

*FCC PART 15, SUBPART C
TEST REPORT*

for

RF MODEM SYSTEM - TX

Model: SCORELINK 200

Prepared for

**ELECTRO-MECH SCOREBOARD COMPANY
#3 INDUSTRIAL PARKWAY
WRIGHTSVILLE, GEORGIA 31096**

**COMPATIBLE ELECTRONICS INC.
114 OLINDA DRIVE
BREA, CALIFORNIA 92823
(714) 579-0500**

DATE: APRIL 16, 2001

REPORT BODY	APPENDICES	TOTAL				
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D	Data Sheets
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LIST OF FIGURES

FIGURE	TITLE
1	Conducted Emissions Test Setup
2	Plot Map And Layout of Test Site



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 without the written permission of Compatible Electronics, unless done so in full.

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

Device Tested: RF Modem System - Tx
 Model: Scorelink 200
 S/N: N/A

Product Description: See Expository Statement.

Modifications: The EUT was modified during the testing. Please see Appendix A for a list of the modifications.

Manufacturer: Electro-Mech Scoreboard Company
 #3 Industrial Parkway
 Wrightsville, Georgia 31096

Test Date: April 11, 2001

File # For Canada: IC2154-D

Test Specifications: EMI requirements
 CFR Title 47, Part 15 Subpart B and Subpart C, Sections 15.205, 15.207, 15.209, 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	Complies with the limits of CFR Title 47, Part 15, Subpart B and Subpart C, section 15.207
2	Radiated RF Emissions, 10 kHz - 9300 MHz	Complies with the limits of CFR Title 47, Part 15, Subpart B and Subpart C, sections 15.205, 15.209, and 15.249

1. PURPOSE

This document is a qualification test report based on the Electromagnetic Interference (EMI) tests performed on the RF Modem System - Tx Model: Scorelink 200. 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 CFR Title 47, Part 15, Subpart B and Subpart C, sections 15.205, 15.207, 15.209, 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

Electro-Mech Scoreboard Company

Tom Ledbetter	Engineer
Dan Ryan	Engineer
Allen McMichael	President

Compatible Electronics Inc.

Kyle Fujimoto	Test Engineer
Scott McCutchan	Lab Manager

2.4 Date Test Sample was Received

The test sample was received on April 6, 2001.

2.5 Disposition of the Test Sample

The test sample has not been returned to Electro-Mech Scoreboard Company as of April 16, 2001.

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
Tx	Transmitter
Rx	Receiver



3. APPLICABLE DOCUMENTS

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

SPEC	TITLE
CFR Title 47, Part 15	FCC Rules – Radio frequency devices (including digital devices)
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.



4. DESCRIPTION OF TEST CONFIGURATION

4.1 Description of Test Configuration - EMI

Specifics of the EUT and Peripherals Tested

The RF Modem System - Tx Model: Scorelink 200 (EUT) was connected to a computer and AC Adapter via its signal and power ports, respectively. The computer was also connected to the monitor, printer, mouse, and keyboard via its video, parallel, mouse, and keyboard ports, respectively. The EUT was transmitting data from a simulator scoreboard program on the computer to the RF Modem System – Rx via a wireless link. The RF Modem System – Rx was connected to a laptop and AC Adapter via its signal and power ports, respectively. The RF Modem System – Rx and its accessories were located approximately 50 feet away from the test site.

During the initial investigation, the EUT was mounted both vertically (using a 10 cm non-conductive block) and horizontally (placed flat on the non-conductive table). The emissions were found to be the worst case when the EUT was mounted vertically.

The antenna connector on the EUT is a reverse polarity SMA.

The final radiated as well as conducted data was taken in the configuration described above. Please see Appendix D for the data sheets.



4.1.1**Cable Construction and Termination****Cable 1**

This is a 2 meter unshielded cable connecting the EUT to the computer. It has a 1/4 inch signal jack at the EUT end and a D-9 pin metallic connector at the computer end. The cable was bundled to a length of 1 meter.

Cable 2

This is a 6 foot unshielded cable connecting the EUT to the AC Adapter. It has a 1/8 inch power connector at the EUT end and is hard wired into the AC Adapter.

Cable 3

This is a 1 meter braid and foil shielded cable connecting the computer to the monitor. It has a high density D-15 pin metallic connector at each end. The shield of the cable was grounded to the chassis via the connectors.

Cable 4

This is a 5 foot braid and foil shielded cable connecting the printer to the computer. It has a Centronics metallic type connector at the printer end and a D-25 pin metallic connector at the computer end. The cable was bundled to a length of 1 meter. The shield of the cable was grounded to the chassis via the connectors.

Cable 5

This is a 4 foot foil shielded cable connecting the computer to the keyboard. It has a 6 pin metallic mini DIN connector at the computer end and is hard wired into the keyboard. The shield of the cable was grounded to the chassis via the connector.

Cable 6

This is a 6 foot foil shielded cable connecting the computer to the mouse. It has a 6 pin metallic mini DIN connector at the computer end and is hard wired into the mouse. The shield of the cable was grounded to the chassis via the connector.

Cable 7

This is a 1.5 meter unshielded cable connecting the RF Modem System – Rx with the laptop. It has a 2 pin terminal block at the RF Modem System – Rx end and a D-9 pin metallic connector at the laptop end.

Cable 8

This is a 6 foot unshielded cable connecting the RF Modem System – Rx to the AC Adapter. It has a 1/8 inch power connector at the RF Modem System – Rx end and is hard wired into the AC Adapter.



5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT

5.1 EUT and Accessory List

EQUIPMENT	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	FCC ID
RF MODEM SYSTEM - Tx (EUT)	ELECTRO-MECH SCOREBOARD COMPANY	SCORELINK 200	N/A	PIJ-SL-200-300
CLASS 2 POWER SUPPLY FOR THE EUT	SHOGYO	280902003C0	N/A	N/A
MONITOR	TWE	PX-14S	901105357	IKGPX14S
COMPUTER	DELL	MCM	CLFHF	DoC
MOUSE	HEWLETT PACKARD	MU07J	09C09002	DoC
KEYBOARD	HEWLETT PACKARD	5125	M82309909	DoC
PRINTER	CITIZEN	LSP-10	1184398-77	DLK66TLSP-10
LAPTOP	TOSHIBA	PA1241U XCD	87142725	DoC
CLASS 2 POWER SUPPLY FOR THE RF MODEM SYSTEM - Rx	SHOGYO	280902003C0	N/A	N/A
RF MODEM SYSTEM - Rx	ELECTRO-MECH SCOREBOARD COMPANY	SCORELINK 200	N/A	DoC



5.2 EMI Test Equipment

EQUIPMENT TYPE	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. DATE	CAL. DUE DATE
Spectrum Analyzer	Hewlett Packard	8566B	3701A22262	June 24, 2000	June 24, 2001
Preamplifier	Com Power	PA-102	1017	Jan. 5, 2001	Jan. 5, 2002
Quasi-Peak Adapter	Hewlett Packard	85650A	2811A01363	June 24, 2000	June 24, 2001
Biconical Antenna	Com Power	AB-100	1548	Oct. 16, 2000	Oct. 16, 2001
Log Periodic Antenna	Com Power	AL-100	16101	Oct. 16, 2000	Oct. 16, 2001
RF Attenuator	Weinschel Corp.	2	BJ6396	Aug. 2, 2000	Aug. 2, 2001
LISN	Com Power	LI-215	12078	Nov. 11, 2000	Nov. 11, 2001
LISN	Com Power	LI-215	12082	Nov. 21, 2000	Nov. 21, 2001
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	Com-Power	PA-122	25195	Jan. 9, 2001	Jan. 9, 2002
Horn Antenna	Antenna Research	DRG-118/A	1053	Jan. 15, 2001	Jan. 15, 2002
Loop Antenna	Com-Power	AL-130	25309	May 25, 2000	May 25, 2001



6. TEST SITE DESCRIPTION

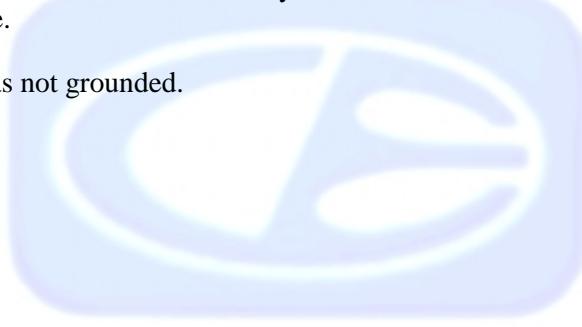
6.1 Test Facility Description

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 not grounded.



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

Conducted Emissions Test

The spectrum analyzer was used as a measuring meter. The data was collected with the spectrum analyzer in the peak detect mode with the "Max Hold" feature activated. The quasi-peak was used only where indicated in the data sheets. A 10 dB attenuation pad was used for the protection of the spectrum analyzer input stage, and the offset was adjusted accordingly to read the actual data measured. The LISN output was measured using the spectrum analyzer. The output of the second LISN was terminated by a 50 ohm termination. The effective measurement bandwidth used for this test was 9 kHz.

Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The EUT was powered through the LISN, which was bonded to the ground plane. The LISN power was filtered and the filter was bonded to the ground plane. The EUT was set up with the minimum distances from any conductive surfaces as specified in ANSI C63.4: 1992. The excess power cord was wrapped in a figure eight pattern to form a bundle not exceeding 0.4 meters in length.

The conducted emissions from the EUT were maximized for operating mode as well as cable placement. The final data was collected under program control by the Compatible Electronics conducted emissions software in several overlapping sweeps by running the spectrum analyzer at a minimum scan rate of 10 seconds per octave. The final qualification data is located in Appendix D.



7.2

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 Com Power Microwave Preamplifier Model: PA-122 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.

For the peak readings below 1000 MHz that were within 3 dB of the spec limit or higher, the quasi-peak adapter was used.

For the peak readings above 1000 MHz that were within 3dB of the spec limit or higher, the readings were averaged manually by narrowing the video filter down to 10 Hz and slowing the sweep time to keep the amplitude reading calibrated.

The measurement bandwidths and transducers used for the radiated emissions test were:

FREQUENCY RANGE	EFFECTIVE MEASUREMENT BANDWIDTH	TRANSDUCER
9 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.



Radiated Emissions (Spurious and Harmonics) Test (con't)

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. The final qualification data sheets are located in Appendix D.



7.2

Band Edge Plots of the Low and High Channels

Spectral plots of both the low and high channels were taken of the EUT to show that the emissions at the band edges (902 and 928 MHz) were attenuated by at least 50 dB below the level of the fundamental or to the general radiated emissions limits in FCC Title 47, Subpart C, section 15.209, whichever is the lesser attenuation. A preamplifier was used to boost the signal level at the band edges for easier comparison to the spec limit. The spectral plots are located in Appendix D.



8. CONCLUSIONS

The RF Modem System - Tx Model: Scorelink 200 meets all of the specification limits defined in CFR Title 47, Part 15, Subpart B and Subpart C, sections 15.205, 15.207, 15.209, 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.

- 1) Change R7 from 24 ohms to 33 ohms
- 2) Change R8 from 43 ohms to 27 ohms
- 3) Change R9 from 24 ohms to 33 ohms



APPENDIX B

***ADDITIONAL MODELS COVERED
UNDER THIS REPORT***



ADDITIONAL MODELS COVERED UNDER THIS REPORT

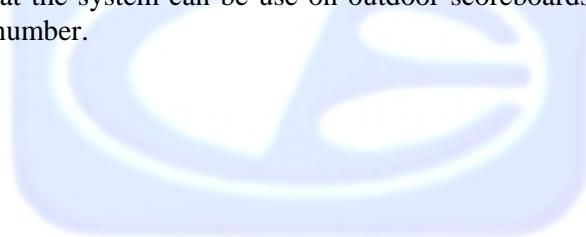
USED FOR THE PRIMARY TEST

RF Modem System - Tx
Model: Scorelink 200
S/N: N/A

ALSO APPROVED UNDER THIS REPORT

RF Modem System – Tx
Model: Scorelink 300
S/N: N/A

The RF Modem System – Tx Model: Scorelink 300 is identical to the RF Modem System – Tx Model: Scorelink 200. The difference is that the receiver that goes with this RF Modem System is also enclosed in a weatherproof enclosure so that the system can be use on outdoor scoreboards. The exact same transmitter will be sold for either model number.



APPENDIX C

DIAGRAMS, CHARTS AND PHOTOS



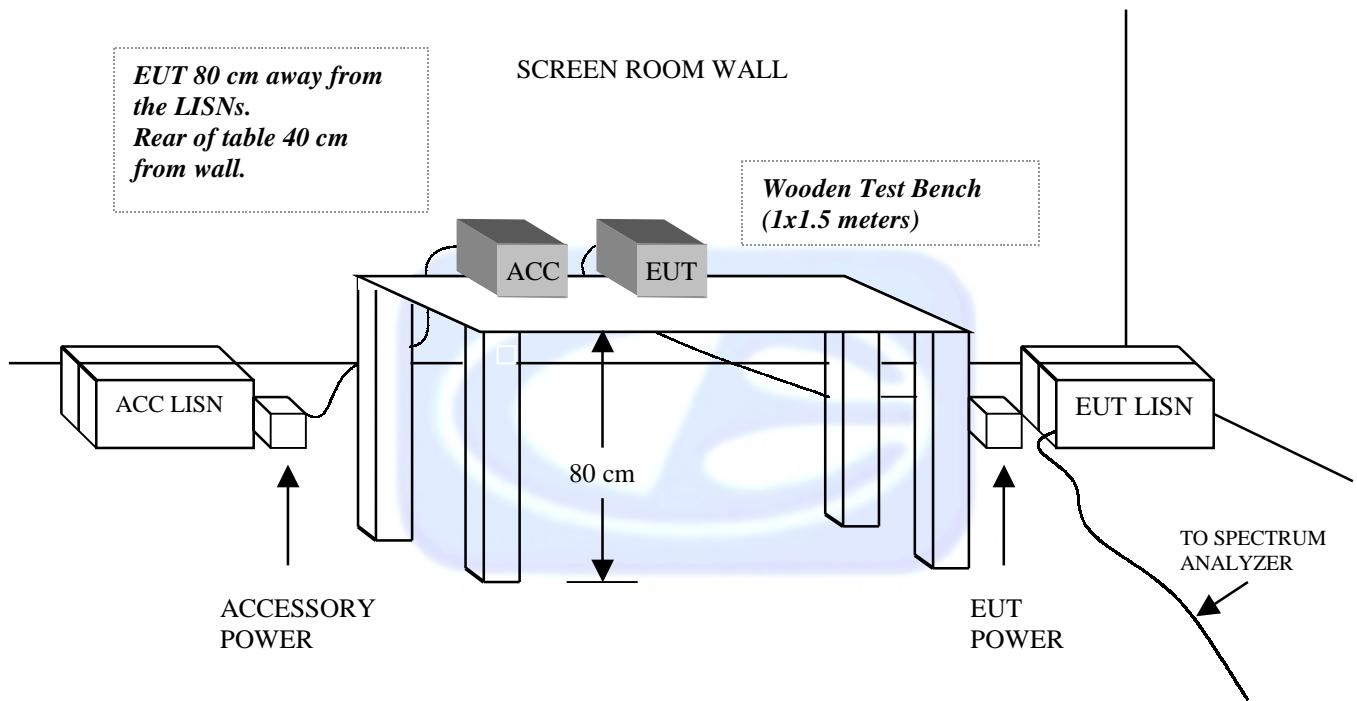
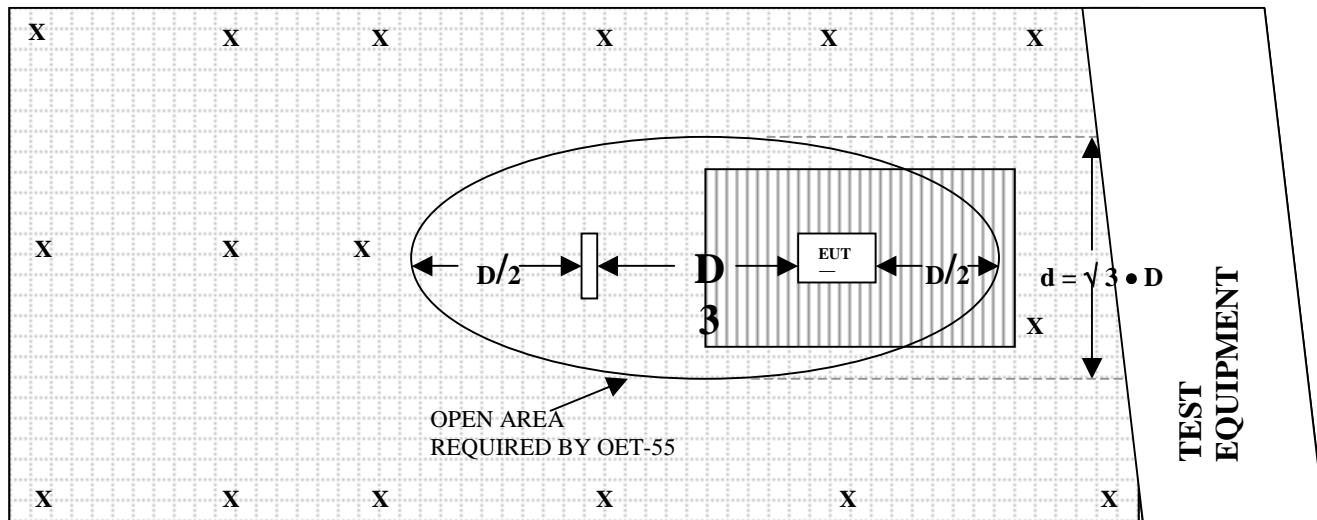
FIGURE 1: CONDUCTED EMISSIONS TEST SETUP

FIGURE 2: PLOT MAP AND LAYOUT OF RADIATED SITE**OPEN LAND > 15 METERS****OPEN LAND > 15 METERS**

	= GROUND RODS		= GROUND SCREEN
	= TEST DISTANCE (meters)		= WOOD COVER



**FRONT VIEW**

ELECTRO-MECH SCOREBOARD COMPANY
RF MODEM SYSTEM - TX
MODEL: SCORELINK 200
FCC SUBPART B AND C - RADIATED EMISSIONS – 4-11-01

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**



**REAR VIEW**

ELECTRO-MECH SCOREBOARD COMPANY
RF MODEM SYSTEM - TX
MODEL: SCORELINK 200
FCC SUBPART B AND C - RADIATED EMISSIONS – 4-11-01

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**



**FRONT VIEW**

ELECTRO-MECH SCOREBOARD COMPANY

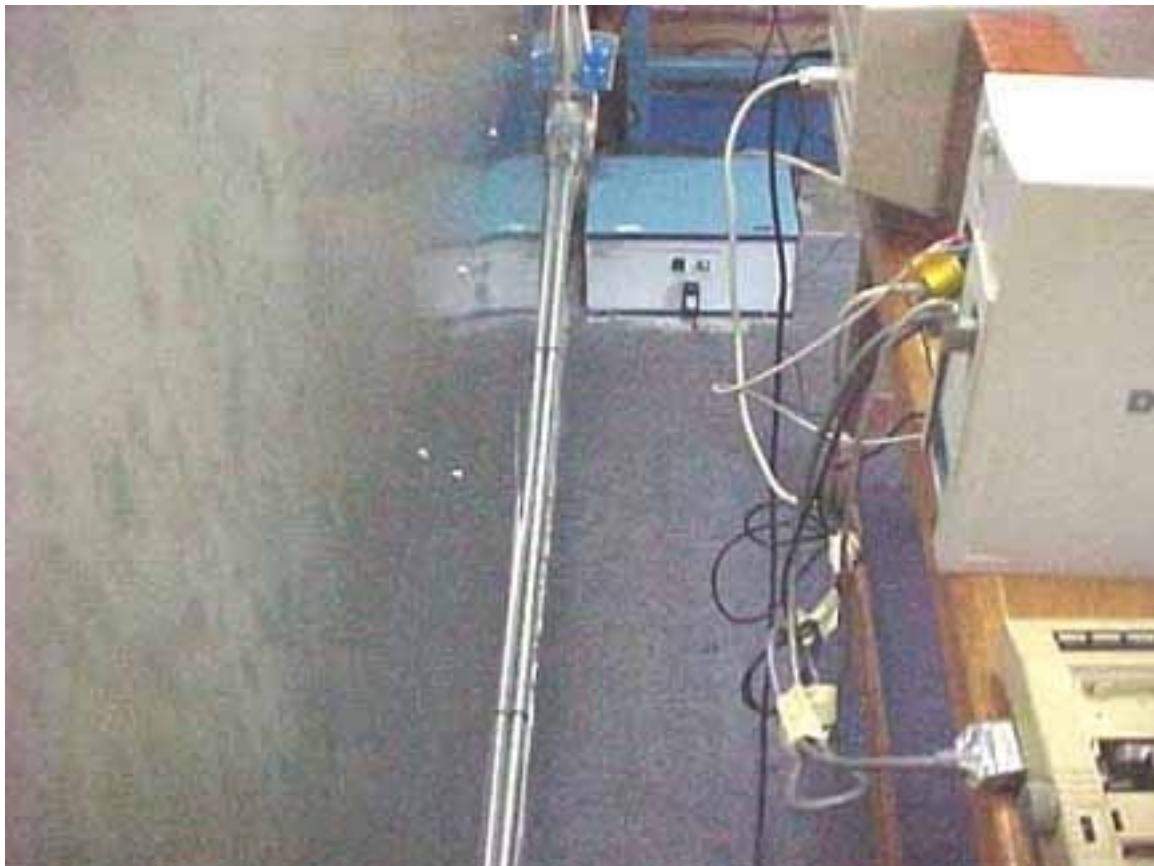
RF MODEM SYSTEM - TX

MODEL: SCORELINK 200

FCC SUBPART B AND C - CONDUCTED EMISSIONS - 4-11-01

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**



**FRONT VIEW**

ELECTRO-MECH SCOREBOARD COMPANY
RF MODEM SYSTEM - TX
MODEL: SCORELINK 200
FCC SUBPART B AND C – CONDUCTED EMISSIONS – 4-11-01

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**



COM-POWER AB-100

BICONICAL ANTENNA

S/N: 01548

CALIBRATION DATE: OCTOBER 16, 2000

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
30	14.01	120	10.33
35	13.63	125	11.61
40	13.26	140	12.70
45	11.62	150	12.95
50	11.03	160	13.58
60	8.52	175	14.82
70	8.94	180	14.84
80	8.17	200	14.80
90	8.08	250	16.42
100	8.64	300	20.26



COM-POWER AL-100

LOG PERIODIC ANTENNA

S/N: 16101

CALIBRATION DATE: OCTOBER 16, 2000

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
300	12.96	700	19.24
400	16.92	800	21.37
500	16.73	900	22.13
600	16.32	1000	22.19



COM-POWER PA-102

PREAMPLIFIER

S/N: 1017

CALIBRATION DATE: JANUARY 5, 2001

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
30	39.0	300	38.9
40	39.2	350	38.9
50	39.2	400	38.6
60	39.2	450	38.5
70	38.8	500	38.7
80	38.6	550	38.4
90	38.5	600	38.8
100	38.7	650	38.5
125	39.2	700	38.6
150	38.8	750	38.1
175	38.8	800	37.9
200	39.0	850	38.0
225	38.8	900	37.8
250	38.8	950	36.9
275	39.0	1000	38.2



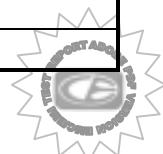
COM-POWER PA-122

MICROWAVE PREAMPLIFIER

S/N: 25195

CALIBRATION DATE: JANUARY 9, 2001

FREQUENCY (GHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
1.0	33.1	9.5	30.7
1.1	33.0	10.0	31.6
1.2	33.2	11.0	30.6
1.3	33.0	12.0	28.5
1.4	32.4	13.0	31.5
1.5	32.3	14.0	33.2
1.6	32.1	15.0	31.5
1.7	32.0	16.0	30.2
1.8	31.8	17.0	31.6
1.9	32.2	18.0	31.7
2.0	32.6		
2.5	31.9		
3.0	31.7		
3.5	31.7		
4.0	32.3		
4.5	31.5		
5.0	32.3		
5.5	34.2		
6.0	30.9		
6.5	32.0		
7.0	32.1		
7.5	33.0		
8.0	31.9		
8.5	31.9		
9.0	31.3		



ANTENNA RESEARCH DRG-118/A

HORN ANTENNA

S/N: 1053

CALIBRATION DATE: JANUARY 15, 2001

FREQUENCY (GHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
1.0	25.4	9.5	39.6
1.5	26.7	10.0	39.7
2.0	29.6	10.5	40.8
2.5	30.7	11.0	40.4
3.0	31.2	11.5	42.2
3.5	32.3	12.0	43.0
4.0	33.2	12.5	42.6
4.5	33.2	13.0	41.3
5.0	34.8	13.5	40.3
5.5	35.4	14.0	40.9
6.0	36.6	14.5	44.0
6.5	36.6	15.0	43.3
7.0	38.7	15.5	42.7
7.5	38.6	16.0	42.6
8.0	37.9	16.5	42.8
8.5	37.9	17.0	43.5
9.0	39.9	17.5	44.6
		18.0	42.2



Com-Power Corporation

(949) 587-9800

Antenna Calibration

Antenna Type:			Loop Antenna
Model:			AL-130
Serial Number:			25309
Calibration Date:			05/25/00
Frequency MHz	Magnetic (dB/m)	Electric dB/m	
0.009	-41.0	10.5	
0.01	-41.0	10.5	
0.02	-41.9	9.6	
0.05	-41.9	9.6	
0.075	-41.8	9.7	
0.1	-42.2	9.3	
0.15	-42.2	9.3	
0.25	-40.7	10.8	
0.5	-42.1	9.4	
0.75	-40.9	10.6	
1	-41.3	10.2	
2	-40.8	10.7	
3	-41.1	10.4	
4	-41.2	10.3	
5	-40.7	10.8	
10	-40.6	10.9	
15	-42.0	9.5	
20	-42.0	9.5	
25	-42.9	8.6	
30	-42.3	9.2	
Trans. Antenna Height	2 meter		
Receiving Antenna Height	2 meter		

APPENDIX D

DATA SHEETS

RADIATED EMISSIONS

DATA SHEETS

RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.249)

COMPANY	ELECTRO-MECH SCOREBOARD COMPANY											DATE	4/11/01
EUT	RF MODEM SYSTEM - TX											DUTY CYCLE	N/A
MODEL	SCORELINK 200											PEAK TO AVG	N/A
S/N	N/A											TEST DIST.	3 METERS
TEST ENGINEER	KYLE FUJIMOTO											LAB	D

Frequency MHz	Peak Reading (dBuV)	Average (A) or Quasi- Peak (QP)	Antenna Polar. (V or H)	Antenna Height (meters)	EUT Azimuth (degrees)	EUT Axis (X,Y,Z)	EUT Tx Channel	Antenna Factor (dB)	Cable Loss (dB)	Amplifier Gain (dB)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments
903.3000	57.3		A	H	1.0	90	Y	LOW	22.1	5.0	0.0	84.5	-9.5	94.0
906.5000	64.7	64.6	A	V	1.0	90	Y	LOW	22.1	5.0	0.0	91.8	-2.2	94.0
912.3000	58.0		A	H	1.5	90	Y	MID	22.1	5.1	0.0	85.2	-8.8	94.0
912.3000	64.5	64.4	A	V	1.5	180	Y	MID	22.1	5.1	0.0	91.6	-2.4	94.0
921.3000	56.8		A	H	1.5	90	Y	HIGH	22.1	5.1	0.0	84.1	-9.9	94.0
921.3000	65.1	65.0	A	V	1.0	180	Y	HGH	22.1	5.1	0.0	92.3	-1.7	94.0

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

** DELTA = SPEC LIMIT - CORRECTED READING

PAGE 1

Test location: Compatible Electronics
 Customer : ELECTRO-MECH SCOREBOARD COMPANY Date : 4/11/2001
 Manufacturer : ELECTRO-MECH SCOREBOARD COMPANY Time : 16.00
 EUT name : RF MODEM SYSTEM - TX Model: SCORELINK 200
 Specification: Fcc_B Test distance: 3.0 mtrs Lab: D
 Distance correction factor($20 \log(\text{test/spec})$) : 0.00
 Test Mode : SPURIOUS EMISSIONS FROM THE EUT
 VERTICAL AND HORIZONTAL POLARIZATION 30 MHz TO 300 MHz
 TEMPERATURE 59 DEGREES F., RELATIVE HUMIDITY 65%
 TESTED BY: 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	61.23	47.40	1.21	8.57	39.15	18.03	40.00	-21.97
2V	65.50	52.60	1.25	8.75	38.98	23.63	40.00	-16.37
3V	80.70	52.90	1.31	8.16	38.59	23.78	40.00	-16.22
4V	99.77	55.20	1.50	8.63	38.70	26.63	43.50	-16.87
5V	110.52	53.90	1.58	9.53	38.91	26.10	43.50	-17.40
6V	160.12	42.50	2.00	13.59	38.80	19.29	43.50	-24.21
7V	196.72	42.20	2.17	14.81	38.97	20.21	43.50	-23.29
HORIZONTAL POLARIZATION								
8V	233.20	51.10	2.30	15.88	38.80	30.47	46.00	-15.53
9H	45.30	44.70	1.05	11.58	39.20	18.14	40.00	-21.86
10H	109.95	45.10	1.58	9.48	38.90	17.26	43.50	-26.24
11H	144.06	43.80	1.93	12.80	38.90	19.64	43.50	-23.86
12H	201.18	46.20	2.20	14.84	38.99	24.25	43.50	-19.25

Test location: Compatible Electronics
 Customer : ELECTRO-MECH SCOREBOARD COMPANY Date : 4/11/2001
 Manufacturer : ELECTRO-MECH SCOREBOARD COMPANY Time : 16.57
 EUT name : RF MODEM SYSTEM - TX Model: SCORELINK 200
 Specification: Fcc_B Test distance: 3.0 mtrs Lab: D
 Distance correction factor($20 \log(\text{test/spec})$) : 0.00
 Test Mode : SPURIOUS EMISSIONS FROM THE EUT
 VERTICAL AND HORIZONTAL POLARIZATION 300 MHz TO 1000 MHz
 TEMPERATURE 59 DEGREES F., RELATIVE HUMIDITY 65%
 TESTED BY: KYLE FUJIMOTO

Pol	Freq	Rdng	Cable	Ant	Amp	Cor'd	limit	Delta
			loss	factor	gain	rdg = R	= L	R-L
	MHz	dBuV	dB	dB	dB	dBuV	dBuV/m	dB
VERTICAL POLARIZATION								
1V	368.70	42.20	3.11	15.67	38.79	22.20	46.00	-23.80
2V	406.49	49.00	3.29	16.90	38.59	30.60	46.00	-15.40
3V	432.17	57.50	3.24	16.85	38.54	39.05	46.00	-6.95
4V	493.08	49.50	3.46	16.74	38.67	31.03	46.00	-14.97
5V	528.17	56.20	3.73	16.61	38.53	38.01	46.00	-7.99
6V	624.14	43.00	3.99	17.02	38.66	25.36	46.00	-20.64
7V	672.99	42.70	4.29	18.45	38.55	26.90	46.00	-19.10
8V	720.15	45.70	4.52	19.67	38.40	31.49	46.00	-14.51
9V	906.49	105.50	5.04	22.13	37.68	94.99	46.00	48.99
10H	336.16	56.60	2.94	14.39	38.90	35.03	46.00	-10.97
HORIZONTAL POLARIZATION								
11H	372.33	43.90	3.13	15.82	38.77	24.09	46.00	-21.91
12H	381.03	43.30	3.19	16.16	38.71	23.93	46.00	-22.07
13H	421.34	37.60	3.26	16.87	38.56	19.17	46.00	-26.83
14H	510.51	49.00	3.58	16.69	38.64	30.63	46.00	-15.37
15H	563.70	49.40	3.87	16.47	38.51	31.23	46.00	-14.77
16H	655.83	42.60	4.22	17.95	38.51	26.26	46.00	-19.74

Test location: Compatible Electronics
Customer : ELECTRO-MECH SCOREBOARD COMPANY Date : 4/11/2001
Manufacturer : ELECTRO-MECH SCOREBOARD COMPANY Time : 17.29
EUT name : RF MODEM SYSTEM - TX Model: SCORELINK 200
Specification: Fcc_B Test distance: 3.0 mtrs Lab: D
Distance correction factor($20 \log(\text{test}/\text{spec})$) : 0.00
Test Mode : SPURIOUS EMISSIONS FROM THE EUT
VERTICAL AND HORIZONTAL POLARIZATION 10 kHz to 30 MHz
TEMPERATURE 59 DEGREES F., RELATIVE HUMIDITY 65%
TESTED BY: KYLE FUJIMOTO

NO EMISSIONS FOUND FROM THE EUT IN
EITHER POLARIZATION FROM 10 kHz TO 30 MHz

RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.249)

COMPANY	ELECTRO-MECH SCOREBOARD COMPANY											DATE	4/11/01
EUT	RF MODEM SYSTEM - TX											DUTY CYCLE	N/A
MODEL	SCORELINK 200											PEAK TO AVG	N/A
S/N	N/A											TEST DIST.	3 METERS
TEST ENGINEER	KYLE FUJIMOTO											LAB	D

Frequency MHz	Peak Reading (dBuV)	Average (A) or Quasi- Peak (QP)	Antenna Polar. (V or H)	Antenna Height (meters)	EUT Azimuth (degrees)	EUT Axis (X,Y,Z)	EUT Tx Channel	Antenna Factor (dB)	Cable Loss (dB)	Amplifier Gain (dB)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments
1813.0000	53.5	52.5	A	H	1.5	180	Y	LOW	28.5	3.4	31.9	52.6	-1.4	54.0
1813.0000	53.1	52.2	A	V	1.0	90	Y	LOW	28.5	3.4	31.9	52.3	-1.7	54.0
1824.6000	53.2	52.1	A	H	1.0	180	Y	MID	28.6	3.4	31.9	52.2	-1.8	54.0
1824.6000	52.8	51.9	A	V	1.0	180	Y	MID	28.6	3.4	31.9	52.0	-2.0	54.0
1842.6000	52.3	51.3	A	H	3.5	180	Y	HIGH	28.7	3.4	32.0	51.4	-2.6	54.0
1842.6000	51.9	51.0	A	V	1.0	180	Y	HIGH	28.7	3.4	32.0	51.1	-2.9	54.0

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

** DELTA = SPEC LIMIT - CORRECTED READING

PAGE 2

RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.249)

COMPANY	ELECTRO-MECH SCOREBOARD COMPANY											DATE	4/11/01
EUT	RF MODEM SYSTEM - TX											DUTY CYCLE	N/A
MODEL	SCORELINK 200											PEAK TO AVG	N/A
S/N	N/A											TEST DIST.	3 METERS
TEST ENGINEER	KYLE FUJIMOTO											LAB	D

Frequency MHz	Peak Reading (dBuV)	Average (A) or Quasi- Peak (QP)	Antenna Polar. (V or H)	Antenna Height (meters)	EUT Azimuth (degrees)	EUT Axis (X,Y,Z)	EUT Tx Channel	Antenna Factor (dB)	Cable Loss (dB)	Amplifier Gain (dB)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments
2719.5000	48.7	45.3 A	H	2.0	180	Y	LOW	30.9	4.2	31.8	48.6	-5.4	54.0	
2719.5000	50.4	47.6 A	V	1.5	180	Y	LOW	30.9	4.2	31.8	50.9	-3.1	54.0	
2736.9000	50.1	47.6 A	H	1.5	180	Y	MID	30.9	4.3	31.8	51.0	-3.0	54.0	
2736.9000	49.1	46.7 A	V	1.5	180	Y	MID	30.9	4.3	31.8	50.0	-4.0	54.0	
2763.9000	48.9	46.2 A	H	1.0	180	Y	HIGH	31.0	4.4	31.8	49.7	-4.3	54.0	
2763.9000	48.7	46.3 A	V	1.5	180	Y	HIGH	31.0	4.4	31.8	49.8	-4.2	54.0	

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

** DELTA = SPEC LIMIT - CORRECTED READING

PAGE 3

RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.249)

COMPANY	ELECTRO-MECH SCOREBOARD COMPANY											DATE	4/11/01
EUT	RF MODEM SYSTEM - TX											DUTY CYCLE	N/A
MODEL	SCORELINK 200											PEAK TO AVG	N/A
S/N	N/A											TEST DIST.	3 METERS
TEST ENGINEER	KYLE FUJIMOTO											LAB	D

Frequency MHz	Peak Reading (dBuV)	Average (A) or Quasi- Peak (QP)	Antenna Polar. (V or H)	Antenna Height (meters)	EUT Azimuth (degrees)	EUT Axis (X,Y,Z)	EUT Tx Channel	Antenna Factor (dB)	Cable Loss (dB)	Amplifier Gain (dB)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments
3626.0000	46.6	42.4	A	H	3.0	0	Y	LOW	32.5	5.1	31.9	48.2	-5.8	54.0
3626.0000	42.7		A	V	1.5	90	Y	LOW	32.5	5.1	31.9	48.5	-5.5	54.0
3649.2000	43.9		A	H	1.5	180	Y	MID	32.6	5.1	31.9	49.7	-4.3	54.0
3649.2000	47.4	43.2	A	V	1.5	180	Y	MID	32.6	5.1	31.9	49.0	-5.0	54.0
3685.2000	44.1		A	H	2.0	180	Y	HIGH	32.6	5.1	31.9	50.0	-4.0	54.0
3685.2000	46.7	42.6	A	V	1.0	180	Y	HIGH	32.6	5.1	31.9	48.4	-5.6	54.0

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

** DELTA = SPEC LIMIT - CORRECTED READING

PAGE 4

RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.249)

COMPANY	ELECTRO-MECH SCOREBOARD COMPANY											DATE	4/11/01
EUT	RF MODEM SYSTEM - TX											DUTY CYCLE	N/A
MODEL	SCORELINK 200											PEAK TO AVG	N/A
S/N	N/A											TEST DIST.	3 METERS
TEST ENGINEER	KYLE FUJIMOTO											LAB	D

Frequency MHz	Peak Reading (dBuV)	Average (A) or Quasi- Peak (QP)	Antenna Polar. (V or H)	Antenna Height (meters)	EUT Azimuth (degrees)	EUT Axis (X,Y,Z)	EUT Tx Channel	Antenna Factor (dB)	Cable Loss (dB)	Amplifier Gain (dB)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments
4532.5000	44.3	38.2	A	H	1.0	90	Y	LOW	33.3	6.2	31.6	46.1	-7.9	54.0
4532.5000	45.4	40.0	A	V	3.0	90	Y	LOW	33.3	6.2	31.6	47.9	-6.1	54.0
4561.5000	44.1	37.1	A	H	1.0	90	Y	MID	33.4	6.1	31.6	45.0	-9.0	54.0
4561.5000	42.9		A	V	1.0	90	Y	MID	33.4	6.1	31.6	50.8	-3.2	54.0
4606.5000	43.7	37.8	A	H	1.0	90	Y	HIGH	33.5	5.9	31.7	45.6	-8.4	54.0
4606.5000	41.4		A	V	1.0	90	Y	HIGH	33.5	5.9	31.7	49.1	-4.9	54.0

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

** DELTA = SPEC LIMIT - CORRECTED READING

PAGE 5

RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.249)

COMPANY	ELECTRO-MECH SCOREBOARD COMPANY											DATE	4/11/01
EUT	RF MODEM SYSTEM - TX											DUTY CYCLE	N/A
MODEL	SCORELINK 200											PEAK TO AVG	N/A
S/N	N/A											TEST DIST.	3 METERS
TEST ENGINEER	KYLE FUJIMOTO											LAB	D

Frequency MHz	Peak Reading (dBuV)	Average (A) or Quasi- Peak (QP)	Antenna Polar. (V or H)	Antenna Height (meters)	EUT Azimuth (degrees)	EUT Axis (X,Y,Z)	EUT Tx Channel	Antenna Factor (dB)	Cable Loss (dB)	Amplifier Gain (dB)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments
5439.0000	43.4	A	H	1.0	90	Y	LOW	35.3	6.1	34.0	50.9	-3.1	54.0	
5439.0000	42.5	A	V	3.0	270	Y	LOW	35.3	6.1	34.0	50.0	-4.0	54.0	
5473.8000	38.1	A	H	1.0	90	Y	MID	35.4	6.2	34.1	45.5	-8.5	54.0	
5473.8000	41.1	A	V	1.0	90	Y	MID	35.4	6.2	34.1	48.5	-5.5	54.0	
5527.8000	37.7	A	H	1.0	180	Y	HIGH	35.5	6.3	34.0	45.4	-8.6	54.0	
5527.8000	38.4	A	V	1.5	90	Y	HIGH	35.5	6.3	34.0	46.1	-7.9	54.0	

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

** DELTA = SPEC LIMIT - CORRECTED READING

No Emissions nor Harmonics found after the
6th Harmonic

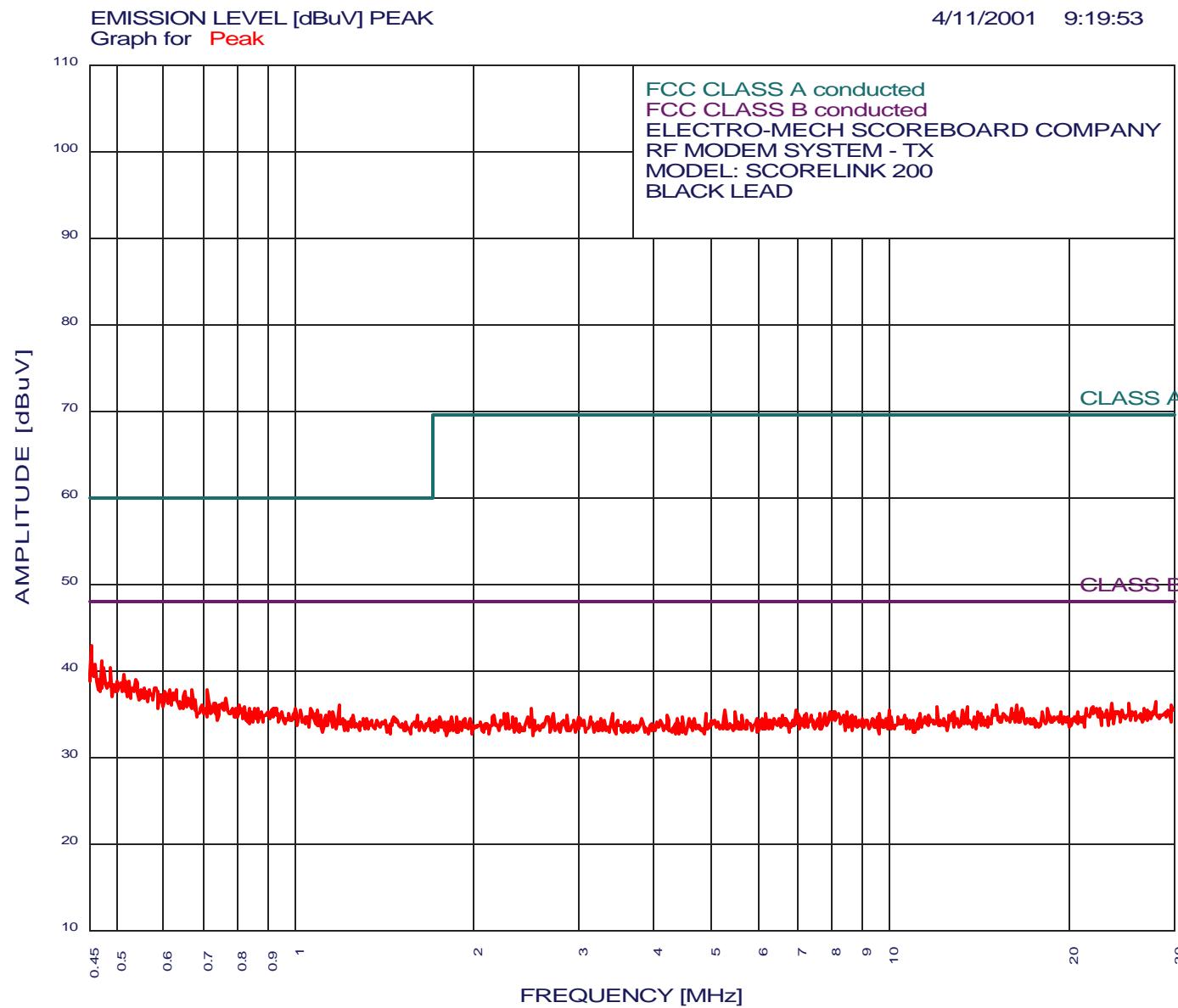
PAGE 6

CONDUCTED EMISSIONS

DATA SHEETS



COMPATIBLE
ELECTRONICS





**COMPATIBLE
ELECTRONICS**

4/11/2001 9:19:53

ELECTRO-MECH SCOREBOARD COMPANY

RF MODEM SYSTEM - TX

MODEL: SCORELINK 200

FCC B - BLACK LEAD

TEST ENGINEER : KYLE FUJIMOTO

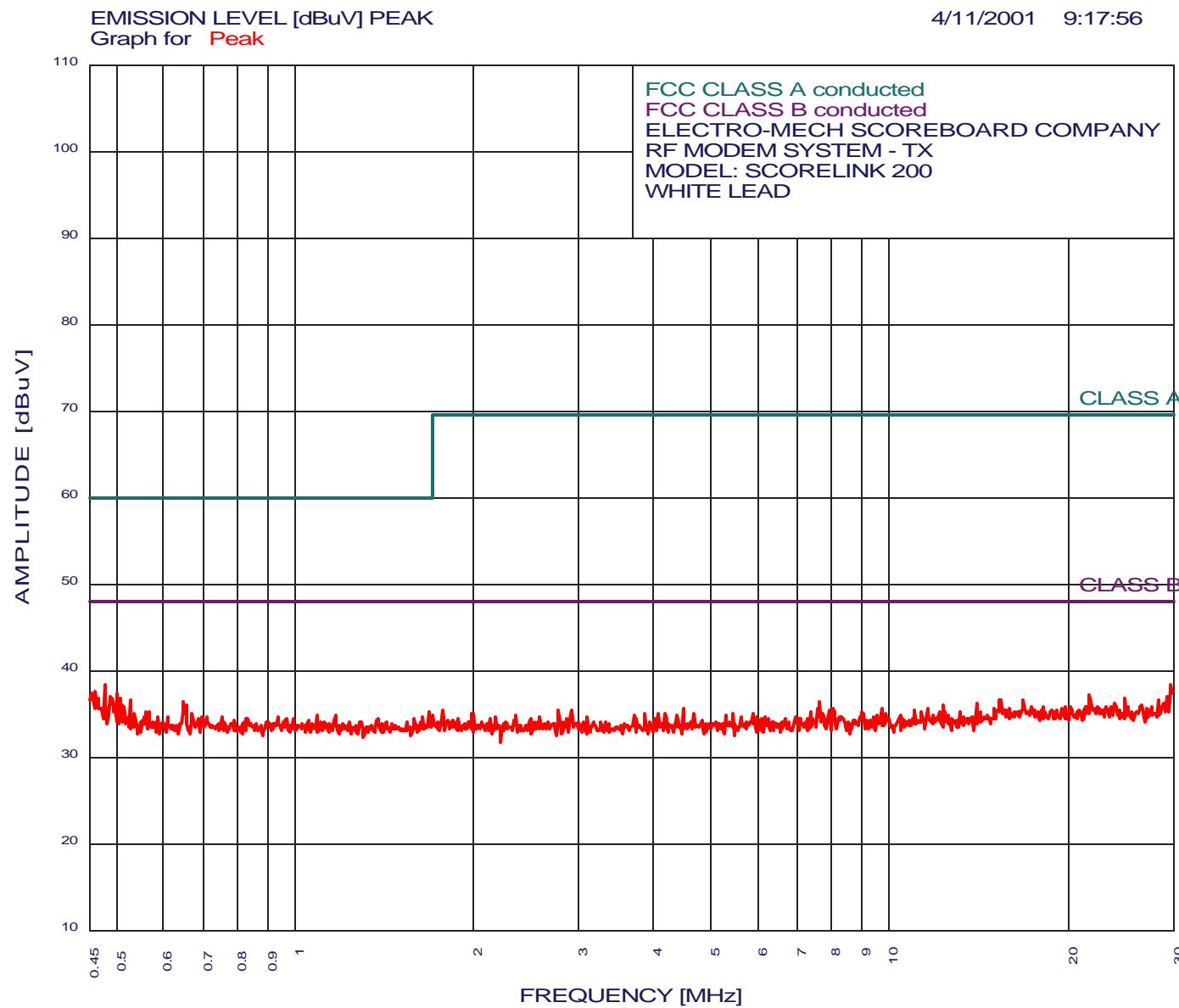
30 highest peaks above -50.00 dB of CLASS B limit line

Peak criteria : 1.00 dB, Curve : Peak

Peak#	Freq(MHz)	Amp(dBuV)	Limit(dB)	Delta(dB)
1	0.454	42.89	48.00	-5.11
2	0.472	41.09	48.00	-6.91
3	0.462	40.59	48.00	-7.41
4	0.489	40.29	48.00	-7.71
5	0.476	40.29	48.00	-7.71
6	0.515	39.49	48.00	-8.51
7	0.539	38.99	48.00	-9.01
8	0.468	38.89	48.00	-9.11
9	0.526	38.79	48.00	-9.21
10	0.519	38.79	48.00	-9.21
11	0.500	38.79	48.00	-9.21
12	0.581	37.99	48.00	-10.01
13	0.556	37.89	48.00	-10.11
14	0.630	37.79	48.00	-10.21
15	0.712	37.69	48.00	-10.31
16	0.671	37.69	48.00	-10.31
17	0.614	37.69	48.00	-10.31
18	0.567	37.69	48.00	-10.31
19	0.604	37.59	48.00	-10.41
20	0.652	37.49	48.00	-10.51
21	0.597	37.19	48.00	-10.81
22	0.764	36.69	48.00	-11.31
23	0.663	36.69	48.00	-11.31
24	0.679	36.59	48.00	-11.41
25	27.946	36.45	48.00	-11.55
26	25.259	36.26	48.00	-11.74
27	23.624	36.10	48.00	-11.90
28	0.736	36.09	48.00	-11.91
29	15.136	36.06	48.00	-11.94
30	29.758	36.01	48.00	-11.99



COMPATIBLE
ELECTRONICS





**COMPATIBLE
ELECTRONICS**

4/11/2001 9:17:56

ELECTRO-MECH SCOREBOARD COMPANY

RF MODEM SYSTEM - TX

MODEL: SCORELINK 200

FCC B - WHITE LEAD

TEST ENGINEER : KYLE FUJIMOTO

30 highest peaks above -50.00 dB of CLASS B limit line

Peak criteria : 1.00 dB, Curve : Peak

Peak#	Freq(MHz)	Amp(dBuV)	Limit(dB)	Delta(dB)
1	0.478	38.29	48.00	-9.71
2	29.758	38.27	48.00	-9.73
3	0.462	37.49	48.00	-10.51
4	0.502	37.29	48.00	-10.71
5	21.721	37.12	48.00	-10.88
6	29.275	36.95	48.00	-11.05
7	0.487	36.89	48.00	-11.11
8	24.952	36.86	48.00	-11.14
9	0.507	36.79	48.00	-11.21
10	16.810	36.64	48.00	-11.36
11	15.388	36.58	48.00	-11.42
12	28.308	36.50	48.00	-11.50
13	0.528	36.49	48.00	-11.51
14	7.636	36.32	48.00	-11.68
15	0.649	36.29	48.00	-11.71
16	14.030	36.22	48.00	-11.78
17	23.931	36.12	48.00	-11.88
18	12.326	36.03	48.00	-11.97
19	26.583	35.93	48.00	-12.07
20	0.511	35.89	48.00	-12.11
21	25.157	35.87	48.00	-12.13
22	20.144	35.83	48.00	-12.17
23	17.321	35.80	48.00	-12.20
24	0.515	35.79	48.00	-12.21
25	23.130	35.78	48.00	-12.22
26	27.583	35.77	48.00	-12.23
27	19.798	35.71	48.00	-12.29
28	18.124	35.69	48.00	-12.31
29	11.573	35.64	48.00	-12.36
30	15.013	35.64	48.00	-12.36

BAND EDGE

DATA SHEETS

BAND EDGE OF LOW CHANNEL

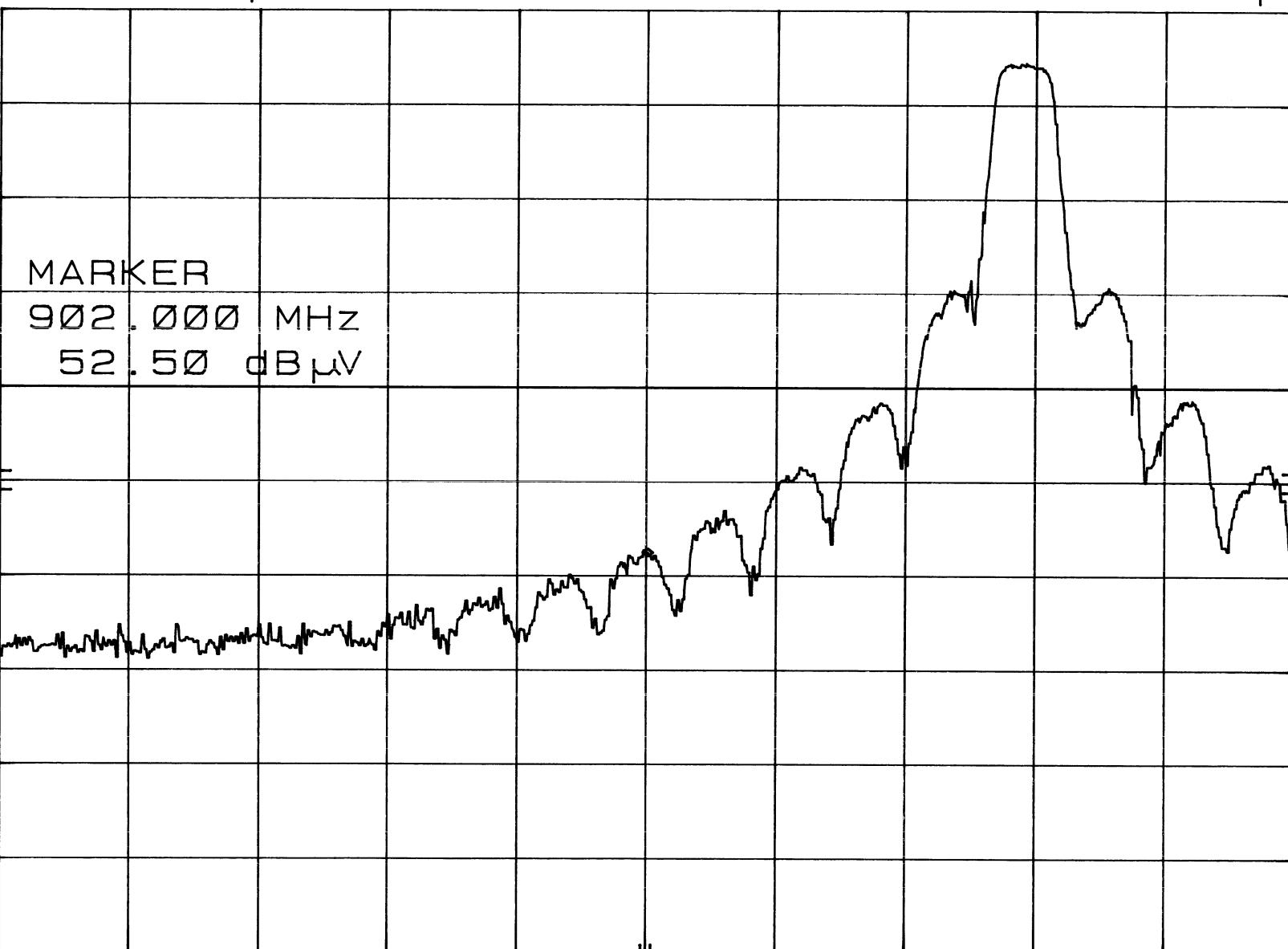
MKR 902.000 MHz

REF 110.0 dB μ V ATTEN 20 dB

52.50 dB μ V

HP

10 dB/



DL
70.0
dB μ V

CORR'D

CENTER 902.00 MHz
RES BW 1 MHz

VBW 1 MHz

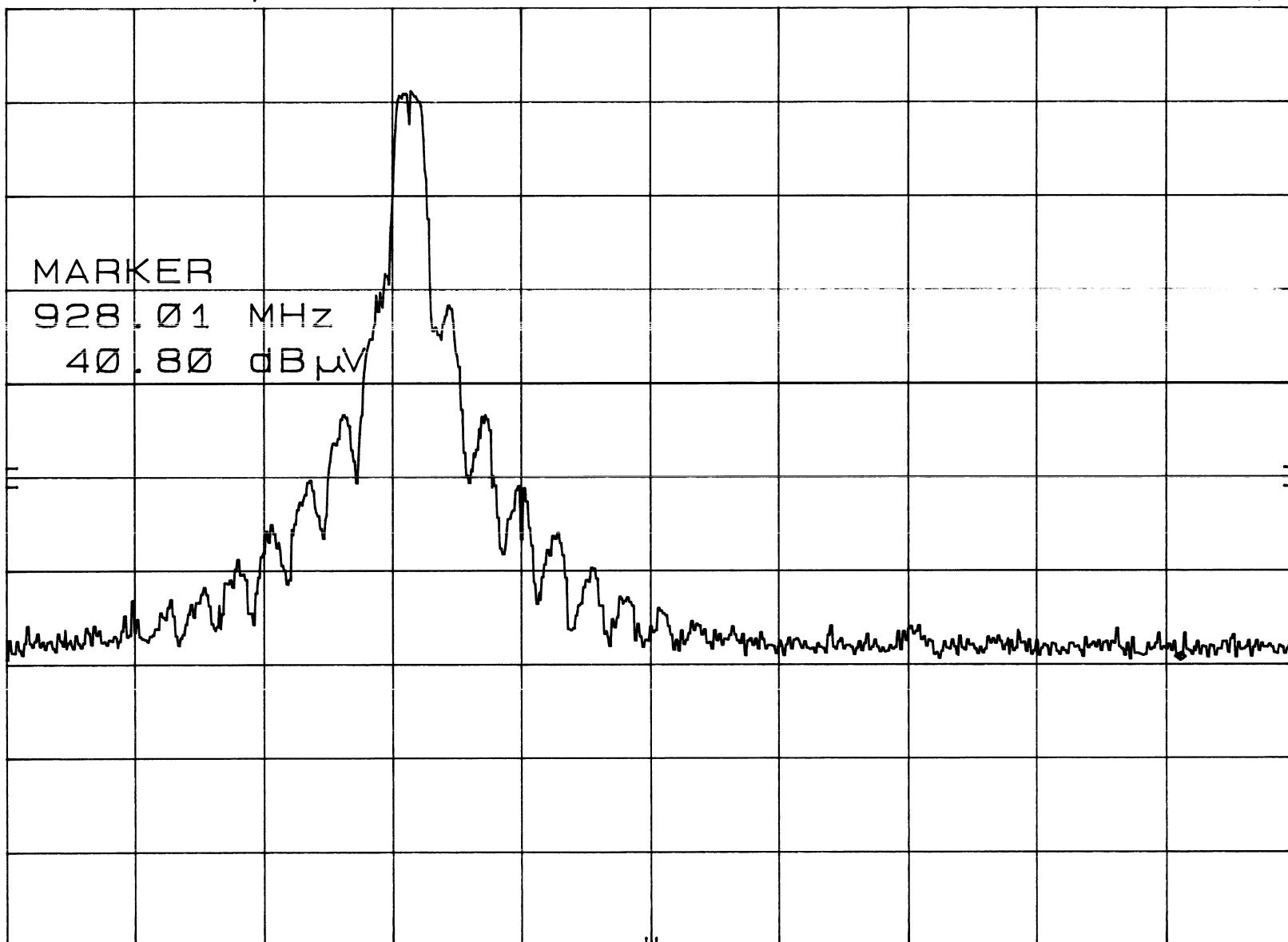
SPAN 5.00 MHz
SWP 20.0 msec

BAND EDGE OF HIGH CHANNEL
REF 110.0 dB μ V ATTEN 20 dB

MKR 928.01 MHz
40.80 dB μ V

hp

10 dB/



CORR'D

START 918.0 MHz

RES BW 1 MHz

VBW 1 MHz

STOP 929.0 MHz

SWP 20.0 msec

RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.249)

COMPANY	ELECTRO-MECH SCOREBOARD COMPANY	DATE	4/11/01
EUT	RF MODEM SYSTEM - TX	DUTY CYCLE	N/A
MODEL	SCORELINK 200	PEAK TO AVG	N/A
S/N	N/A	TEST DIST.	3 METERS
TEST ENGINEER	KYLE FUJIMOTO	LAB	D

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

** DELTA = SPEC LIMIT - CORRECTED READING

PAGE 1

APPENDIX E

LABORATORY RECOGNITIONS

LABORATORY RECOGNITIONS

Compatible Electronics has the following agency accreditations:

National Voluntary Laboratory Accreditation Program - Lab Code: 200063-0

Voluntary Control Council for Interference - Registration Numbers: R-983, C-1026, R-984 and C-1027

Bureau of Standards and Metrology Inspection - Reference Number: SL2-IN-E-1031

Compatible Electronics is recognized or on file with the following agencies:

Federal Communications Commission

Industry Canada

Radio-Frequency Technologies (Competent Body)

Technology International (Europe) Ltd.