	39.6	11.5
12	39.8	12.0
13	39.7	12.8
14	41.8	11.3
15	41.9	11.9
16	38.1	16.3
17	41.0	13.9
18	46.5	8.9

Serial number : 1053
Job number : 96-092
Remarks : 3 meter calibration
Standards : LPD-118/A, TE-1000

Temperature : 72° F
Humidity : 56 %
Traceability : A01887
Date : December 08, 1995

Calibrated By

Com-Power Corporation

(949) 587-9800

Antenna Calibration

Antenna Type:	Loop Antenna
Model:	AL-130
Serial Number:	25309
Calibration Date:	4/13/99

Frequency MHz	Magnetic (dB/m)	Electric dB/m
0.01	-40.6	10.9
0.02	-41.5	10.0
0.03	-39.9	11.6
0.04	-40.2	11.3
0.05	-41.5	10.0
0.06	-41.1	10.4
0.07	-41.3	10.2
0.08	-41.6	9.9
0.09	-41.7	9.8
0.1	-41.7	9.8
0.2	-44.0	7.5
0.3	-41.6	9.9
0.4	-41.6	9.9
0.5	-41.7	9.8
0.6	-41.5	10.0
0.7	-41.4	10.1
0.8	-41.5	10.0
0.9	-41.6	9.9
1	-41.2	10.3
2	-40.5	11.0
3	-40.8	10.7
4	-41.0	10.5
5	-40.5	11.0
6	-40.5	11.0
7	-40.7	10.8
8	-40.8	10.7
9	-40.1	11.4
10	-40.4	11.1
12	-41.0	10.5
14	-42.1	9.4
15	-42.3	9.2
16	-42.7	8.8
18	-41.0	10.5
20	-41.1	10.4
25	-43.4	8.1
30	-45.3	6.2

Trans. Antenna Height	2 meter
Receiving Antenna Height	2 meter

APPENDIX D

DATA SHEETS

Test location: Compatible Electronics
Customer : BARTON INSTRUMENT SYSTEMS Date : 5/4/1999
Manufacturer : BARTON INSTRUMENT SYSTEMS Time : 10.31
EUT name : TANKSCAN MIR MONITOR Model: TANKSCAN TL10 SERIES
Specification: Fcc_B Test distance: 3.0 mtrs Lab: B
Distance correction factor(20*log(test/spec)) : 0.00
Test Mode :
SPURIOUS EMISSIONS 30 MHz - 1000 MHz
TEMPERATURE 61 DEGREES F., RELATIVE HUMIDITY 75%
TESTED BY: Kyle Fujimoto
KYLE FUJIMOTO

Pol	Freq	Rdng	Cable loss	Ant factor	Amp gain	Cor'd rdg = R	limit = L	Delta R-L
	MHz	dBuV	dB	dB	dB	dBuV	dBuV/m	dB
VERTICAL POLARIZATION								
1V	100.01	48.70	1.00	9.40	27.70	31.40	46.00	-14.60
2V	140.02	42.20	1.10	11.10	27.70	26.70	46.00	-19.30
3V	240.60	40.00	1.50	17.40	28.10	30.80	46.00	-15.20
4V	300.75	42.40	1.60	17.40	28.10	33.30	46.00	-12.70
5V	865.64	49.30	3.30	20.40	28.80	44.20	46.00	-1.80
6V	865.64	48.20	3.30	20.40	28.80	43.10Qp	46.00	-2.90
7V	967.47	46.50	3.00	23.20	28.10	44.60	54.00	-9.40
HORIZONTAL POLARIZATION								
1H	100.01	45.50	1.00	9.40	27.70	28.20	46.00	-17.80
2H	140.02	37.60	1.10	11.10	27.70	22.10	46.00	-23.90
3H	365.01	45.00	1.90	14.90	27.90	32.90	46.00	-13.10
4H	865.64	44.60	3.30	20.40	28.80	39.50	46.00	-6.50
5H	967.47	46.80	3.00	23.20	28.10	44.90	54.00	-9.10

Test location: Compatible Electronics
Customer : BARTON INSTRUMENT SYSTEMS Date : 5/4/1999
Manufacturer : BARTON INSTRUMENT SYSTEMS Time : 11.46
EUT name : TANKSCAN MIR MONITOR Model: TANKSCAN TL10 SERIES
Specification: Fcc_B Test distance: 3.0 mtrs Lab: B
Distance correction factor(20*log(test/spec)) : 0.00
Test Mode :
SPURIOUS EMISSIONS 30 MHz - 1000 MHz
TEMPERATURE 61 DEGREES F., RELATIVE HUMIDITY 75%
TESTED BY: Kyle Fujimoto
KYLE FUJIMOTO

NO SPURIOUS EMISSIONS FOUND FROM 10 kHz to 30 MHz
NOR 1000 MHz - 9300 MHz
FOUND IN EITHER POLARIZATION FOR THE EUT

RADIATED EMISSIONS (FCC SUBPART C, SECTION 15.249)

COMPANY	Barton Instrument Systems	**DATE**	5/4/99
EUT	TankScan MIR Monitor	**ANTENNAS**	Log Periodic AND Horn
MODEL	TANKSCAN TL10 SERIES	**POLARIZATION**	SEE BELOW
S/N	N/A	**TEST DISTANCE**	3 METERS
EUT MODE	TRANSMITTING	**LAB**	D

Frequency MHz	Peak Reading (dBuV)	Average or Quasi-Peak (dBuV)	Antenna Height (meters)	Azimuth (degrees)	Distance Factor (dB)	Antenna Factor (dB)	Cable Loss (dB)	Amplifier Gain (dB)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments
VERTICAL ANTENNA POLARIZATION												
916.50	65.9	65.8	1.5	180	0.0	22.1	2.9	0.0	90.8	-3.2	94.0	
1833.00	58.0	55.0	1.5	180	0.0	24.5	3.1	35.6	47.0	-7.0	54.0	
2749.50	53.6	50.5	2.0	180	0.0	28.2	3.4	35.6	46.5	-7.5	54.0	
3666.00	51.1	47.6	1.5	180	0.0	29.6	3.8	35.2	45.8	-8.2	54.0	
4582.50	48.5	45.9	1.5	0	0.0	30.9	8.4	34.1	51.1	-2.9	54.0	
5499.00	46.2	41.5	1.5	180	0.0	32.4	6.9	33.0	47.8	-6.2	54.0	
6415.50	42.3	38.7	2.0	270	0.0	34.3	8.3	34.5	46.8	-7.2	54.0	
7332.00	41.2	34.5	1.5	180	0.0	36.8	10.3	33.9	47.7	-6.3	54.0	
8248.50	"--"	"--"	1.5	180	0.0	37.4	10.4	34.5	"--"	"--"	54.0	
9165.00	"--"	"--"	1.5	180	0.0	36.8	12.9	34.4	"--"	"--"	54.0	
HORIZONTAL POLARIZATION												
916.50	53.4	53.3	1.5	180	0.0	22.1	2.9	0.0	78.3	-15.7	94.0	
1833.00	54.0	51.5	1.5	180	0.0	24.5	3.1	35.6	43.5	-10.5	54.0	
2749.50	49.8	46.7	3.0	0	0.0	28.2	3.4	35.6	42.7	-11.3	54.0	
3666.00	48.7	43.5	1.5	180	0.0	29.6	3.8	35.2	41.7	-12.3	54.0	
4582.50	47.9	43.6	1.5	180	0.0	30.9	8.4	34.1	48.8	-5.2	54.0	
5499.00	43.2	38.7	3.0	180	0.0	32.4	6.9	33.0	45.0	-9.0	54.0	
6415.50	41.2	36.5	1.5	90	0.0	34.3	8.3	34.5	44.6	-9.4	54.0	
7332.00	40.1	35.2	3.0	0	0.0	36.8	10.3	33.9	48.4	-5.6	54.0	
8248.50	"--"	"--"	1.5	180	0.0	37.4	10.4	34.5	"--"	"--"	54.0	
9165.00	"--"	"--"	1.5	180	0.0	36.8	12.9	34.4	"--"	"--"	54.0	

* CORRECTED READING = METER READING + ANTENNA FACTOR + CABLE LOSS - AMPLIFIER GAIN

** DELTA = SPEC LIMIT - CORRECTED READING

*** BELOW 1 GHz, QUASI-PEAK MEASUREMENT IS EMPLOYEED, ABOVE 1 GHz, AVERAGE MEASUREMENT IS EMPLOYED

"--" NO HARMONICS FOUND AT THIS FREQUENCY

COMPATIBLE ELECTRONICS