

*FCC PART 15, SUBPART B & C
TEST REPORT*

for

MULTIPARAMETER RF TELEMETRY TRANSMITTER

Model: 206000-001

FCC ID: MRA-206005

Prepared for

ZYMED MEDICAL INSTRUMENTATION INC.

20 NORTH AVIADOR STREET

CAMARILLO, CA 93020-8348

COMPATIBLE ELECTRONICS INC.

2337 TROUTDALE DRIVE

AGOURA, CALIFORNIA 91301

(818) 597-0600

DATE: MAY 13, 1999

	REPORT BODY	APPENDICES				TOTAL
		<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	
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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: Multiparameter RF Telemetry Transmitter
Model: 206000-001
S/N: none

Product Description: *This is a VHF transmitter used to transmit multiple ECG channels to a host computer.*

Modifications: The EUT was not modified during the testing.

Manufacturer: Zymed Medical Instrumentation, Inc.
20 North Aviator Street
Camarillo, CA 93010-8348

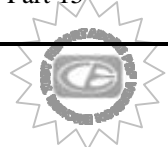
Test Date: March 29, 1999

Test Specifications: EMI requirements
FCC Title 47, Part 15 Subpart B & C
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 device is battery operated and does not draw power from public mains; therefore no conducted test was required.
2	Radiated RF Emissions, 30 MHz – 1000 MHz.	Complies with the Class B limits of FCC Title 47, Part 15 Subpart B.
3	Radiated RF Emissions, 10kHz to 2.16GHz.	Complies with the limits of FCC Title 47, Part 15 Subpart C 15.109, 15.209, 15.241.



1. PURPOSE

This document is a qualification test report based on the Electromagnetic Interference (EMI) tests performed on the Multiparameter RF Telemetry Transmitter Model: 206000-001. 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 in FCC Title 47, Part 15, Subpart C, 15.109 and 15.209 and 15.241.



2. ADMINISTRATIVE DATA

2.1 Location of Testing

The EMI tests described herein were performed at the test facility of Compatible Electronics, 2337 Troutdale Drive, Agoura, California 91301.

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

Zymed Medical Instrumentation, Inc.

George Bornazyan Hardware Engineer

Compatible Electronics, Inc.

Joey J. Madlangbayan Test Engineer

Jeff S. Klinger Lab Manager

2.4 Date Test Sample was Received

The test sample was received on March 29, 1999.

2.5 Disposition of the Test Sample

The test sample remains at Compatible Electronics.

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 - Intentional Radiators.
FCC Title 47, Subpart B.	FCC Rules – Radio frequency devices (including digital devices).
CISPR 16 1993	Specification for radio disturbance and immunity measuring apparatus and methods.
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

The EUT was set up in a tabletop configuration while communicating to the Easi-View System via wireless communication. The EUT was tested while continuously transmitting a signal within the EUT output frequencies. The Desktop PC was remotely located 30 meters away and also used to change the output frequency. The Monitor keyboard, and mouse were connected to the PC video, keyboard, and mouse ports respectively.

It was determined that the highest emission levels were found in the above configuration. The final radiated data was taken in this mode of operation. All initial investigations were performed with the Spectrum Analyzer in manual mode scanning the frequency range continuously. Photographs and data sheets are included in Appendices C and D.

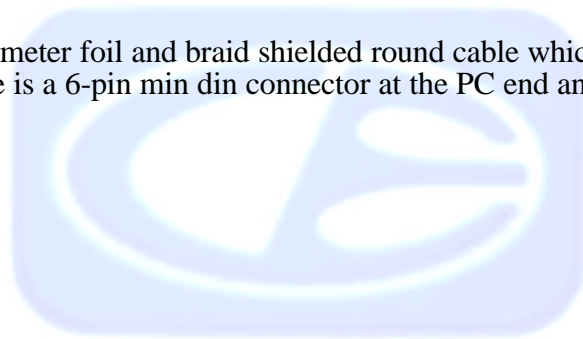


4.1.1 Cable Construction and Termination

Cable 1 This is a 2 meter foil shielded round cable which connects the keyboard to the PC. There is a 6-pin min din connector at the PC end and it is hard wired into the Keyboard.

Cable 2 This is a 2 meter foil shielded round cable which connects the Mouse to the PC. There is a 6-pin min din connector at the PC end and it is hard wired into the Mouse.

Cable 3 This is a 2 meter foil and braid shielded round cable which connects the Mouse to the PC. There is a 6-pin min din connector at the PC end and it is hard wired into the Mouse.



5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT

5.1 EUT and Accessory List

EQUIPMENT TYPE	MANUFACTURER	MODEL	SERIAL NUMBER
MULTIPARAMETER RF TELEMETRY TRANSMITTER (EUT)	Zymed, Inc.	206000-001	S/N: 003 FCC ID: MRA-206005
EASY VIEW SYSTEM (PC Computer)	Zymed, Inc.	10905-108	247
KEYBOARD	GENERIC	FKB4700	K4055873
MOUSE	LOGITECH	M-M30	LQA52102326
MONITOR	VIEWSONIC	1457-M	8134907337



5.2 EMI Test Equipment

EQUIPMENT TYPE	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. DATE	CAL. DUE DATE
Spectrum Analyzer	Hewlett Packard	8566A	1904A00188	Mar. 10, 1998	Mar. 10, 1999
Quasi Peak Adapter	Hewlett Packard	85650A	2043A00276	Mar. 10, 1998	Mar. 10, 1999
Preamplifier	Com Power	PA-102	01249	Apr. 20, 1998	Apr. 20, 1999
Biconical Antenna	Com Power	AB-100	01535	Apr. 17, 1998	Apr. 17, 1999
Log Periodic Antenna	Com Power	AL-100	A101	Apr. 16, 1998	Apr. 16, 1999
Microwave Amplifier	Com Power	PA-122	25137	Jul. 15, 1998	Jul. 15, 1999
Horn Antenna	Amplifier Research Associates	DRG 118/A	1015	Dec. 2, 1993	N.C.R.
Active Loop Antenna	Com Power	AL-130	17054	Jan. 6, 1999	Jan. 6, 2000
Antenna Mast	Com Power	AM-400	N/A	N/A	N/A
Turntable	Com Power	TT-106A	N/A	N/A	N/A



6. TEST SITE DESCRIPTION

6.1 Test Facility Description

Please refer to section 2.1 and 7.1.2 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 RF Emissions

7.1.1 Conducted Emissions Test

The Spectrum Analyzer was used as a measuring meter along with the Quasi-Peak Adapter. 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 Spectrum Analyzer offset was adjusted accordingly to read the actual data measured. The LISN output was read by the Spectrum Analyzer. The output of the second LISN was terminated by a 50 ohm termination. The effective measurement bandwidth used for the conducted emissions 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 initial test data was taken in manual mode while scanning the frequency ranges of 0.15 MHz to 1.6 MHz, 1.6 MHz to 5 MHz and 5 MHz to 30 MHz. The conducted emissions from the EUT were maximized for operating mode as well as cable and peripheral placement. Once a predominant frequency (within 12 dB of the limit) was found, it was more closely examined with the Spectrum Analyzer span adjusted to 1 MHz.

The EUT is battery powered therefore this test was not performed.



7.1.2 Radiated Emissions Test

The Spectrum Analyzer was used as a measuring meter along with the Quasi-Peak Adapter. The preamplifier was used to increase the sensitivity of the instrument. 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 was used only for those readings which are marked accordingly on the data sheets. The effective measurement bandwidth used for the radiated emissions test was 120 kHz.

Broadband biconical and log periodic antennas were used as transducers during the measurement. The biconical antenna was used from 30 MHz to 300 MHz, and the log periodic antenna was used from 300 MHz to 1 GHz. The frequency spans were wide (30 MHz to 88 MHz, 88 MHz to 216 MHz, 216 to 300 MHz and 300 MHz to 1 GHz) during preliminary investigations. The final data was taken with a frequency span of 1 MHz. Furthermore, the frequency span was reduced during the preliminary investigations as deemed necessary.

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 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 10 meter test distance to obtain final test data.



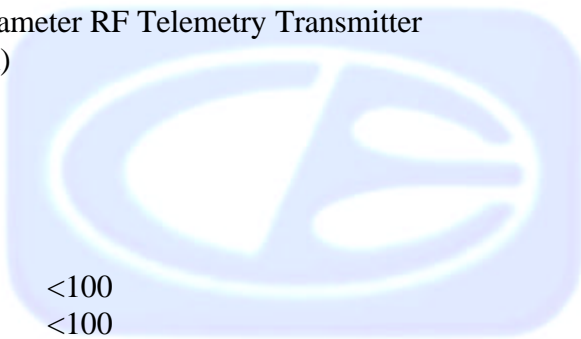
7.1.3 RF Emissions Test Results

The fundamental and up to the 10th harmonic emissions are within the specifications.
No spurious emissions were found.

RADIATED EMISSIONS - SPURIOUS MULTIPARAMETER RF TELEMETRY TRANSMITTER

The following bands were specifically scanned.
Frequency Band 30 – 5000Mhz

RF Energy From Multiparameter RF Telemetry Transmitter
in MHz at 3 meters ($\mu\text{V/m}$)

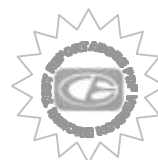


37.5-38.25	<100
73-74.6	<100
74.8-75.2	<100
108-121.94	<100
123-138	<150
149.9-150.05	<150
156.52-156.52	<150
162.01-167.17	<150
167.72-173.2	<150
240-285	<200
322-335.4	<200
399.9-410	<200
608-614	<200
960-1240	<500
1300-1427	<500
1435-1626.5	<500
1645.5-1646.5	<500
1660-1710	<500
1718.8-1722.2	<500
2200-2300	<500



8. CONCLUSION

The Multi-parameter RF Telemetry Transmitter Model: 206000-001 meets all of the requirements of the FCC Title 47, Part 15, Subpart B & C.





APPENDIX A

MODIFICATIONS TO THE EUT



MODIFICATIONS TO THE EUT

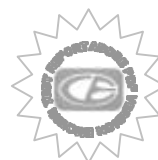
There were no modifications made to the EUT during the test.





APPENDIX B

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

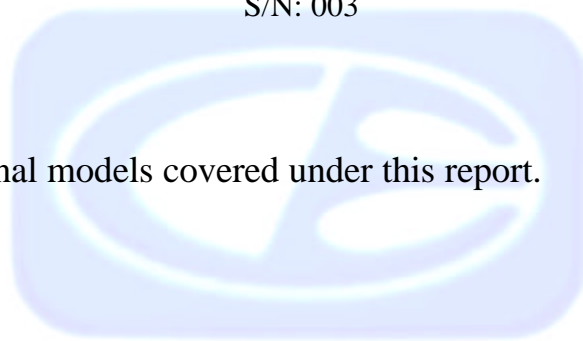


ADDITIONAL MODELS COVERED UNDER THIS REPORT

USED FOR THE PRIMARY TEST

MULTIPARAMETER RF TELEMETRY
TRANSMITTER
Model: 206000-001
S/N: 003

There were no additional models covered under this report.





APPENDIX C

DIAGRAMS, CHARTS AND PHOTOS

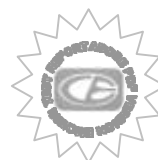
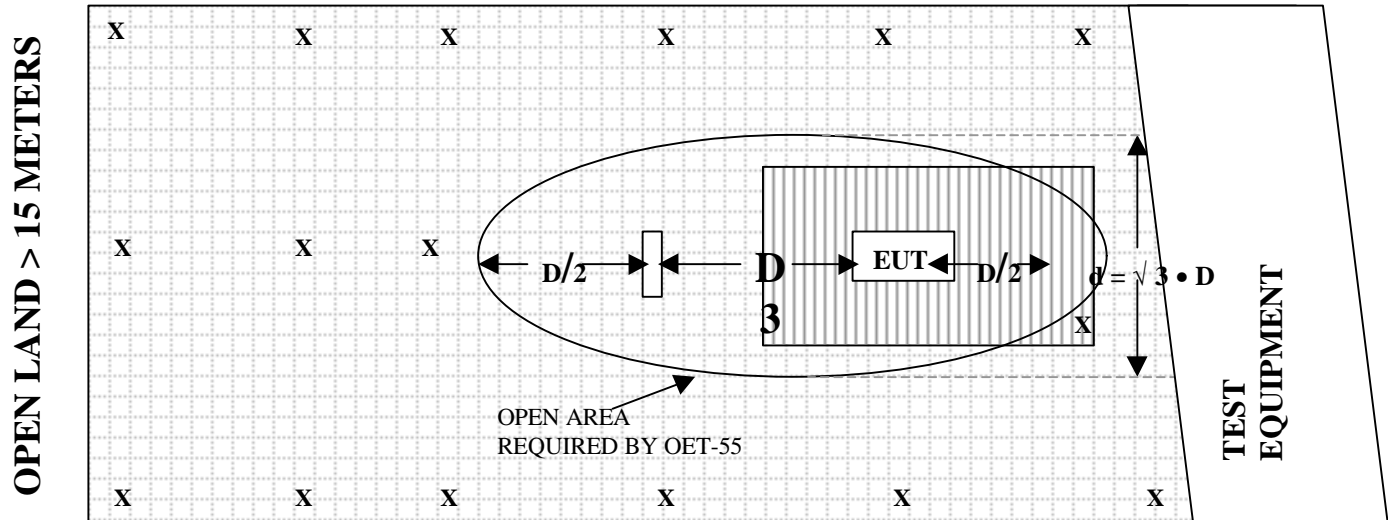


FIGURE 1: PLOT MAP AND LAYOUT OF RADIATED SITE**OPEN LAND > 15 METERS****OPEN LAND > 15 METERS**

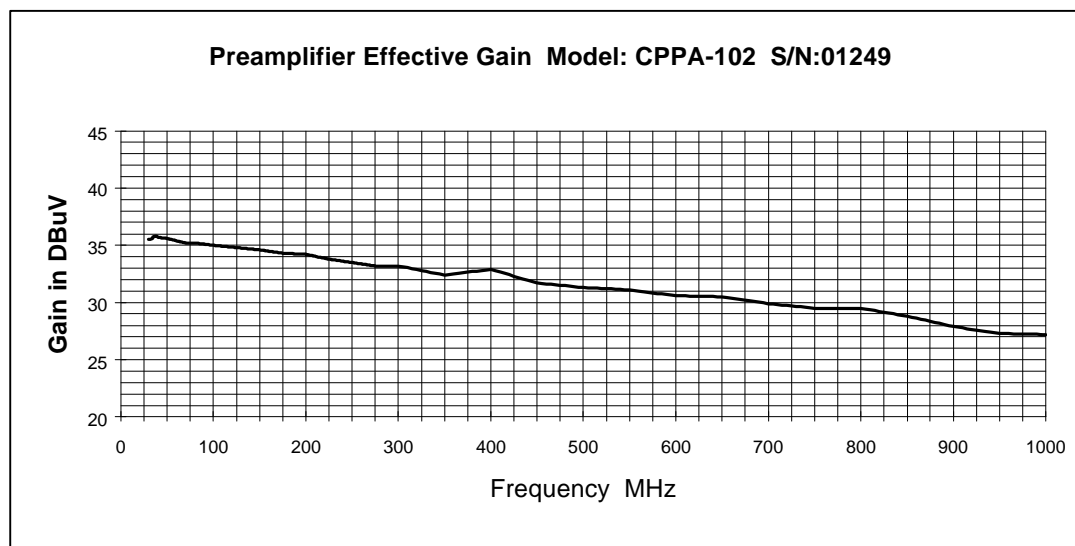
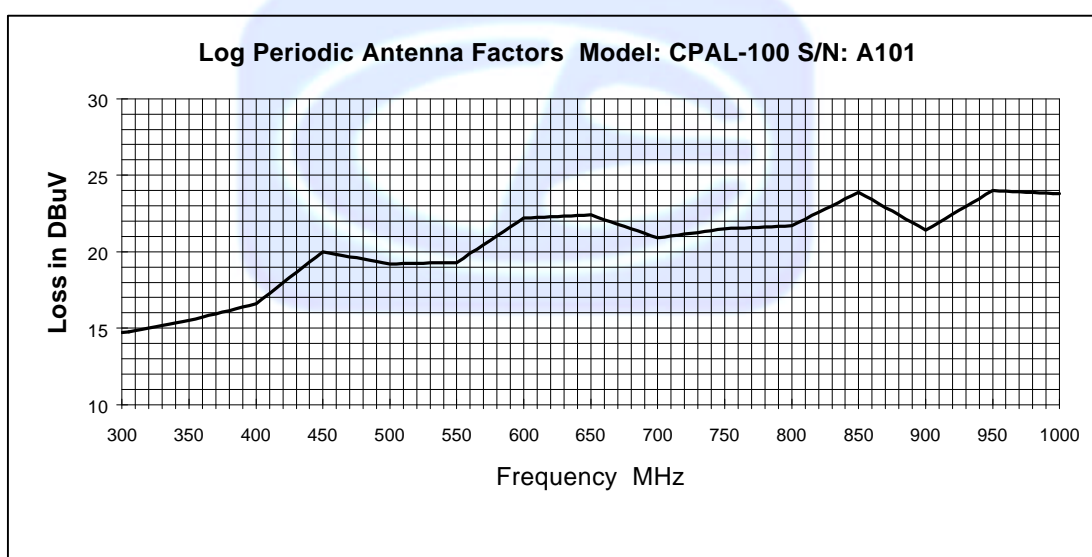
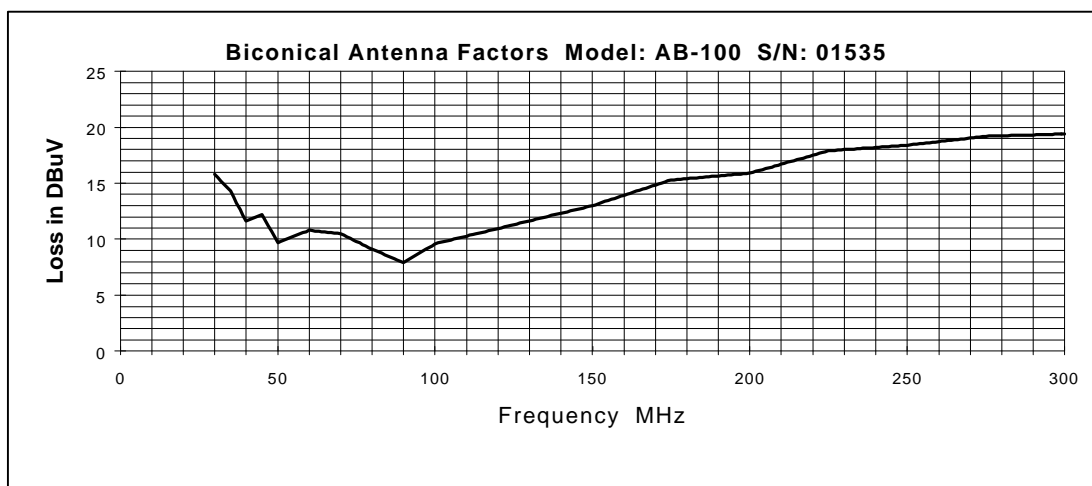
X	= GROUND RODS
---	---------------

	= GROUND SCREEN
--	-----------------

D	= TEST DISTANCE (meters)
---	--------------------------

	= WOOD COVER
--	--------------



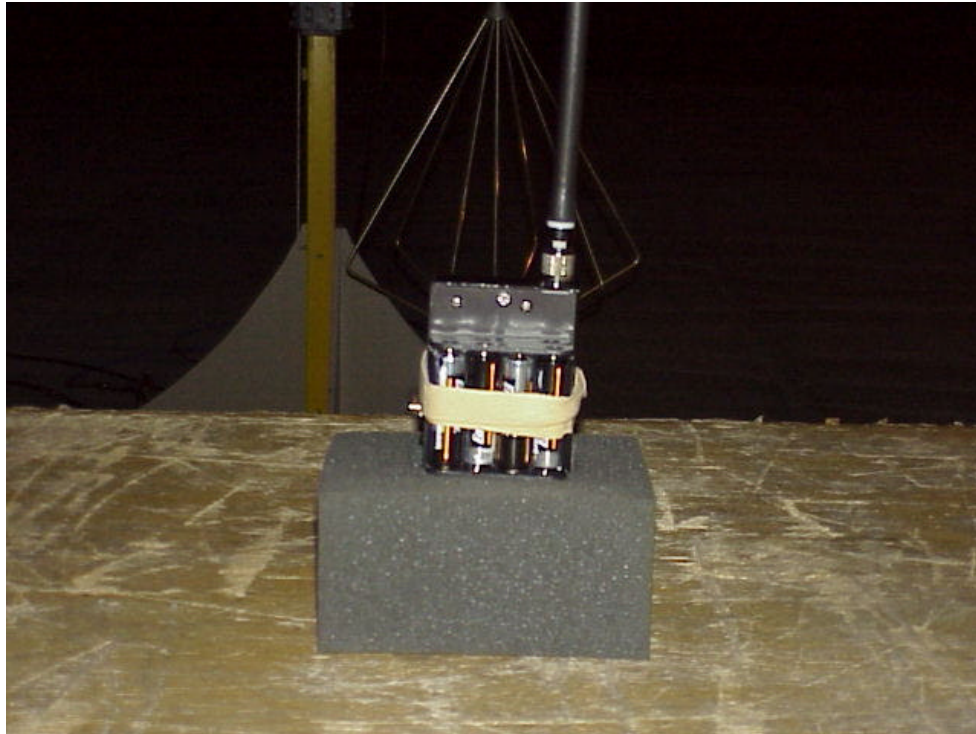


Com-Power Corporation

(949) 587-9800

Antenna Calibration		
Antenna Type: Loop Antenna	Transmit Antenna Height: 2 meters	
Model: AL-130	Receive Antenna Height: 2 meters	
Serial Number: 17054		
Calibration Date: 1/6/99		
Frequency MHz	Magnetic (dB/m)	Electric (dB/m)
0.01	-41.3	10.2
0.02	-42.2	9.3
0.03	-40.5	11.0
0.04	-40.8	10.7
0.05	-42.1	9.4
0.06	-41.7	9.8
0.07	-41.8	9.7
0.08	-42.1	9.4
0.09	-42.3	9.2
0.1	-42.3	9.2
0.2	-44.6	6.9
0.3	-42.1	9.4
0.4	-42.2	9.3
0.5	-42.2	9.3
0.6	-42.1	9.4
0.7	-42.0	9.5
0.8	-42.0	9.5
0.9	-41.9	9.6
1	-41.4	10.1
2	-40.6	10.9
3	-40.9	10.6
4	-41.1	10.4
5	-40.5	11.0
6	-40.5	11.0
7	-40.9	10.6
8	-41.1	10.4
9	-40.6	10.9
10	-40.9	10.6
12	-41.6	9.9
14	-41.9	9.6
15	-42.1	9.4
16	-42.3	9.2
18	-42.1	9.4
20	-42.4	9.1
25	-43.4	8.1
30	-45.6	5.9



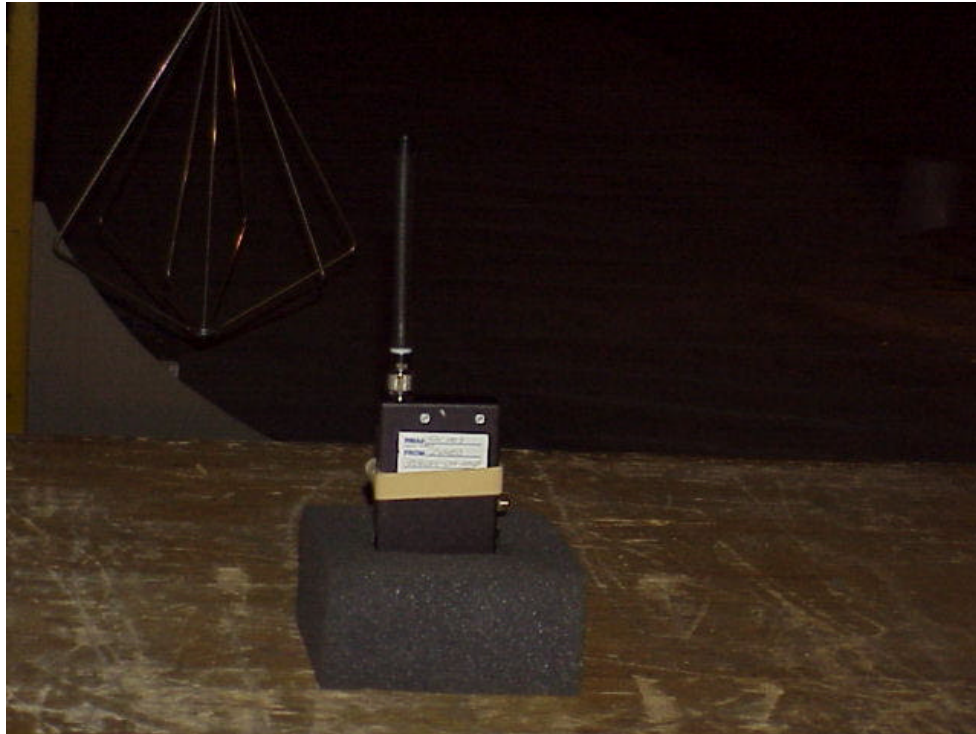


FRONT VIEW

ZYMED, INC.
MULTIPARAMETER RF TELEMETRY TRANSMITTER
Model: 206000-001
FCC PART 15 SUBPART B & C - RADIATED EMISSIONS – 3-29-99

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





BACK VIEW

ZYMED, INC.
MULTIPARAMETER RF TELEMETRY TRANSMITTER
Model: 206000-001
FCC PART 15 SUBPART B & C - RADIATED EMISSIONS – 3-29-99

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



APPENDIX D



RADIATED EMISSIONS

COMPANY NAME: ZYMEO DATE: 3-29-99

EUT: VHF TELEMETRY MULTIPARAMETER ^{X-METER} EUT S/N: 003

EUT MODEL: 206000-001 REV 0 LOCATION: ☐ BREA ☐ SILVERADO ☒ AGOURA

SPECIFICATION: FCC PT 15 ^{B+C} CLASS: TEST DISTANCE: 3m LAB: F

ANTENNA: ☐ LOOP ☒ BICONICAL ☐ LOG ☐ HORN POLARIZATION: ☒ VERT ☐ HORIZ

~~QUALIFICATION~~ ☐ ENGINEERING ☐ MFG. AUDIT ENGINEER: J. MADONGBAYAN

NOTES: 15.242

HUMIDITY: 55%

TEMP: 16 DEG CEL.

FUNDAMENTAL FREQUENCIES

	Frequency (MHz)	Peak Reading (dBuV/m)	Quasi- Peak (dBuV/m)	Antenna Height (meters)	Azimuth (degrees)	Delta * (dB)	Corrected Limit (dBuV/m)	Comments
X	174.04	106.4		1.0	90°	-19.0	125.4	LO
Y	174.03	106.3		2.0	0°	-19.1	125.4	
Z	174.04	103.5		2.0	0°	-21.9	125.4	
X	195.04	104.1		2.0	270°	-20.5	124.6	MID
Y	195.03	104.7		1.5	180°	-19.9	124.6	
Z	195.03	103.7		2.0	0°	-20.9	124.6	
X	216.03	109.9		3.0	90°	-13.2	123.1	H1
Y	216.03	99.2		2.0	0°	-23.9	123.1	
Z	216.03	104.6		2.0	0°	-18.5	123.1	

* DELTA = METER READING - CORRECTED LIMIT

RADIATED EMISSIONS

COMPANY NAME: ZYMED

DATE: 3-29-99

MULTIPARAMETER

EUT: VHF TELEMETRY TRANSMITTER

EUT S/N: 003

EUT MODEL: 206000-001 REV 0 LOCATION: ☐ BREA ☐ SILVERADO ☒ AGOURA

SPECIFICATION: FCC PT 15 B4C CLASS: — TEST DISTANCE: 3m LAB: F

ANTENNA: ☐ LOOP ☒ BICONICAL ☐ LOG ☐ HORN

POLARIZATION: ☐ VERT ☒ HORIZ

☒ QUALIFICATION ☐ ENGINEERING ☐ MFG. AUDIT

ENGINEER: J. MADRANGBAYAN

NOTES:

FUNDAMENTAL FREQUENCIES

	Frequency (MHz)	Peak Reading (dBuV/m)	Quasi- Peak (dBuV/m)	Antenna Height (meters)	Azimuth (degrees)	Delta * (dB)	Corrected Limit (dBuV/m)	Comments
X	174.03	78.4		3.0	180°	-4.7	125.4	LO
Y	174.03	84.6		2.0	270°	-40.8	125.4	
Z	174.03	83.0		2.0	270°	-42.4	125.4	
X	195.03	100.0		1.5	180°	-24.6	124.6	MID
Y	195.03	115.3		1.5	180°	-9.3	124.6	
Z	195.03	113.8		1.5	180°	-10.8	124.6	
X	216.04	107.8		1.0	0°	-15.3	123.1	H1
Y	216.04	110.1		1.0	270°	-13.0	123.1	
Z	216.03	114.9		1.0	90°	-8.2	123.1	

* DELTA = METER READING - CORRECTED LIMIT

RADIATED EMISSIONS - CONTINUATION SHEET

COMPANY NAME: ZYMED DATE: 3-29-99

EUT: VHF TELEMETRY MULTI PARAMETER TRANSMITTER

EUT S/N: 003

EUT MODEL: 206000-001 REV 0 ENGINEER: J. MADRANGIBAYAN

ANTENNA: ☐ LOOP ☐ BICONICAL ☒ LOG ☒ HORN POLARIZATION: ☒ VERT ☐ HORIZ

Frequency (MHz)	Peak Reading (dBuV/m)	Quasi- Peak (dBuV/m)	Antenna Height (meters)	Azimuth (degrees)	Delta *	Corrected Limit (dBuV/m)	Comments
348.08	40.5		1.0	90°	-23.0	63.5	
348.05	38.0		1.0	270°	-25.5	63.5	
348.06	38.3		2.0	0°	-25.2	63.5	
390.00		NO	FREQUENCIES		FOUND		
390.00				"			
390.00				"			
432.00				"			
432.00				"			
432.00				"			
		NO	FREQUENCIES		FOUND		
		ABOVE	2 ND HARMONICS				
		NO	SPIROUS EMISSIONS				
		FOUND	30 - 1000 MHz				

* DELTA = METER READING - CORRECTED LIMIT

RADIATED EMISSIONS - CONTINUATION SHEET

COMPANY NAME: ZYMED DATE: 3-29-99

EUT: VHF TELEMETRY TRANSMITTER EUT S/N: 003

EUT MODEL: 206000-001 REV 0 ENGINEER: J. MADLANGBAYAN

ANTENNA: ☐ LOOP ☐ BICONICAL ☒ LOG ☒ HORN POLARIZATION: ☐ VERT ☒ HORIZ

Frequency (MHz)	Peak Reading (dBuV/m)	Quasi- Peak (dBuV/m)	Antenna Height (meters)	Azimuth (degrees)	Delta * (dB)	Corrected Limit (dBuV/m)	Comments
348.08	39.9		1.0	270°	-23.6	63.5	
348.06	40.0		1.0	90°	-23.5	63.5	
348.07	41.6		1.0	90°	-21.9	63.5	
390.00		NO	FREQUENCIES		FOUND		
390.00				"			
390.00				"			
432.00				"			
432.00				"			
432.00				"			
		NO	FREQUENCIES				
			FOUND ABOVE 2 ND		HARMONICS		
		NO	SPURIOUS EMISSIONS				
			FOUND		30-1000 MHz		

* DELTA = METER READING - CORRECTED LIMIT