

**FCC PART 15, SUBPART B and C
TEST REPORT***for***TANK UNIT****MODEL: SL2000**

Prepared for

**FLUENT SYSTEMS, LLC
5325 WALL STREET
MADISON, WISCONSIN 53718**

Prepared by: _____

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DATE: SEPTEMBER 30, 2002

	REPORT BODY	APPENDICES					TOTAL
		A	B	C	D	E	
PAGES	17	2	2	2	10	18	51

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1	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: Tank Unit
Model: SL2000
S/N: N/A

Product Description: See Expository Statement.

Modifications: The EUT was not modified during the testing.

Manufacturer: Fluent Systems, LLC
5325 Wall Street
Madison, Wisconsin 53718

Test Date: September 17, 2002

Test Specifications: EMI requirements
CFR Title 47, Part 15 Subpart B; and Subpart C, Sections 15.205, 15.209, and 15.231(e)

Test Procedure: ANSI C63.4: 1992

Test Deviations: The test procedure was not deviated from during the testing.

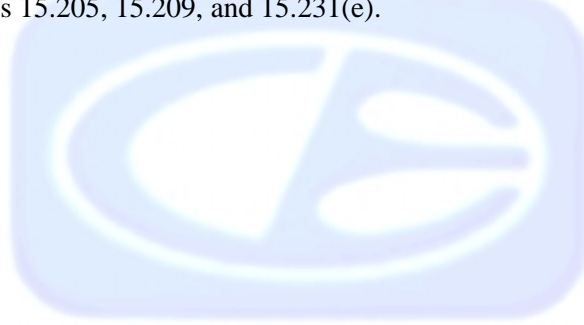
SUMMARY OF TEST RESULTS

TEST	DESCRIPTION	RESULTS
1	Conducted RF Emissions, 450 kHz - 30 MHz	This test was not performed because the EUT operates on battery power only and cannot be plugged into the AC public mains.
2	Radiated RF Emissions, 10 kHz - 4300 MHz	Complies with the Class B limits of CFR Title 47, Part 15, Subpart B; and Subpart C, sections 15.205, 15.209, and 15.231(e).



1. PURPOSE

This document is a qualification test report based on the Electromagnetic Interference (EMI) tests performed on the Tank Unit Model: SL2000. 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 Class B specification limits defined by CFR Title 47, Part 15, Subpart B; and Subpart C, sections 15.205, 15.209, and 15.231(e).



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

Fluent Systems, LLC

Jaume Villanueva Chief Operations Officer

Compatible Electronics, Inc.

Kyle Fujimoto Test Engineer

Michael Christensen Test Engineer

2.4 Date Test Sample was Received

The test sample was received on September 16, 2002.

2.5 Disposition of the Test Sample

The sample has not been returned to Fluent Systems, LLC as of September 30, 2002.

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
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

Setup and operation of the equipment under test.

Specifics of the EUT and Peripherals Tested

The Tank Unit Model: SL2000 (EUT) was tested as a stand alone unit and was continuously transmitting to a cab unit. The antenna connector is a reverse polarity SMA connector.

Note: The EUT was continuously transmitting for testing purposes only. Under normal circumstances, the transmitter will only be on once every 10 seconds.

The final radiated data was taken in the mode above. Please see Appendix E for the data sheets.



4.1.1 Cable Construction and Termination

There were no external cables connected 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
TANK UNIT (EUT)	FLUENT SYSTEMS, LLC	SL2000	N/A	QNA-SL2000
CAB UNIT	FLUENT SYSTEMS, LLC	SL1000	N/A	DoC



5.2 EMI Test Equipment

EQUIPMENT TYPE	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. DATE	CAL. DUE DATE
Radiated Emissions Manual Test – Radiated	Compatible Electronics	N/A	N/A	N/A	N/A
Spectrum Analyzer – Main Section	Hewlett Packard	8566B	2727A04757	Nov. 9, 2001	Nov. 9, 2002
Spectrum Analyzer – Display Section	Hewlett Packard	85662A	2648A15455	Nov. 9, 2001	Nov. 9, 2002
Spectrum Analyzer – Quasi-Peak Adapter	Hewlett Packard	85650A	3303A01688	Nov. 9, 2001	Nov. 9, 2002
Preamplifier	Com Power	PA-102	1202	Oct. 17, 2001	Oct. 17, 2002
Biconical Antenna	Com Power	AB-900	15011	July 15, 2002	July 15, 2003
Log Periodic Antenna	Com Power	AL-100	16101	Oct. 11, 2001	Oct. 11, 2002
Computer	Hewlett Packard	D5251A 888	US74458128	N/A	N/A
Printer	Hewlett Packard	C5886A	SG7CM1P090	N/A	N/A
Monitor	Hewlett Packard	D5258A	DK74889705	N/A	N/A
Loop Antenna	Com-Power	AL-130	17070	June 19, 2002	June 19, 2003
Horn Antenna	Com-Power	AH-118	10073	Jan. 21, 2002	Jan. 21, 2003
Microwave Preamplifier	Com-Power	PA-122	25195	Jan. 7, 2002	Jan. 7, 2003



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 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.

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. The loop antenna was also rotated in the horizontal and vertical axis 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 E.



7.2 Bandwidth of the Fundamental

The -20 dB bandwidth was checked to see that it was within 0.25% of the fundamental frequency for the EUT. A plot of the -20 dB bandwidth is located in Appendix D.



7.3 Plot Showing the Time between Transmissions

Section 15.231(e) mandates that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

Plots showing the EUT meets the criteria above are located in Appendix D.



8. CONCLUSIONS

The Tank Unit Model: SL2000 meets all of the Class B specification limits defined in CFR Title 47, Part 15, Subpart B; and Subpart C, sections 15.205, 15.209, and 15.231.



APPENDIX A

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

Conformity Assessment Body for the EMC Directive Under the US/EU MRA Appointed by NIST

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

Federal Communications Commission

Industry Canada

Radio-Frequency Technologies (Competent Body)



APPENDIX B

MODIFICATIONS TO THE EUT

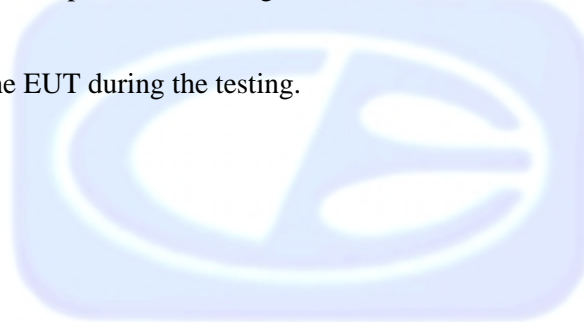


MODIFICATIONS TO THE EUT

The modifications listed below were made to the EUT to pass FCC 15.231 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.

No modifications were made to the EUT during the testing.





APPENDIX C

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



ADDITIONAL MODELS COVERED UNDER THIS REPORT

USED FOR THE PRIMARY TEST

Tank Unit
Model: SL2000
S/N: N/A

There were no additional models covered under this report.



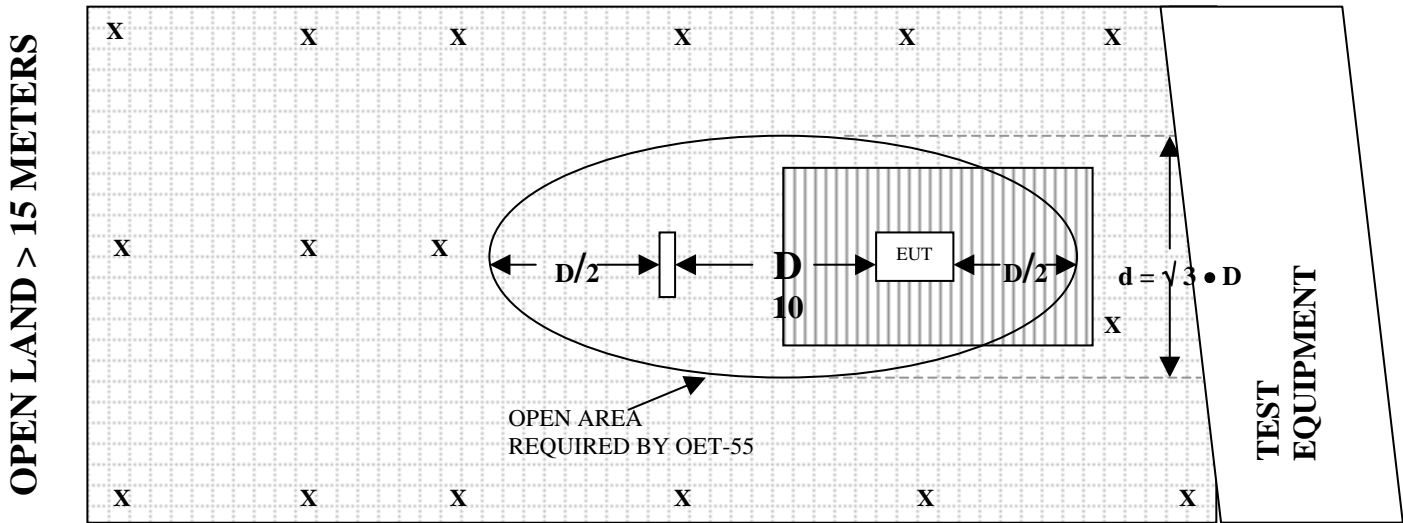
APPENDIX D

DIAGRAMS, CHARTS, AND PHOTOS



FIGURE 1: PLOT MAP AND LAYOUT OF RADIATED SITE

OPEN LAND > 15 METERS



OPEN LAND > 15 METERS

- | | | | |
|----------|--------------------------|--|-----------------|
| X | = GROUND RODS | | = GROUND SCREEN |
| D | = TEST DISTANCE (meters) | | = WOOD COVER |



COM-POWER AB-900

BICONICAL ANTENNA

S/N: 15011

CALIBRATION DATE: JULY 15, 2002

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
30	11.30	120	14.10
35	10.40	125	13.20
40	11.80	140	12.20
45	13.10	150	12.00
50	12.30	160	13.50
60	12.10	175	15.60
70	8.10	180	16.30
80	6.50	200	16.70
90	9.50	250	16.50
100	11.40	300	19.30



COM-POWER AL-100

LOG PERIODIC ANTENNA

S/N: 16101

CALIBRATION DATE: OCTOBER 11, 2001

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
300	14.40	700	20.50
400	15.40	800	22.20
500	16.60	900	23.00
600	19.70	1000	26.60



COM-POWER PA-102**PREAMPLIFIER**

S/N: 1202

CALIBRATION DATE: OCTOBER 17, 2001

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
30	35.8	300	35.7
40	36.0	350	35.4
50	36.1	400	35.5
60	36.0	450	35.4
70	35.9	500	34.9
80	35.5	550	35.4
90	35.4	600	35.1
100	36.0	650	35.3
125	36.0	700	34.6
150	35.8	750	34.8
175	35.5	800	34.5
200	35.7	850	34.9
225	35.9	900	33.8
250	35.6	950	33.4
275	35.5	1000	34.5



COM-POWER PA-122**MICROWAVE PREAMPLIFIER**

S/N: 25195

CALIBRATION DATE: JANUARY 7, 2002

FREQUENCY (GHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
1.0	33.7	9.5	31.8
1.1	33.4	10.0	32.2
1.2	33.1	11.0	31.4
1.3	33.1	12.0	30.2
1.4	33.2	13.0	32.9
1.5	32.5	14.0	33.9
1.6	32.7	15.0	32.4
1.7	32.3	16.0	32.2
1.8	32.3	17.0	31.5
1.9	31.4	18.0	32.2
2.0	32.8	19.0	31.2
2.5	33.3	20.0	31.3
3.0	31.7	21.0	31.7
3.5	31.6	22.0	29.7
4.0	31.2		
4.5	31.2		
5.0	31.0		
5.5	31.3		
6.0	32.1		
6.5	32.1		
7.0	31.8		
7.5	32.0		
8.0	33.1		
8.5	32.0		
9.0	30.8		



COM-POWER AH-118**HORN ANTENNA**

S/N: 10073

CALIBRATION DATE: JANUARY 21, 2002

FREQUENCY (GHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
1.0	26.6	9.5	41.4
1.5	29.2	10.0	41.8
2.0	32.4	10.5	40.4
2.5	32.3	11.0	37.5
3.0	31.4	11.5	42.2
3.5	31.8	12.0	40.4
4.0	31.1	12.5	43.6
4.5	32.0	13.0	44.2
5.0	33.9	13.5	41.8
5.5	32.0	14.0	43.3
6.0	37.8	14.5	47.0
6.5	36.8	15.0	49.4
7.0	42.4	15.5	49.9
7.5	39.5	16.0	49.9
8.0	41.3	16.5	48.2
8.5	40.3	17.0	44.0
9.0	39.5	17.5	44.8
		18.0	44.7



COM-POWER AL-130**LOOP ANTENNA**

S/N: 17070

CALIBRATION DATE: JUNE 19, 2002

FREQUENCY (MHz)	MAGNETIC (dB/m)	ELECTRIC (dB/m)
0.009	-40.4	11.1
0.01	-40.3	11.2
0.02	-41.2	10.3
0.05	-41.6	9.9
0.07	-41.4	10.1
0.1	-41.7	9.8
0.2	-44.0	7.5
0.3	-41.6	9.9
0.5	-41.3	10.2
0.7	-41.4	10.1
1	-40.9	10.6
2	-40.6	10.9
3	-40.5	11.0
4	-40.8	10.7
5	-40.2	11.3
10	-40.7	10.8
15	-41.4	10.1
20	-41.6	9.9
25	-41.7	9.8
30	-42.9	8.6





FRONT VIEW

FLUENT SYSTEMS, LLC
TANK UNIT
MODEL: SL2000
FCC SUBPART B AND C - RADIATED EMISSIONS – 09-17-02

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



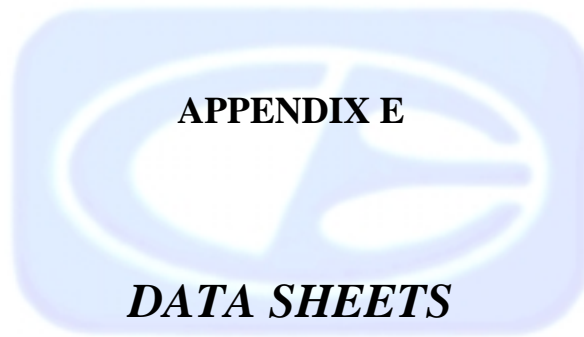


REAR VIEW

FLUENT SYSTEMS, LLC
TANK UNIT
MODEL: SL2000
FCC SUBPART B AND C - RADIATED EMISSIONS – 09-17-02

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





RADIATED EMISSIONS

DATA SHEETS





**COMPATIBLE
ELECTRONICS**

Test Location : Compatible Electronics
 Customer : Fluent Systems, LLC
 Manufacturer : Fluent Systems, LLC
 Eut name : Tank Unit
 Model : SL2000
 Serial # : N/A
 Specification : FCC Class B
 Distance correction factor (20 * log(test/spec) : 0.00
 Test Mode : Vertical and Horizontal Polarization
 Spurious Emissions from the Transmitter - 10 kHz to 4200 MHz
 Temperature 70 Degrees F., Relative Humidity 65%
 Tested By: Kyle Fujimoto

Page : 1/1
 Date : 9/27/2002
 Time : 14:32:03
 Lab : A
 Test Distance : 3.0 Meters

Pol	Freq MHz	Rdng dBuV	Cable loss dB	Ant factor dB	Amp gain dB	Cor'd rdg = R dBuV	Li mit = L dBuV/m	Delta R-L dB
V	31.982	33.50	0.70	10.93	35.40	9.73	40.00	-30.27
V	36.000	34.80	0.70	10.70	35.40	10.80	40.00	-29.20
V	40.000	34.10	0.70	11.80	35.40	11.20	40.00	-28.80
V	48.000	33.90	0.78	12.57	35.48	11.77	40.00	-28.23
V	72.000	34.40	1.02	7.76	35.52	7.66	40.00	-32.34
V	144.000	34.50	1.40	12.12	35.37	12.65	43.50	-30.85
H	36.000	35.50	0.70	10.70	35.40	11.50	40.00	-28.50
H	40.000	34.10	0.70	11.80	35.40	11.20	40.00	-28.80
H	48.000	33.50	0.78	12.57	35.48	11.37	40.00	-28.63
H	320.000	34.90	2.28	14.62	34.82	16.99	46.00	-29.01
H	324.000	34.10	2.30	14.67	34.80	16.27	46.00	-29.73
H	328.000	34.50	2.32	14.71	34.78	16.74	46.00	-29.26

-20 dB BANDWIDTH

DATA SHEET

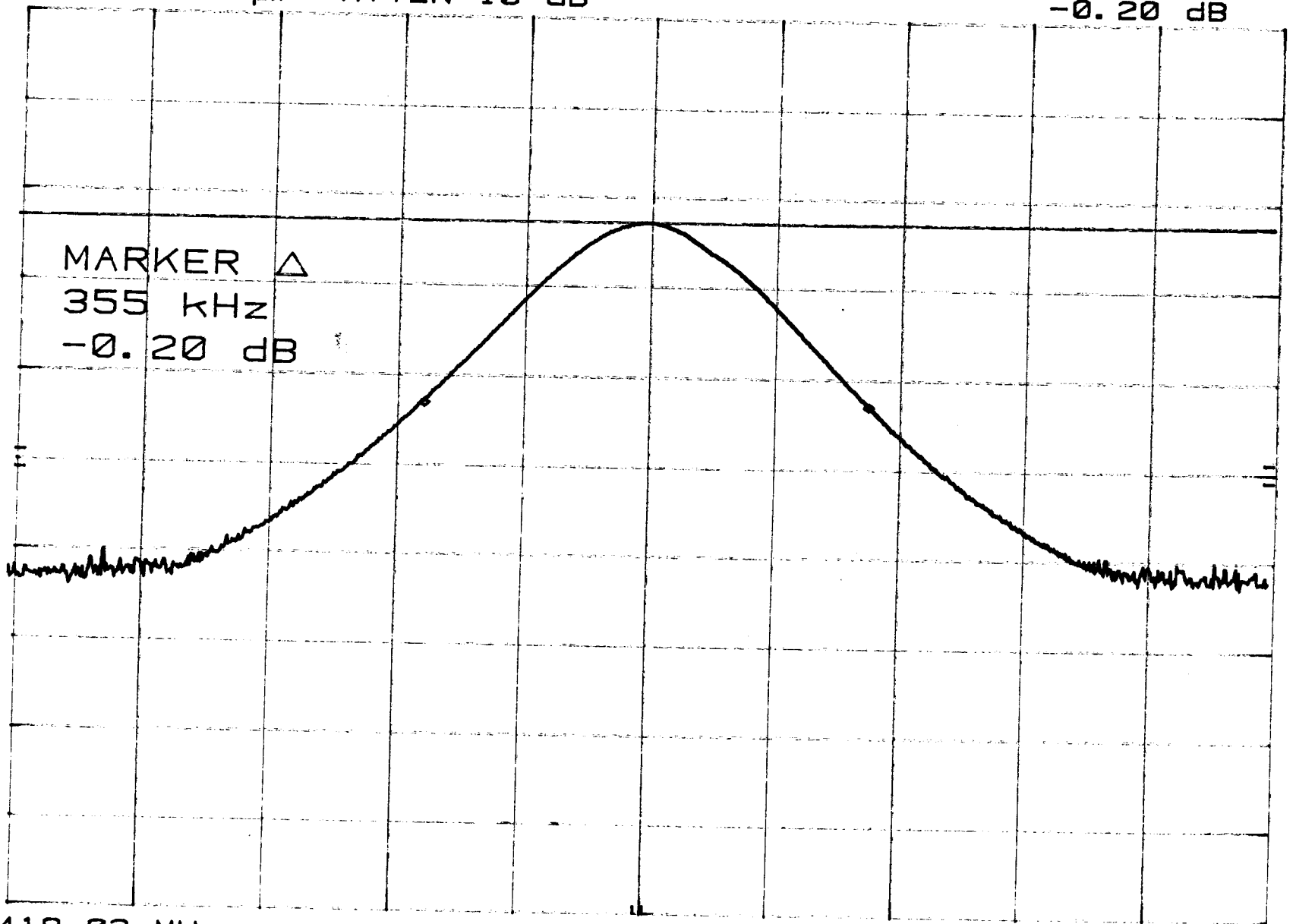


hp
-20 dB BANDWIDTH OF FUNDAMENTAL
REF 97.0 dBμV ATTN 10 dB

MKR Δ 355 kHz
-0.20 dB

10 dB/

DL
74.0
dBμV



CORR'D

CENTER 418.02 MHz

RES BW 100 kHz

VBW 100 kHz

SPAN 1.00 MHz
SWP 20.0 msec

TIME BETWEEN TRANSMISSIONS

DATA SHEETS



hp
TIME OF ONE TRANSMISSION
REF 117.0 dBμV ATTN 20 dB

MKR Δ 335.0 msec
0.00 dB

10 dB/

DL
77.0
dBμV

MARKER Δ
335.0 msec
0.00 dB

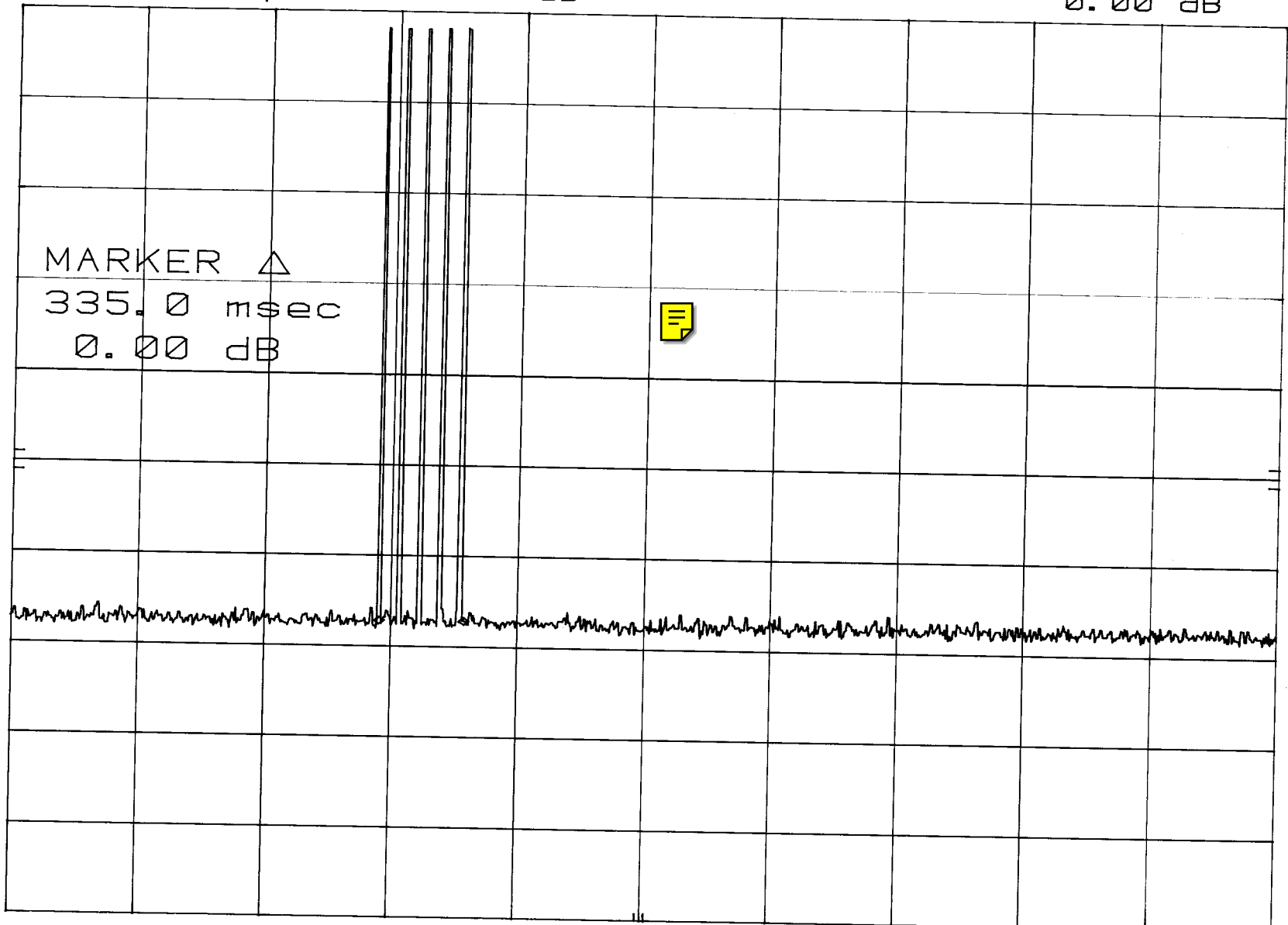


CORR'D

CENTER 418.000 000 MHz
RES BW 1 MHz

VBW 1 MHz

SPAN 0 Hz
SWP 5.00 sec

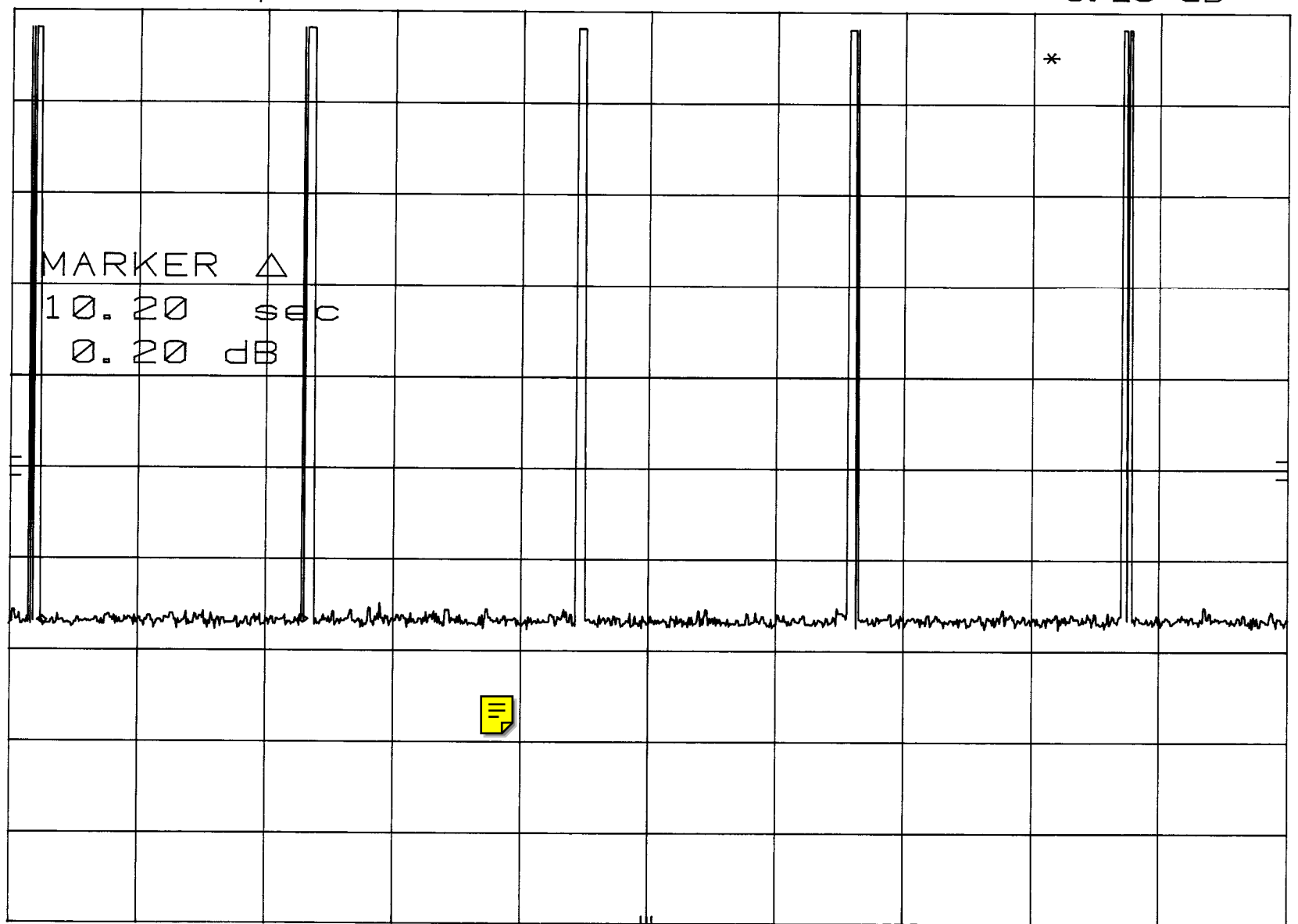


PLOT SHOWING TIME BETWEEN TRANSMISSIONS
REF 117.0 dBμV ATTEN 20 dB

MKR Δ 10.20 sec
0.20 dB

hp
10 dB/

DL
77.0
dBμV



CORR'D

CENTER 418.000 000 MHz
RES BW 1 MHz

VBW 1 MHz

SPAN 0 Hz
SWP 50.0 sec