Spacelabs Medical

90341-05

FCCID: CM676A90341-WMTS

August 08, 2003

Report No. SPAC0339.1 Rev. 1

Report Prepared By:

1-888-EMI-CERT

Test Report

NORTHWEST EMC Parkway

Suite 400
Hillsboro, Oregon 97124

Certificate of Test

Issue Date: August 08, 2003
Spacelabs Medical
Model: 90341-05

Emissions

Description	Pass	Fail
FCC Part 95.1115:2003 Field Strength of Fundamental	☒	☐
FCC Part 2.1055:2003 Frequency Stability	☒	☐
FCC Part 2.1049:2003 Occupied Bandwidth	☒	☐
FCC Part 95.1115:2003 Field Strength of Spurious Emissions	☒	☐

The equipment was tested in the configuration and mode(s) of operation provided by the client. The specific tests and test levels were specified by the client. Any additional tests, or product configurations that should be tested are the responsibility of the client. Product compliance is the responsibility of the client.

Modifications made to the product

- See the modifications page of the report

Deviations to the test standard

- No deviations were made to the test standard

Test Facility

- The measurement facility used to collect the data is located at:

  Northwest EMC, Inc.; 22975 NW Evergreen Parkway, Suite 400; Hillsboro, OR 97124
  Phone: (503) 844-4066
  Fax: 844-3826

This site has been fully described in a report filed with the FCC (Federal Communications Commission), and accepted by the FCC in a letter maintained in our files.

Approved By:

Don Facteau, IS Manager

This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government of the United States of America.

This Report may only be duplicated in its entirety. The results of this test pertain only to the sample(s) tested, the specific description is noted in each of the individual sections of the test report supporting this certificate of test.

Revision Number	Description	Date	Page Number
01	Added FCC site description for wireless devices to Certificate of Test	8/7/03	2
01	Changed 300Hz to 1kHz under the test description of the Occupied Bandwidth section of report	8/7/03	31

FCC: The Open Area Test Sites, and conducted measurement facilities, have been fully described in reports filed with the FCC and accepted by the FCC in letters maintained in our files.

TCB: Northwest EMC has been accredited by ANSI to ISO/IEC Guide 65 as a product certifier. We have been designated by the FCC as a Telecommunications Certification Body (TCB). This allows Northwest EMC to certify transmitters to FCC specifications in accordance with 47 CFR 2.960 and 2.962.

NVLAP: Accreditation has been granted to Northwest EMC, Inc. to perform the Electromagnetic Compatibility (EMC) tests described in the Scope of Accreditation. Assessment performed to ISO/IEC 17025. Certificate Number: 200629-0, Certificate Number: 200630-0.

Australia/New Zealand: The National Association of Testing Authorities (NATA), Australia has been appointed by the ACA as an accreditation body to accredit test laboratories and competent bodies for EMC standards. Accredited test reports or assessments by competent bodies must carry the NATA logo. Test reports made by an overseas laboratory that has been accredited for the relevant standards by an overseas accreditation body that has a Mutual Recognition Agreement (MRA) with NATA are also accepted as technical grounds for product conformity. The report should be endorsed with the respective logo of the accreditation body. (A2LA)

TÜV Product Service: Included in TUV Product Service Group's Listing of Recognized Laboratories. It qualifies in connection with the TUV Certification after Recognition of Agent's Testing Program for the product categories and/or standards shown in TUV's current Listing of CARAT Laboratories available from TUV. A certificate was issued to represent that this laboratory continues to meet TUV's CARAT Program requirements. Certificate No. USA0302C

TÜV Rheinland: Authorized to carryout EMC tests by order and under supervision of TÜV Rheinland. This authorization is based on "Conditions for EMC-Subcontractors" of November 1992.

NEMKO: Assessed and accredited by NEMKO (Norwegian testing and certification body) for European emissions and immunity testing. As a result of NEMKO's laboratory assessment, they will accept test results from Northwest EMC, Inc. for product certification (Authorization No. ELA 119).

Technology International: Assessed in accordance with ISO Guide 25 defining the general international requirements for the competence of calibration and testing laboratories and with ITI assessment criteria LACO196. Based upon that assessment Interference Technology International, Ltd., has granted approval for specifications implementing the EU Directive on EMC (89/336/EEC and amendments). The scope of the approval was provided on a Schedule of Assessment supplied with the certificate and is available upon request.

Industry Canada: Accredited by Industry Canada for performance of radiated measurements. Our open area test sites comply with RSP 100, Issue 7, section 3.3.

VCCI: Accepted as an Associate Member to the VCCI, Acceptance No. 564. Conducted and radiated measurement facilities have been registered in accordance with Regulations for Voluntary Control Measures, Article 8. *(Registration Nos. - Evergreen: C-1071 and R-1025, Trails End: C-694 and R-677, Sultan: C-905, R-871 and R-1172, North Sioux City C-1246, R-1185 and R-1217)*

BSMI: Northwest EMC has been designated by NIST and validated by C-Taipei (BSMI) as a CAB to conduct tests as described in the APEC Mutual Recognition Agreement. License No.SL2-IN-E-1017.

CAB: Designated by NIST and validated by the European Commission as a Conformity Assessment Body (CAB) to conduct tests and approve products to the EMC directive and transmitters to the R&TTE directive, as described in the U.S. - EU Mutual Recognition Agreement

GOST: Northwest EMC, Inc. has been assessed and accredited by the Russian Certification bodies Certinform VNIINMASH, CERTINFO, SAMTES, and Federal CHEC, to perform EMC and Hygienic testing for Information Technology Products. As a result of their laboratory assessment, they will accept test results from Northwest EMC, Inc. for product certification

	NVLAP	FCC	NIST	TUV PS	TUV Rheinland	Nemko	Technology International	Industry Canada	BSMI	VCCI	GOST	NATA
IEC 1000-4-2	✓			✓	✓	✓	✓					
IEC 1000-4-3	✓			✓	✓	✓	✓					
IEC 1000-4-4	✓			✓	✓	✓	✓					
IEC 1000-4-5	✓			✓	✓	✓	✓					
IEC 1000-4-6	✓			✓	✓	✓	✓					
IEC 1000-4-8	✓			✓	✓	✓	✓					
IEC 1000-4-11	✓			✓	✓	✓	✓					
IEC 1000-3-2	✓			✓	✓	✓	✓					
IEC 1000-3-3	✓			✓	✓	✓	✓					
AS/NZS 3548	✓											✓
CNS 13438	✓								✓			
ISO/IEC17025	✓			✓	✓	✓	✓		✓			
Radiated Emissions	✓			✓	✓	✓	✓	✓	✓	✓	✓	
Conducted Emissions	✓			✓	✓	✓	✓	✓	✓	✓	✓	
OATS Sites	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	
Hillsboro 5-Meter Chamber (EV01)	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	
TCB for Licensed Transmitters		✓										
TCB for un-Licensed Transmitters		✓										
Cab for R&TTE			✓									
CAB for EMC			✓									

This chart represents only a partial NVLAP Scope, please reference http://ts.nist.gov/ts/htdocs/210/214/214.htm for the full NVLAP Scope of Accreditation

Explanation of Northwest EMC Performance Criteria

How important is it to understand performance criteria?

It is the responsibility of the test laboratory to observe the results of the tests that are performed and to accurately report those results. As the responsible party (manufacturer, importer, etc) it is your responsibility to take those results, compare them against the specifications and standards, then, if appropriate make a declaration of conformity. As the responsible party it makes sense that you are fully aware of the requirements, how your device performs when tested to those requirements, and what information is being used to declare conformity.

To better assist you in making those conformity decisions, Northwest EMC has adopted a very simple, yet very clear performance assessment procedure. The following criteria is used when performing immunity or susceptibility tests:

Performance Criteria 1:

- The EUT exhibited no change in performance when operating as specified by the manufacturer. In this case no changes were observed during the test.
- In most cases this would be equivalent to Performance Criteria A. When operating the equipment in the modes or configurations specified by the responsible party, monitoring the parameters specified, no changes were observed. Basically nothing happened.

Performance Criteria 2:

- The EUT exhibited a change in performance when operating as specified by the manufacturer. In this case the equipment recovered without any operator intervention. The data sheets will detail the exact phenomena observed.
- In most cases this would be equivalent to Performance Criteria B. When operating the equipment in the modes or configurations specified by the responsible party, monitoring the parameters specified, changes were observed. The EUT was able to recover from those changes without any operator intervention.

Performance Criteria 3:

- The EUT exhibited a change in performance when operating as specified by the manufacturer. In this case the equipment required some operator intervention in order to recover. This intervention may be in the form of reducing the test levels, changing parameters, or even resetting the system. The data sheets will detail the exact phenomena observed.
- In most cases this would be equivalent to Performance Criteria C. When operating the equipment in the modes or configurations specified by the responsible party, monitoring the parameters specified, changes were observed. The EUT required some sort of operator intervention to recover. There was no permanent damage and the EUT appeared to function normally after completion test.

Performance Criteria 4:

- The EUT exhibited a change in performance when operating as specified by the manufacturer. In this case the equipment was damaged and would not recover. The data sheets will detail the exact phenomena observed.
- In most cases there is no specific criterion to compare this to, it typically ends the test. When operating the equipment in the modes or configurations specified by the responsible party, monitoring the parameters specified, changes were observed. There was no recovery; the equipment would no longer function as intended.

Each of the standards and specifications has unique performance criteria. In order to make an accurate assessment, one must compare the test results provided with the specific performance criteria. **To ensure that a responsible party is compliant with the specifications, one must read and understand those specifications. Provided below is a sample performance criteria, taken from EN 50082-1.**

EN 50082-1 Performance Criteria

Performance Criteria A: *The apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.*

Performance Criteria B: *The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.*

Performance Criteria C: *Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of controls.*

How should a device perform in order for a declaration of conformity to be made?

As already stated, it is the responsible party that must interpret and understand the results in such a way that a declaration of conformity is made. Having said that, we are often asked to render our opinion as to how a device should perform. Our recommendation simply follows the standards, as can be referenced below. Most of the standards and specifications offer the same performance criterion shown below as their requirements.

Test	Performance Criteria typically specified by the Standard	Equivalent Northwest EMC Performance Criteria
ESD	Performance Criteria B	Performance Criteria 1 or 2
Radiated RF	Performance Criteria A	Performance Criteria 1
EFT/Burst	Performance Criteria B	Performance Criteria 1 or 2
Surge	Performance Criteria B	Performance Criteria 1 or 2
Conducted RF	Performance Criteria A	Performance Criteria 1
Magnetic Field	Performance Criteria A	Performance Criteria 1
Voltage Dips and Variations	Performance Criteria B & C	Performance Criteria 1, 2, or 3

What is measurement uncertainty?

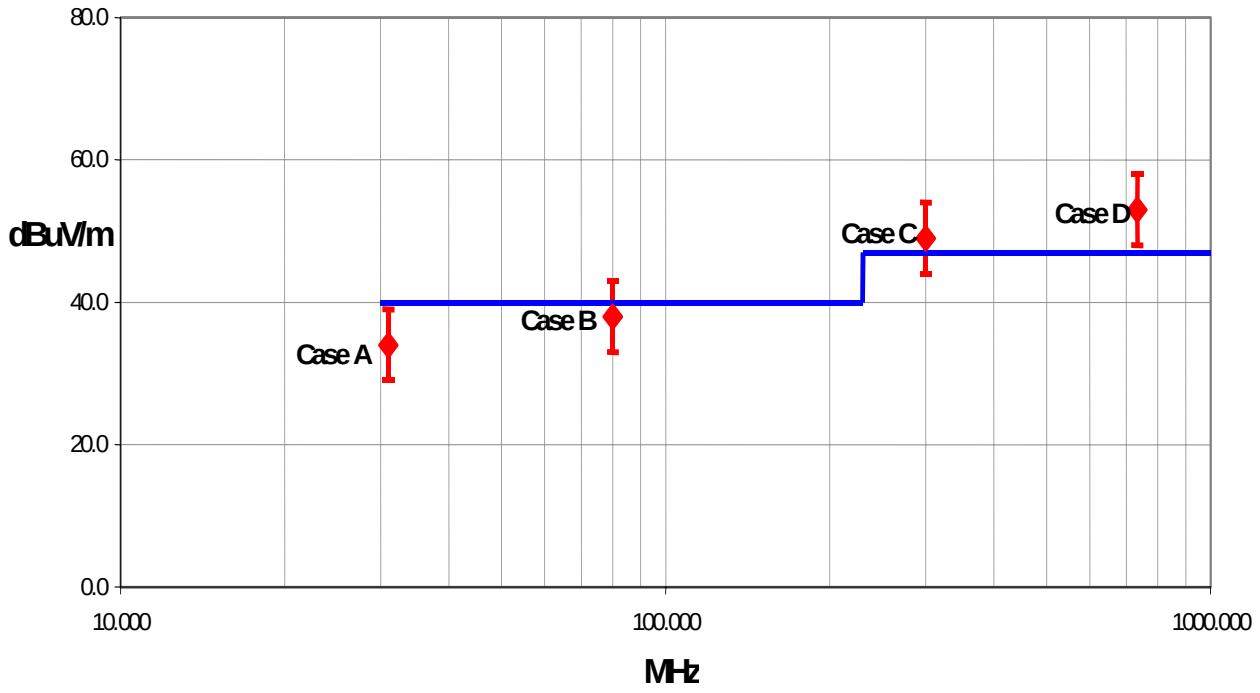
When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. The following statement of measurement uncertainty is used to reflect the accuracy of the measured result as compared with its "true" value. In the case of transient tests (ESD, EFT, Surge, Voltage Dips and Interruptions), the test equipment has been demonstrated by calibration to provide at least a 95% confidence that it complies with the test specification requirements.

The following documents were the basis for determining the uncertainty levels of our measurements:

- "ISO Guide to the Expression of Uncertainty in Measurements", October 1993
- "NIS81: The Treatment of Uncertainty in EMC Measurements", May 1994
- "IEC CISPR 16-3 A1 f1 Ed.1: Radio-interference measurements and statistical techniques", December 2000

How might measurement uncertainty be applied to test results?

If the diamond marks the measured value for the test and the vertical bars bracket the range of + and – measurement uncertainty, then test results can be interpreted from the diagram below.



Test Result Scenarios:
Case A: Product complies.
Case B: Product conditionally complies. It is not possible to say with 95% confidence that the product complies.
Case C: Product conditionally does not comply. It is not possible to say with 95% confidence that the product does not comply.
Case D: Product does not comply.

Radiated Emissions ≤ 1 GHz		Value (dB)					
	Probability Distribution	Biconical Antenna		Log Periodic Antenna		Dipole Antenna	
Test Distance		3m	10m	3m	10m	3m	10m
Combined standard uncertainty $u_c(y)$	normal	+ 1.86 - 1.88	+ 1.82 - 1.87	+ 2.23 - 1.41	+ 1.29 - 1.26	+ 1.31 - 1.27	+ 1.25 - 1.25
Expanded uncertainty ***U*** (level of confidence ≈ 95%)	normal (k=2)	+ 3.72 - 3.77	+ 3.64 - 3.73	+ 4.46 -2.81	+ 2.59 - 2.52	+ 2.61 - 2.55	+ 2.49 - 2.49

Radiated Emissions > 1 GHz	Value (dB)		
	Probability Distribution	Without High Pass Filter	With High Pass Filter
Combined standard uncertainty $u_c(y)$	normal	+ 1.29 - 1.25	+ 1.38 - 1.35
Expanded uncertainty ***U*** (level of confidence ≈ 95%)	normal (k=2)	+ 2.57 - 2.51	+ 2.76 - -2.70

Conducted Emissions		
	Probability Distribution	Value (+/- dB)
Combined standard uncertainty ***uc(y)***	normal	1.48
Expanded uncertainty ***U*** (level of confidence ≈ 95 %)	normal (k = 2)	2.97

Radiated Immunity		
	Probability Distribution	Value (+/- dB)
Combined standard uncertainty ***uc(y)***	normal	1.05
Expanded uncertainty ***U*** (level of confidence ≈ 95 %)	normal (k = 2)	2.11

Conducted Immunity		
	Probability Distribution	Value (+/- dB)
Combined standard uncertainty ***uc(y)***	normal	1.05
Expanded uncertainty ***U*** (level of confidence ≈ 95 %)	normal (k = 2)	2.10

Legend

$u_c(y)$ = square root of the sum of squares of the individual standard uncertainties

U = combined standard uncertainty multiplied by the coverage factor: **k**. This defines an interval about the measured result that will encompass the true value with a confidence level of approximately 95%. If a higher level of confidence is required, then k=3 (CL of 99.7%) can be used. Please note that with a coverage factor of one, uc(y) yields a confidence level of only 68%.

California

Orange County Facility

41 Tesla Ave.
Irvine, CA 92618
(888) 364-2378
FAX (503) 844-3826

Oregon

Evergreen Facility

22975 NW Evergreen Pkwy.,
Suite 400
Hillsboro, OR 97124
(503) 844-4066
FAX (503) 844-3826

Oregon

Trails End Facility

30475 NE Trails End Lane
Newberg, OR 97132
(503) 844-4066
FAX (503) 537-0735

South Dakota

North Sioux City Facility

745 N. Derby Lane
P.O. Box 217
North Sioux City, SD 57049
(605) 232-5267
FAX (605) 232-3873

Washington

Sultan Facility

14128 339th Ave. SE
Sultan, WA 98294
(888) 364-2378
FAX (360) 793-2536

Party Requesting the Test

Company Name:	Spacelabs Medical
Address:	5250 220th Ave. SE
City, State, Zip:	Issaquah, WA 98027-7018
Test Requested By:	Stan Wiley
Model:	90341-05 WMTS Transmitter
First Date of Test:	June 18, 2003
Last Date of Test:	July 30, 2003
Receipt Date of Samples:	June 18, 2003
Equipment Design Stage:	Production
Equipment Condition:	No visible signs of Damage

Information Provided by the Party Requesting the Test

Clocks/Oscillators:	32.768kHz, 4.096kHz, SN:PAR 01 XTL 152.034375 MHz, SN:PAR 12 XTL153.459375MHz
I/O Ports:	None

Functional Description of the EUT (Equipment Under Test):

Wireless Medical Telemetry Service (WMTS)

Client Justification for EUT Selection:

Each transmitter is a fixed radio frequency device – determined by the factory installed crystal oscillator. The oscillator frequency goes through two doubler stages to reach the RF operating frequency. Two test samples provided for WMTS 608 – 614 MHz band. SN: PAR 01 operating at 608.1375MHz and SN: PAR 12 operating at 613.8375MHz.

Client Justification for Test Selection

No periphery equipment is needed for emissions testing. A 90478 receiver module and portable monitor are used to observe the performance of the transmitter while being subjected to RF fields and ESD immunity tests.

Equipment modifications				
Item #	Test	Date	Modification	Note
1	Occupied Bandwidth	06-23-2003	No EMI suppression devices were added or modified during this test.	Same configuration as delivered.
2	Field Strength of Fundamental	07-15-2003	No EMI suppression devices were added or modified during this test.	Same configuration as delivered.
3	Field Strength of Spurious Emissions	07-16-2003	No EMI suppression devices were added or modified during this test.	Same configuration as delivered.
4	Frequency Stability	07-29-2003	No EMI suppression devices were added or modified during this test.	Same configuration as delivered.

Justification

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. While scanning the radiated emissions, all of the EUT parameters listed below were investigated. This includes, but may not be limited to, antennas, tuned transmit frequency ranges, operating modes, and data rates.

Channels in Specified Band Investigated:
High
Low

Operating Modes Investigated:
Typical

Data Rates Investigated:
Maximum

Output Power Setting(s) Investigated:
Maximum

Power Input Settings Investigated:
9V Battery

Software\Firmware Applied During Test

Exercise software	Standard Production Software	Version	Unknown
Description			
The system was tested using standard operating production software to exercise the functions of the device during the testing. This included continuously transmitting at 608MHz and 614MHz.			

EUT and Peripherals

Description	Manufacturer	Model/Part Number	Serial Number
EUT 1- ECG Transmitter (Ch. 1246)	SpaceLabs Medical	90341-05	PAR 01
EUT 2- ECG Transmitter (Ch. 1474)	SpaceLabs Medical	90341-05	PAR 12
Shorting bar	SpaceLabs Medical	N/A	N/A

Cables

Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
ECG Leads (5)	PA	0.6	PA	EUT	Shorting bar

PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.

Field Strength of Fundamental

Measurement Equipment

Description	Manufacturer	Model	Identifier	Last Cal	Interval
Spectrum Analyzer	Hewlett-Packard	8566B	AAL	01/07/2003	12 mo
Quasi-Peak Adapter	Hewlett-Packard	85650A	AQF	01/07/2003	12 mo
Antenna, Biconilog	EMCO	3141	AXE	12/31/2001	36 mo

Test Description

Requirement: The field strength of the fundamental radiated emissions shall meet the limits as defined in 47 CFR 95.1115(a). In the 608-614 MHz band, the maximum allowable field strength is 200 mV/m, as measured at a distance of 3 meters, using measuring instrumentation with a CISPR quasi-peak detector.

Configuration: The antenna to be used with the EUT was tested. The EUT was transmitting while set at the lowest and highest channels available. The spectrum was scanned from 606 MHz to 616 MHz. While scanning, emissions from the EUT were maximized by rotating the EUT, adjusting the measurement antenna height and polarization, and manipulating the EUT antenna in 3 orthogonal plane (per ANSI C63.4:1992).

Bandwidths Used for Measurements

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 – 0.15	1.0	0.2	0.2
0.15 – 30.0	10.0	9.0	9.0
30.0 – 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0
Measurements were made using the bandwidths and detectors specified. No video filter was used.			

Completed by:

NORTHWEST EMC

OATS DATA SHEET

REV df3.11 06/23/2003

EUT:	90341-05			Work Order:	SPAC0339
Serial Number:	PAR 12			Date:	07/15/03
Customer:	Spacelabs Medical			Temperature:	77
Attendees:	Drop Off			Humidity:	41%
Cust. Ref. No.:	N/A			Barometric Pressure	29.98
Tested by:	Holly Ashkannejhad	Power:	9VDC Battery	Job Site:	EV01

TEST SPECIFICATIONS

Specification:	FCC CFR 47 95.1115(a)	Year:	2003
Method:	ANSI C63.4	Year:	1992

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator

COMMENTS

EUT OPERATING MODES

Transmitting high channel

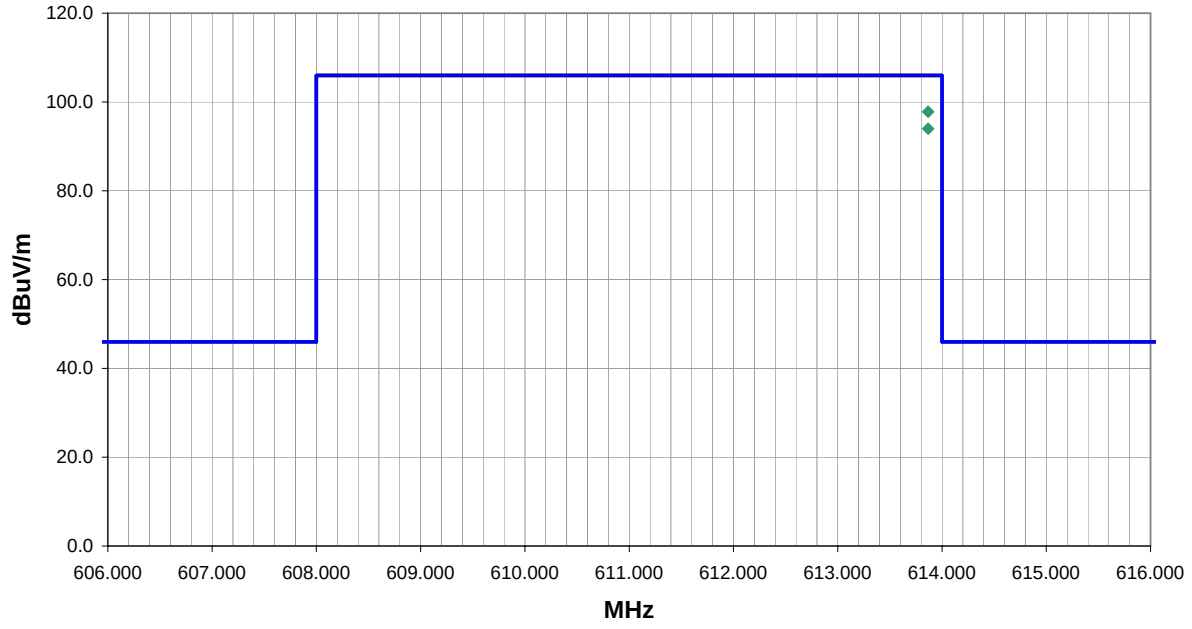
DEVIATIONS FROM TEST STANDARD

No deviations.

RESULTS	Run #
Pass	39

Other

Tested By: Holly Ashkannejhad



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
613.867	84.8	-7.0	306.0	1.4	3.0	20.0	H-Bilog	QP	0.0	97.8	106.0	-8.2
613.867	81.0	-7.0	341.0	1.7	3.0	20.0	V-Bilog	QP	0.0	94.0	106.0	-12.0

NORTHWEST EMC

OATS DATA SHEET

REV df3.11 06/23/2003

EUT:	90341-05			Work Order:	SPAC0339
Serial Number:	PAR 12			Date:	07/15/03
Customer:	Spacelabs Medical			Temperature:	77
Attendees:	Drop Off			Humidity:	41%
Cust. Ref. No.:	N/A			Barometric Pressure	29.98
Tested by:	Holly Ashkannejhad	Power:	9VDC Battery	Job Site:	EV01

TEST SPECIFICATIONS

Specification:	FCC CFR 47 95.1115(a)	Year:	2003
Method:	ANSI C63.4	Year:	1992

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator

COMMENTS

EUT OPERATING MODES

Transmitting low channel

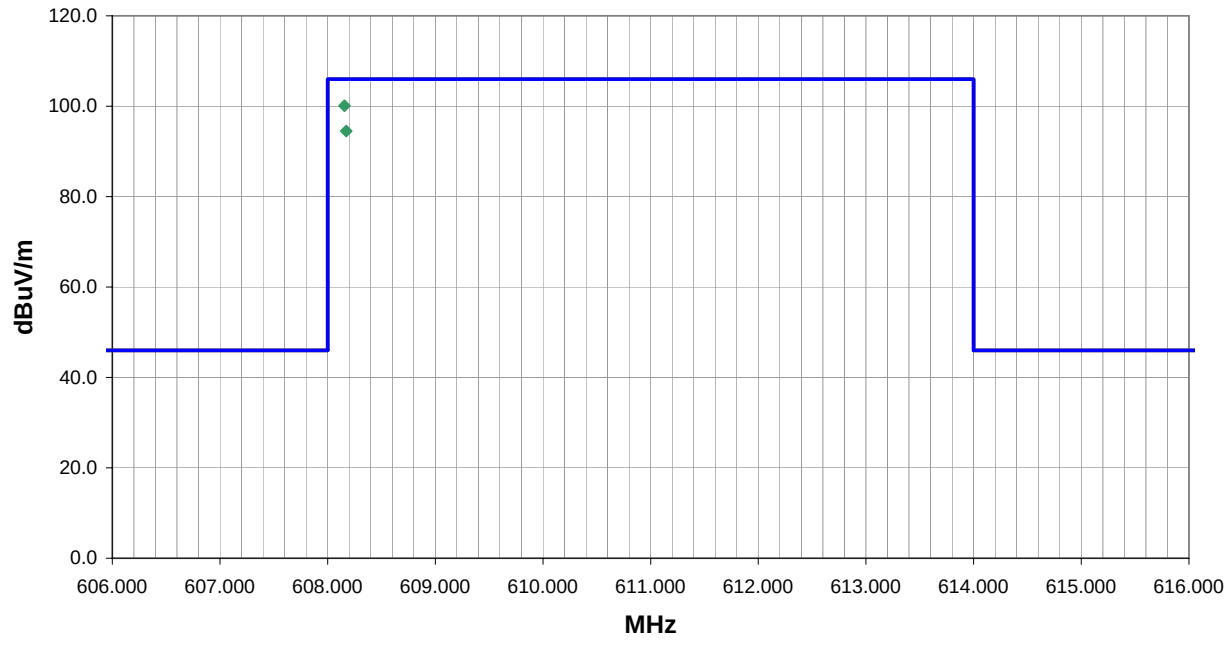
DEVIATIONS FROM TEST STANDARD

No deviations.

RESULTS	Run #
Pass	35

Other

Tested By: Holly Ashkannejhad



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
608.156	97.2	-7.1	9.0	1.4	3.0	10.0	H-Bilog	QP	0.0	100.1	106.0	-5.9
608.173	91.6	-7.1	141.0	1.8	3.0	10.0	V-Bilog	QP	0.0	94.5	106.0	-11.5

Justification

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. While scanning the radiated emissions, all of the EUT parameters listed below were investigated. This includes, but may not be limited to, antennas, tuned transmit frequency ranges, operating modes, and data rates.

Channels in Specified Band Investigated:
High
Low

Operating Modes Investigated:
Typical

Antennas Investigated:
Integral

Data Rates Investigated:
Maximum

Output Power Setting(s) Investigated:
Maximum

Power Input Settings Investigated:
9V Battery

Frequency Range Investigated			
Start Frequency	30 MHz	Stop Frequency	7 GHz

Software\Firmware Applied During Test			
Exercise software	Standard Production Software	Version	Unknown
Description			
The system was tested using standard operating production software to exercise the functions of the device during the testing. This included continuously transmitting at 608MHz and 614MHz.			

EUT and Peripherals

Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
EUT 1- ECG Transmitter (Ch. 1246)	SpaceLabs Medical	90341-05	PAR 01
EUT 2- ECG Transmitter (Ch. 1474)	SpaceLabs Medical	90341-05	PAR 12
Shorting bar	SpaceLabs Medical	N/A	N/A

Cables

Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
ECG Leads (5)	PA	0.6	PA	EUT	Shorting bar

PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.

Measurement Equipment

Description	Manufacturer	Model	Identifier	Last Cal	Interval
Spectrum Analyzer	Hewlett-Packard	8566B	AAL	01/07/2003	12 mo
Quasi-Peak Adapter	Hewlett-Packard	85650A	AQF	01/07/2003	12 mo
Pre-Amplifier	Amplifier Research	LN1000A	APS	01/06/2003	12 mo
Antenna, Biconilog	EMCO	3141	AXE	12/31/2001	36 mo
Antenna, Horn	EMCO	3115	AHC	08/12/2002	12 mo
Pre-Amplifier	Miteq	AMF-4D-005180-24-10P	APJ	01/06/2003	12 mo
High Pass Filter	Hewlett-Packard	84300-80037	HFE	05/01/2003	12 mo
High Pass Filter	MicroLab	FH-1001	HFI	05/01/2003	12 mo

Test Description

Requirement: The field strength of spurious radiated emissions shall meet the limits as defined in 47 CFR 95.1115. Field strength limits are specified at a distance of 3 meters. Below 960 MHz, measurements are made using instrumentation with a CISPR quasi-peak detector. Above 960 MHz, measurements are made using instrumentation with an averaging detector and a 1 MHz bandwidth.

Configuration: The antenna to be used with the EUT was testing. The EUT was transmitting while set at the lowest and highest channels available. The spectrum was scanned from 30 MHz to 7 GHz. While scanning, emissions from the EUT were maximized by rotating the EUT, adjusting the measurement antenna height and polarization, and manipulating the EUT antenna in 3 orthogonal plane (per ANSI C63.4:1992). A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.

Bandwidths Used for Measurements

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 – 0.15	1.0	0.2	0.2
0.15 – 30.0	10.0	9.0	9.0
30.0 – 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0
Measurements were made using the bandwidths and detectors specified. No video filter was used.			

Completed by:

Holly Arrington

NORTHWEST EMC

OATS DATA SHEET

REV df3.11 06/23/2003

EUT:	90341-05			Work Order:	SPAC0339
Serial Number:	PAR 12			Date:	07/15/03
Customer:	Spacelabs Medical			Temperature:	77
Attendees:	Drop Off			Humidity:	41%
Cust. Ref. No.:	N/A			Barometric Pressure	29.98
Tested by:	Holly Ashkannejhad	Power:	9VDC Battery	Job Site:	EV01

TEST SPECIFICATIONS

Specification:	FCC CFR 47 95.1115(b)	Year:	2003
Method:	ANSI C63.4	Year:	1992

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator

COMMENTS

EUT OPERATING MODES

Transmitting low channel

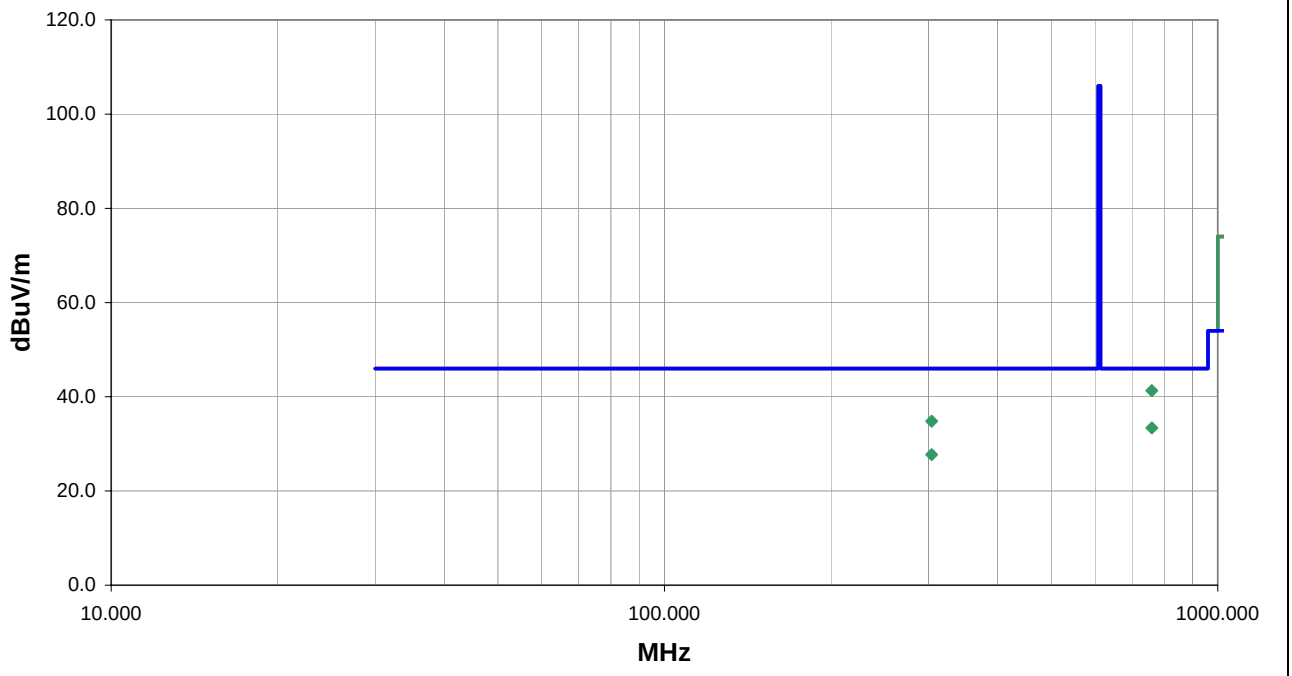
DEVIATIONS FROM TEST STANDARD

No deviations.

RESULTS	Run #
Pass	33

Other

Tested By:



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
760.199	37.3	-6.0	313.0	1.2	3.0	10.0	H-Bilog	QP	0.0	41.3	46.0	-4.7
304.098	38.4	-13.6	26.0	1.1	3.0	10.0	H-Bilog	QP	0.0	34.8	46.0	-11.2
760.199	29.4	-6.0	5.0	1.1	3.0	10.0	V-Bilog	QP	0.0	33.4	46.0	-12.6
304.099	31.3	-13.6	358.0	1.4	3.0	10.0	V-Bilog	QP	0.0	27.7	46.0	-18.3

NORTHWEST EMC

OATS DATA SHEET

REV df3.11 06/23/2003

EUT:	90341-05			Work Order:	SPAC0339
Serial Number:	PAR 12			Date:	07/15/03
Customer:	Spacelabs Medical			Temperature:	77
Attendees:	Drop Off			Humidity:	41%
Cust. Ref. No.:	N/A			Barometric Pressure	29.98
Tested by:	Holly Ashkannejhad	Power:	9VDC Battery	Job Site:	EV01

TEST SPECIFICATIONS

Specification:	FCC CFR 47 95.1115(b)	Year:	2003
Method:	ANSI C63.4	Year:	1992

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator

COMMENTS

EUT OPERATING MODES

Transmitting high channel

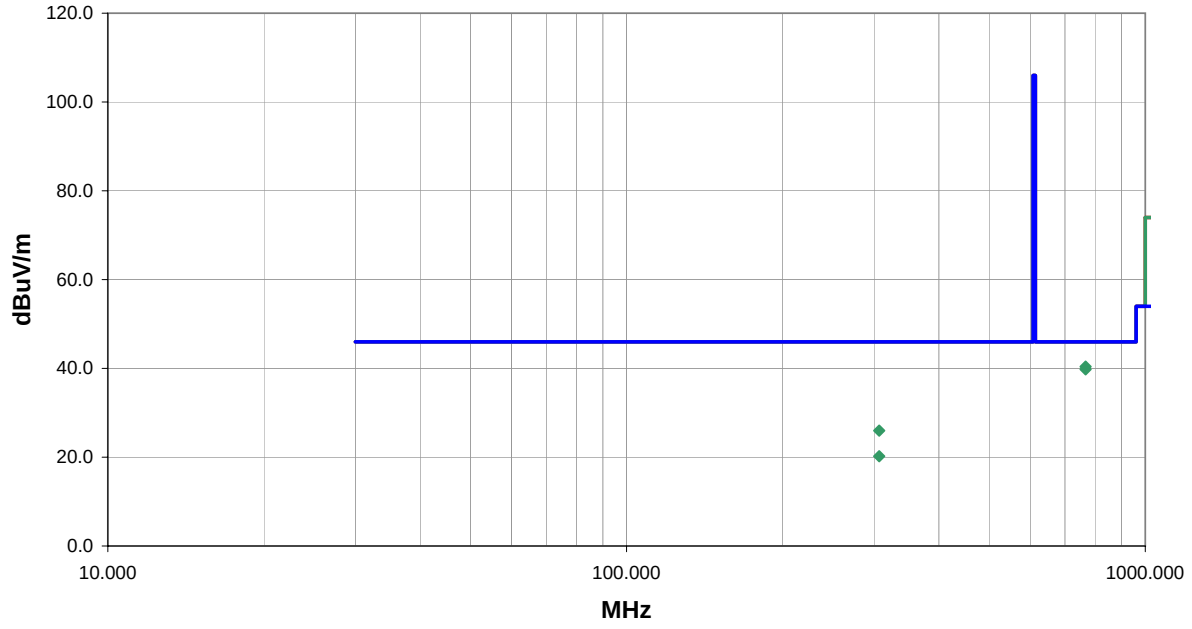
DEVIATIONS FROM TEST STANDARD

No deviations.

RESULTS	Run #
Pass	37

Other

Tested By: Holly Ashkannejhad



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
767.300	36.3	-5.9	93.0	1.4	3.0	10.0	V-Bilog	QP	0.0	40.4	46.0	-5.6
767.300	35.7	-5.9	270.0	1.0	3.0	10.0	H-Bilog	QP	0.0	39.8	46.0	-6.2
306.916	29.5	-13.5	277.0	1.0	3.0	10.0	H-Bilog	QP	0.0	26.0	46.0	-20.0
306.916	23.7	-13.5	93.0	1.4	3.0	10.0	V-Bilog	QP	0.0	20.2	46.0	-25.8

NORTHWEST EMC

OATS DATA SHEET

REV df3.11 06/23/2003

EUT:	90341-05			Work Order:	SPAC0339
Serial Number:	PAR 12			Date:	07/15/03
Customer:	Spacelabs Medical			Temperature:	77
Attendees:	Drop Off			Humidity:	41%
Cust. Ref. No.:	N/A			Barometric Pressure	29.98
Tested by:	Holly Ashkannejhad	Power:	9VDC Battery	Job Site:	EV01

TEST SPECIFICATIONS

Specification:	FCC CFR 47 95.1115(b)	Year:	2003
Method:	ANSI C63.4	Year:	1992

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator

COMMENTS

EUT OPERATING MODES

Transmitting high channel

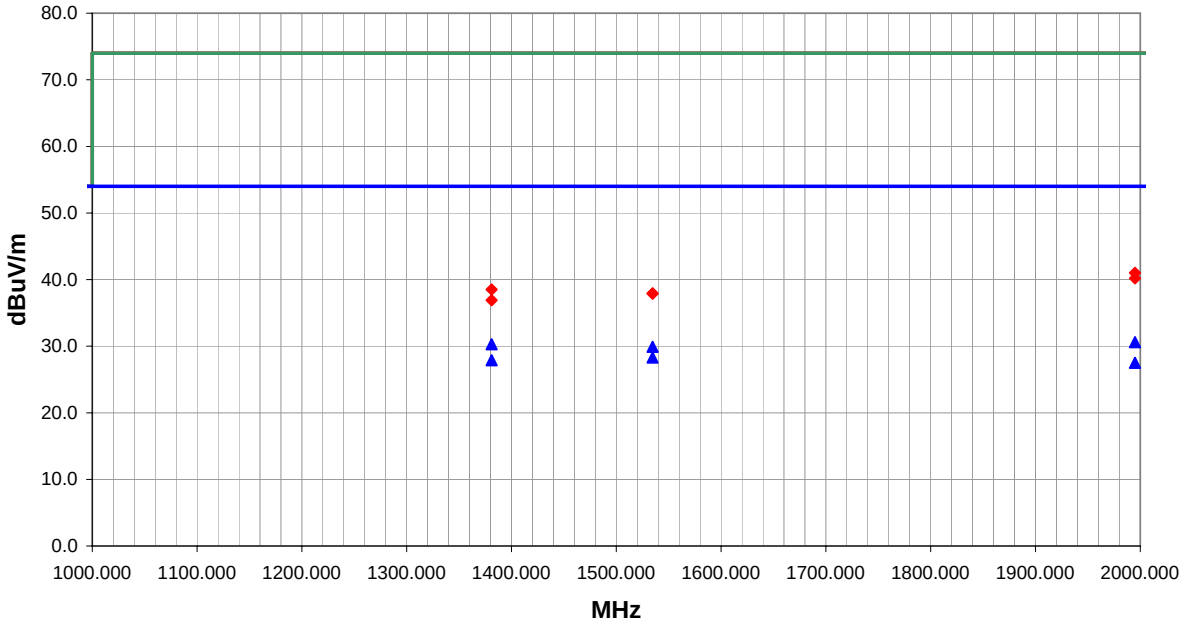
DEVIATIONS FROM TEST STANDARD

No deviations.

RESULTS	Run #
Pass	41

Other

Tested By: Holly Ashkannejhad



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
1994.979	32.2	-1.6	152.0	1.3	3.0	0.0	H-Horn	AV	0.0	30.6	54.0	-23.4
1381.141	36.0	-5.7	222.0	1.7	3.0	0.0	V-Horn	AV	0.0	30.3	54.0	-23.7
1534.594	34.7	-4.8	48.0	1.2	3.0	0.0	V-Horn	AV	0.0	29.9	54.0	-24.1
1534.594	33.1	-4.8	116.0	1.3	3.0	0.0	H-Horn	AV	0.0	28.3	54.0	-25.7
1381.141	33.6	-5.7	143.0	1.7	3.0	0.0	H-Horn	AV	0.0	27.9	54.0	-26.1
1994.979	29.1	-1.6	262.0	1.1	3.0	0.0	V-Horn	AV	0.0	27.5	54.0	-26.5
1994.979	42.6	-1.6	152.0	1.3	3.0	0.0	H-Horn	PK	0.0	41.0	74.0	-33.0
1994.979	41.8	-1.6	262.0	1.1	3.0	0.0	V-Horn	PK	0.0	40.2	74.0	-33.8
1381.141	44.2	-5.7	222.0	1.7	3.0	0.0	V-Horn	PK	0.0	38.5	74.0	-35.5
1534.594	42.7	-4.8	116.0	1.3	3.0	0.0	H-Horn	PK	0.0	37.9	74.0	-36.1
1534.594	42.7	-4.8	48.0	1.2	3.0	0.0	V-Horn	PK	0.0	37.9	74.0	-36.1
1381.141	42.6	-5.7	143.0	1.7	3.0	0.0	H-Horn	PK	0.0	36.9	74.0	-37.1

NORTHWEST EMC

OATS DATA SHEET

REV df3.11 06/23/2003

EUT:	90341-05			Work Order:	SPAC0339
Serial Number:	PAR 12			Date:	07/15/03
Customer:	Spacelabs Medical			Temperature:	77
Attendees:	Drop Off			Humidity:	41%
Cust. Ref. No.:	N/A			Barometric Pressure	29.98
Tested by:	Holly Ashkannejhad	Power:	9VDC Battery	Job Site:	EV01

TEST SPECIFICATIONS

Specification:	FCC CFR 47 95.1115(b)	Year:	2003
Method:	ANSI C63.4	Year:	1992

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator

COMMENTS

EUT OPERATING MODES

Transmitting low channel

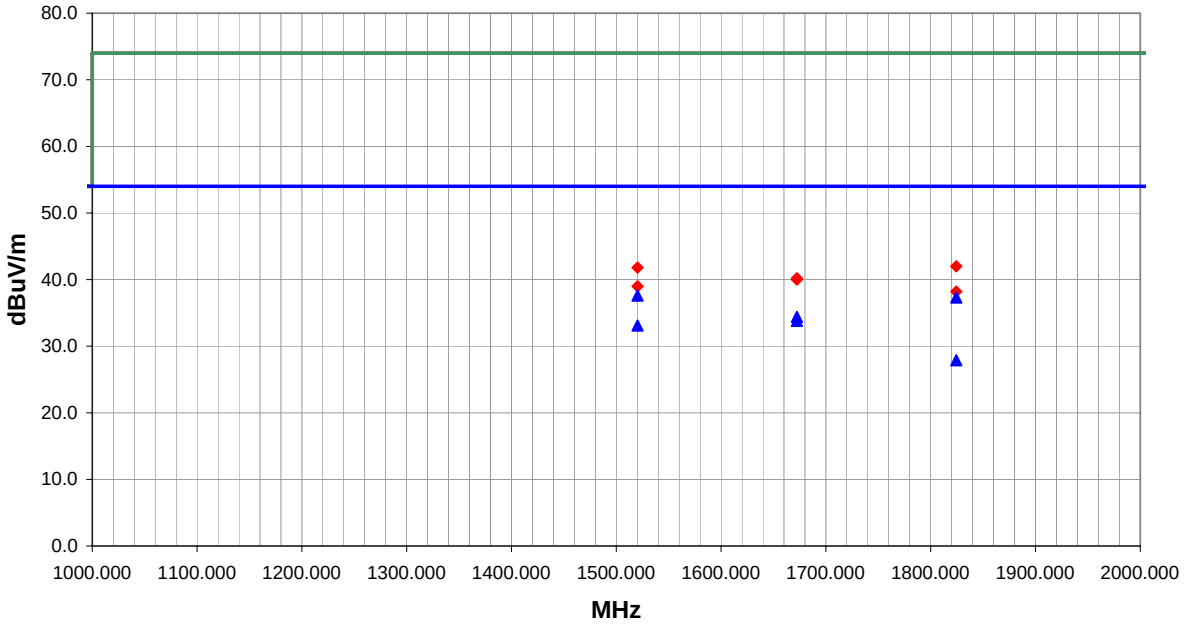
DEVIATIONS FROM TEST STANDARD

No deviations.

RESULTS	Run #
Pass	43

Other

Tested By: Holly Ashkannejhad



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
1520.353	42.6	-5.0	256.0	1.3	3.0	0.0	H-Horn	AV	0.0	37.6	54.0	-16.4
1824.415	39.9	-2.6	347.0	1.1	3.0	0.0	V-Horn	AV	0.0	37.3	54.0	-16.7
1672.389	38.1	-3.7	47.0	1.2	3.0	0.0	V-Horn	AV	0.0	34.4	54.0	-19.6
1672.389	37.5	-3.7	281.0	1.6	3.0	0.0	H-Horn	AV	0.0	33.8	54.0	-20.2
1520.353	38.1	-5.0	247.0	1.2	3.0	0.0	V-Horn	AV	0.0	33.1	54.0	-20.9
1824.415	30.5	-2.6	25.0	1.3	3.0	0.0	H-Horn	AV	0.0	27.9	54.0	-26.1
1824.415	44.6	-2.6	347.0	1.1	3.0	0.0	V-Horn	PK	0.0	42.0	74.0	-32.0
1520.353	46.8	-5.0	256.0	1.3	3.0	0.0	H-Horn	PK	0.0	41.8	74.0	-32.2
1672.389	43.9	-3.7	281.0	1.6	3.0	0.0	H-Horn	PK	0.0	40.2	74.0	-33.8
1672.389	43.7	-3.7	47.0	1.2	3.0	0.0	V-Horn	PK	0.0	40.0	74.0	-34.0
1520.353	44.0	-5.0	247.0	1.2	3.0	0.0	V-Horn	PK	0.0	39.0	74.0	-35.0
1824.415	40.8	-2.6	25.0	1.3	3.0	0.0	H-Horn	PK	0.0	38.2	74.0	-35.8

NORTHWEST EMC

OATS DATA SHEET

REV df3.11 06/23/2003

EUT:	90341-05			Work Order:	SPAC0339
Serial Number:	PAR 12			Date:	07/16/03
Customer:	Spacelabs Medical			Temperature:	77
Attendees:	Drop Off			Humidity:	41%
Cust. Ref. No.:	N/A			Barometric Pressure	29.98
Tested by:	Holly Ashkannejhad	Power:	9VDC Battery	Job Site:	EV01

TEST SPECIFICATIONS

Specification:	FCC CFR 47 95.1115(b)	Year:	2003
Method:	ANSI C63.4	Year:	1992

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator

COMMENTS

EUT OPERATING MODES

Transmitting low channel

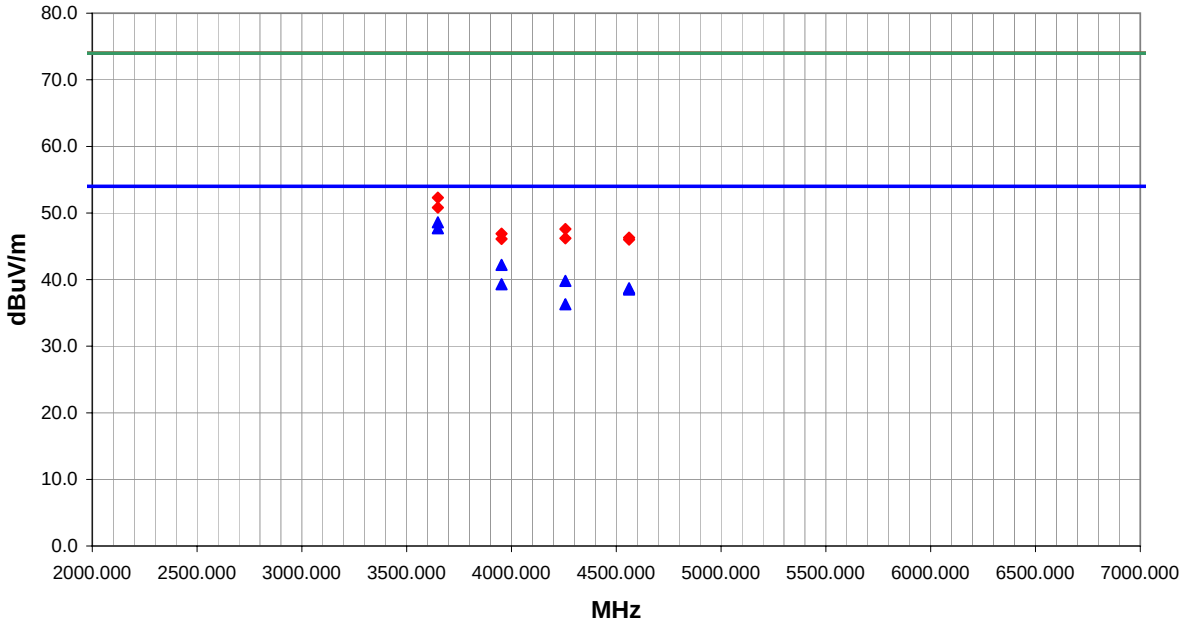
DEVIATIONS FROM TEST STANDARD

No deviations.

RESULTS	Run #
Pass	45

Other

Tested By:



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
3648.798	44.9	3.7	160.0	1.1	3.0	0.0	H-Horn	AV	0.0	48.6	54.0	-5.4
3648.798	44.0	3.7	23.0	1.1	3.0	0.0	V-Horn	AV	0.0	47.7	54.0	-6.3
3952.908	37.3	4.9	91.0	1.1	3.0	0.0	H-Horn	AV	0.0	42.2	54.0	-11.8
4256.954	34.8	5.0	259.0	1.4	3.0	0.0	V-Horn	AV	0.0	39.8	54.0	-14.2
3952.908	34.4	4.9	54.0	1.2	3.0	0.0	V-Horn	AV	0.0	39.3	54.0	-14.7
4561.047	33.5	5.2	58.0	1.3	3.0	0.0	H-Horn	AV	0.0	38.7	54.0	-15.3
4561.047	33.3	5.2	36.0	1.2	3.0	0.0	V-Horn	AV	0.0	38.5	54.0	-15.5
4256.954	31.3	5.0	161.0	1.3	3.0	0.0	H-Horn	AV	0.0	36.3	54.0	-17.7
3648.798	48.6	3.7	160.0	1.1	3.0	0.0	H-Horn	PK	0.0	52.3	74.0	-21.7
3648.798	47.1	3.7	23.0	1.1	3.0	0.0	V-Horn	PK	0.0	50.8	74.0	-23.2
4256.954	42.6	5.0	259.0	1.4	3.0	0.0	V-Horn	PK	0.0	47.6	74.0	-26.4
3952.908	42.0	4.9	91.0	1.1	3.0	0.0	H-Horn	PK	0.0	46.9	74.0	-27.1
4561.047	41.1	5.2	58.0	1.3	3.0	0.0	H-Horn	PK	0.0	46.3	74.0	-27.7
4256.954	41.2	5.0	161.0	1.3	3.0	0.0	H-Horn	PK	0.0	46.2	74.0	-27.8
3952.908	41.2	4.9	54.0	1.2	3.0	0.0	V-Horn	PK	0.0	46.1	74.0	-27.9
4561.047	40.8	5.2	36.0	1.2	3.0	0.0	V-Horn	PK	0.0	46.0	74.0	-28.0

NORTHWEST EMC

OATS DATA SHEET

REV df3.11 06/23/2003

EUT:	90341-05			Work Order:	SPAC0339
Serial Number:	PAR 12			Date:	07/16/03
Customer:	Spacelabs Medical			Temperature:	77
Attendees:	Drop Off			Humidity:	41%
Cust. Ref. No.:	N/A			Barometric Pressure	29.98
Tested by:	Holly Ashkannejhad	Power:	9VDC Battery	Job Site:	EV01

TEST SPECIFICATIONS

Specification:	FCC CFR 47 95.1115(b)	Year:	2003
Method:	ANSI C63.4	Year:	1992

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator

COMMENTS

EUT OPERATING MODES

Transmitting high channel

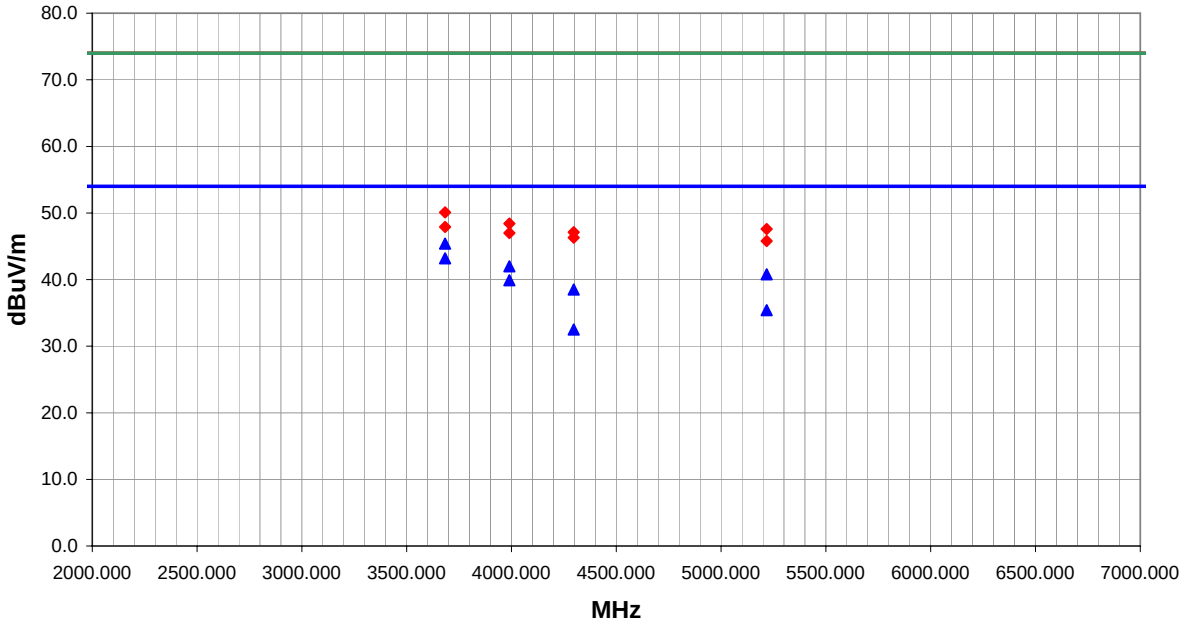
DEVIATIONS FROM TEST STANDARD

No deviations.

RESULTS	Run #
Pass	47

Other

Tested By: Holly Ashkannejhad



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
3683.046	41.6	3.8	154.0	1.1	3.0	0.0	H-Horn	AV	0.0	45.4	54.0	-8.6
3683.046	39.4	3.8	117.0	1.2	3.0	0.0	V-Horn	AV	0.0	43.2	54.0	-10.8
3989.976	36.9	5.1	69.0	1.6	3.0	0.0	H-Horn	AV	0.0	42.0	54.0	-12.0
5217.605	33.6	7.2	80.0	1.5	3.0	0.0	V-Horn	AV	0.0	40.8	54.0	-13.2
3989.976	34.8	5.1	32.0	1.2	3.0	0.0	V-Horn	AV	0.0	39.9	54.0	-14.1
4296.879	33.4	5.1	251.0	1.2	3.0	0.0	V-Horn	AV	0.0	38.5	54.0	-15.5
5217.605	28.2	7.2	33.0	1.3	3.0	0.0	H-Horn	AV	0.0	35.4	54.0	-18.6
4296.879	27.4	5.1	236.0	3.1	3.0	0.0	H-Horn	AV	0.0	32.5	54.0	-21.5
3683.046	46.3	3.8	154.0	1.1	3.0	0.0	H-Horn	PK	0.0	50.1	74.0	-23.9
3989.976	43.3	5.1	69.0	1.6	3.0	0.0	H-Horn	PK	0.0	48.4	74.0	-25.6
3683.046	44.1	3.8	117.0	1.2	3.0	0.0	V-Horn	PK	0.0	47.9	74.0	-26.1
5217.605	40.4	7.2	80.0	1.5	3.0	0.0	V-Horn	PK	0.0	47.6	74.0	-26.4
4296.879	42.0	5.1	251.0	1.2	3.0	0.0	V-Horn	PK	0.0	47.1	74.0	-26.9
3989.976	41.9	5.1	32.0	1.2	3.0	0.0	V-Horn	PK	0.0	47.0	74.0	-27.0
4296.879	41.2	5.1	236.0	3.1	3.0	0.0	H-Horn	PK	0.0	46.3	74.0	-27.7
5217.605	38.6	7.2	33.0	1.3	3.0	0.0	H-Horn	PK	0.0	45.8	74.0	-28.2

Justification

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. While scanning the radiated emissions, all of the EUT parameters listed below were investigated. This includes, but may not be limited to, antennas, tuned transmit frequency ranges, operating modes, and data rates.

Channels in Specified Band Investigated:
High
Low

Operating Modes Investigated:
Typical

Power Input Settings Investigated:
9V Battery

Software\Firmware Applied During Test			
Exercise software	Standard Production Software	Version	Unknown
Description			
The system was tested using standard operating production software to exercise the functions of the device during the testing.			

EUT and Peripherals

Description	Manufacturer	Model/Part Number	Serial Number
EUT 1- ECG Transmitter (Ch. 1246)	SpaceLabs Medical	90341-05	PAR 01
EUT 2- ECG Transmitter (Ch. 1474)	SpaceLabs Medical	90341-05	PAR 12
Shorting bar	SpaceLabs Medical	N/A	N/A

Cables

Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
ECG Leads (5)	PA	0.6	PA	EUT	Shorting bar

PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.

Measurement Equipment

Description	Manufacturer	Model	Identifier	Last Cal	Interval
Spectrum Analyzer	Tektronix	2784	AAO	02/26/2003	24 mo

Test Description

Requirement: Per 47 CFR 2.1049, the 20 dB occupied bandwidth was measured.

Configuration: The antenna is integral to the EUT, so a radiated measurement was made using a spectrum analyzer and a near field probe. A 1kHz resolution bandwidth with no video filtering and a peak detector were used. The RBW was sufficiently narrow to plot the actually bandwidth of the signal and not the filter response curve of the spectrum analyzer.

Completed by:

NORTHWEST EMC

EMISSIONS DATA SHEET

Rev BETA 01/30/01

EUT:	90341-05			Work Order:	SPACV0339
Serial Number:	PAR 01			Date:	06/23/03
Customer:	Spacelabs Medical			Temperature:	23 degrees C
Attendees:	N/A	Tested by:	Rod Peloquin	Humidity:	38% RH
Customer Ref. No.:	N/A	Power:	N/A	Job Site:	EV06

TEST SPECIFICATIONS

Specification:	47 CFR 2.1049	Year:	2003	Method:	TIEA/EIA - 603	Year:	1993

SAMPLE CALCULATIONS

COMMENTS

EUT OPERATING MODES

Modulated at maximum data rate, maximum output power

DEVIATIONS FROM TEST STANDARD

None

REQUIREMENTS

The maximum 20dB bandwidth is 1.5 MHz

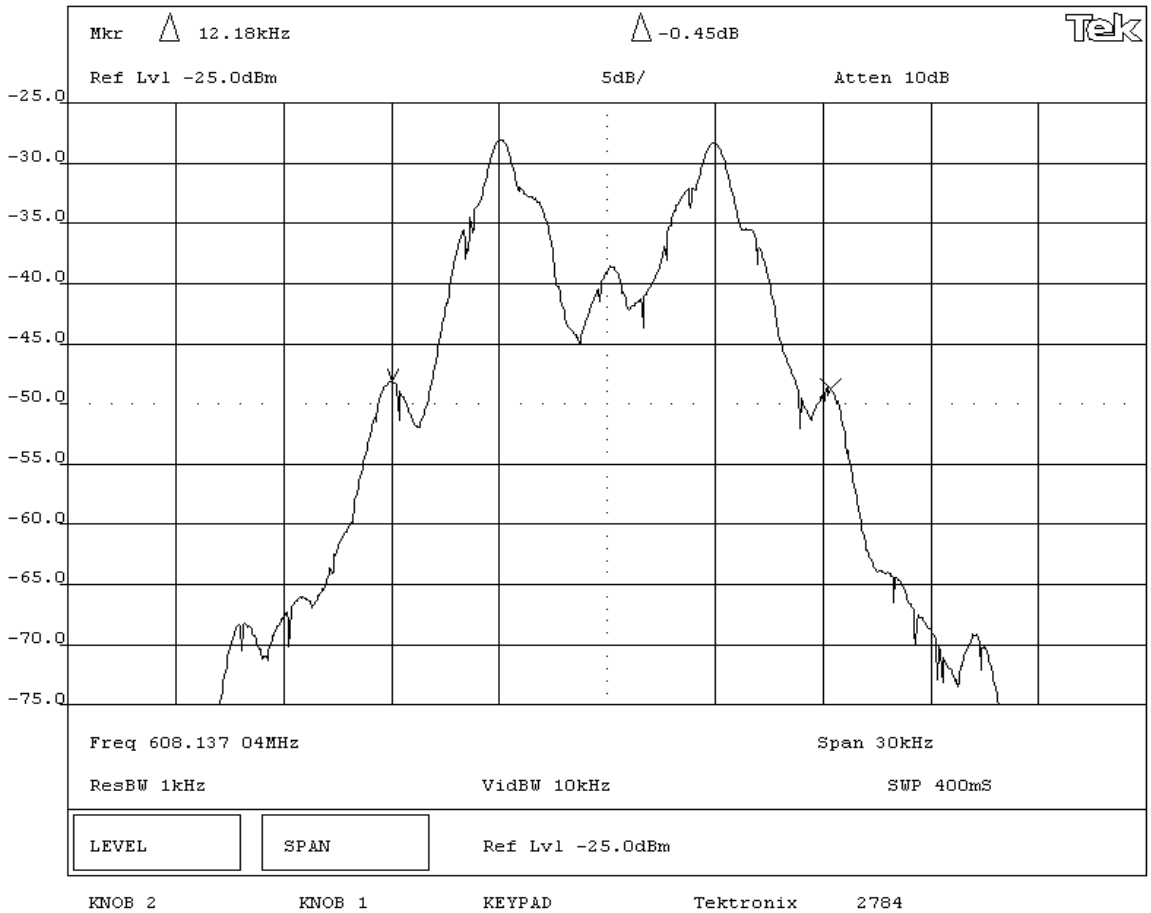
RESULTS	BANDWIDTH
Pass	12.18KHz

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST

20dB Bandwidth - Low Channel



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/30/01

EUT:	90341-05			Work Order:	SPACV0339
Serial Number:	PAR 12			Date:	06/23/03
Customer:	Spacelabs Medical			Temperature:	23 degrees C
Attendees:	N/A	Tested by:	Rod Peloquin	Humidity:	38% RH
Customer Ref. No.:	N/A	Power:	N/A	Job Site:	EV06

TEST SPECIFICATIONS

Specification:	47 CFR 2.1049	Year:	2003	Method:	TIEA/EIA - 603	Year:	1993

SAMPLE CALCULATIONS

COMMENTS

EUT OPERATING MODES

Modulated at maximum data rate, maximum output power

DEVIATIONS FROM TEST STANDARD

None

REQUIREMENTS

The maximum 20dB bandwidth is 1.5 MHz

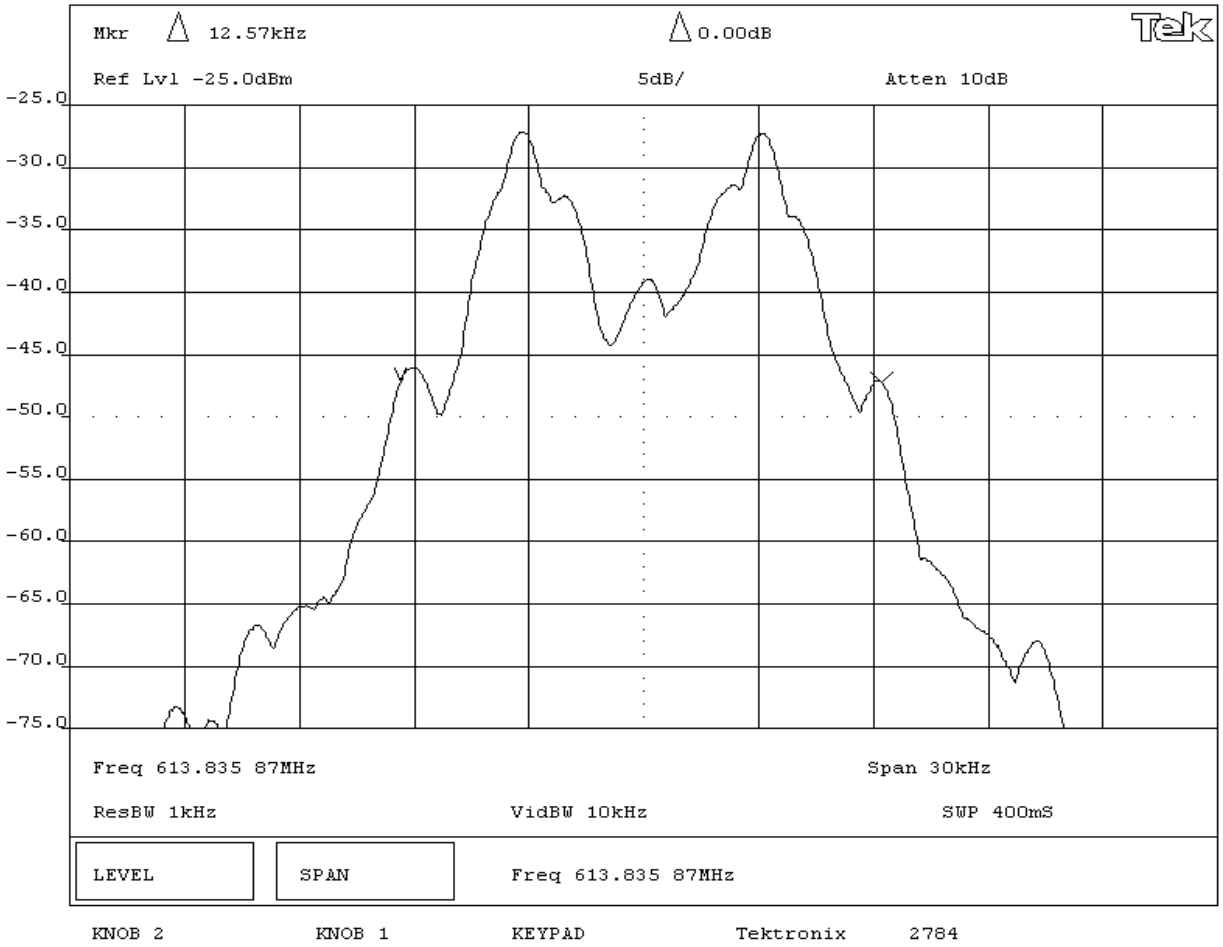
RESULTS	BANDWIDTH
Pass	12.57KHz

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST

20dB Bandwidth - High Channel



Justification

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. While scanning the radiated emissions, all of the EUT parameters listed below were investigated. This includes, but may not be limited to, antennas, tuned transmit frequency ranges, operating modes, and data rates.

Channels in Specified Band Investigated:
High
Low

Operating Modes Investigated:
Typical

Power Input Settings Investigated:
9V Battery

Software\Firmware Applied During Test			
Exercise software	Standard Production Software	Version	Unknown
Description			
The system was tested using standard operating production software to exercise the functions of the device during the testing.			

EUT and Peripherals

Description	Manufacturer	Model/Part Number	Serial Number
EUT 1- ECG Transmitter (Ch. 1246)	SpaceLabs Medical	90341-05	PAR 01
EUT 2- ECG Transmitter (Ch. 1474)	SpaceLabs Medical	90341-05	PAR 12
Shorting bar	SpaceLabs Medical	N/A	N/A

Cables

Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
ECG Leads (5)	PA	0.6	PA	EUT	Shorting bar

PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.

Measurement Equipment

Description	Manufacturer	Model	Identifier	Last Cal	Interval
Spectrum Analyzer	Hewlett Packard	8593E	AAP	02/26/2003	12 mo
Near Field Probe	EMCO	7405	IPD	No Cal Required	N/A
Digital Multimeter	Fluke	79	MMC	09/11/2002	12 mo
DC Power Supply	Topward	TPS-2000	TPD	No Cal Required	N/A
Temperature / Humidity Chamber	Cincinnati Sub-Zero	ZH-32-2-H/AC	TBA	09/20/2002	12 mo

Test Description

Requirement: Per 47 CFR 2.1055, the frequency stability shall be measured with variation of ambient temperature and primary supply voltage. A spectrum analyzer or frequency counter can be used to measure the frequency stability. If using a spectrum analyzer, it must have a precision frequency reference that exceeds the stability requirement of the transmitter. A temperature / humidity chamber is required.

Configuration:

Variation of Supply Voltage

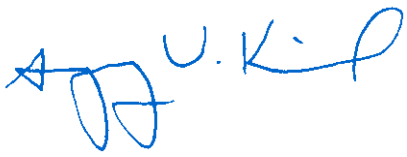
The primary supply voltage was varied from 85% to 115% of nominal. The EUT can only be battery operated, so a DC lab supply was used to vary the supply voltage up to 115% of 9V and down to the EUT's voltage end point.

Variation of Ambient Temperature

Using a temperature chamber, the transmit frequency was recorded at the extremes of the specified temperature range (-30° to +50° C) and at 10°C intervals.

The antenna is integral to the EUT, so a radiated measurement was made using a spectrum analyzer and a near field probe. The spectrum analyzer is equipped with a precision frequency reference that exceeds the stability requirement of the EUT.

Completed by:



NORTHWEST EMC

EMISSIONS DATA SHEET

Rev BETA 01/30/01

EUT:	90341-05			Work Order:	SPAC0339
Serial Number:	PAR 1			Date:	07/29/03
Customer:	Spacelabs Medical			Temperature:	see below
Attendees:	N/A	Tested by:	Greg Kiemel	Humidity:	30% RH
Customer Ref. No.:	N/A	Power:	N/A	Job Site:	EV09

TEST SPECIFICATIONS

Specification:	47 CFR 2.1055	Year:	Most Current	Method:	TIA/EIA - 603	Year:	1993

SAMPLE CALCULATIONS

COMMENTS

EUT OPERATING MODES

Transmitting

DEVIATIONS FROM TEST STANDARD

None

REQUIREMENTS

The frequency stability shall be measured with variation of ambient temperature and primary supply voltage.

RESULTS	MINIMUM FREQUENCY STABILITY
Pass	13.73 ppm

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST

Frequency Stability

Frequency Stability with Variation of Ambient Temperature (Primary Supply = 120V, 60Hz)

Temp (°C)	Assigned Frequency (MHz)	Measured Frequency (MHz)	Tolerance (ppm)	Specification (ppm)
-30	608.137150	608.128800	13.73	n/a
-20	608.137150	608.133730	5.62	n/a
-10	608.137150	608.136200	1.56	n/a
0	608.137150	608.137100	0.08	n/a
10	608.137150	608.137480	0.54	n/a
20	608.137150	608.137200	0.08	n/a
30	608.137150	608.137100	0.08	n/a
40	608.137150	608.136880	0.44	n/a
50	608.137150	608.136550	0.99	n/a

Frequency Stability with Variation of Battery Voltage (Ambient Temperature = 25°C)

Voltage (VDC)	Assigned Frequency (MHz)	Measured Frequency (MHz)	Tolerance (ppm)	Specification (ppm)
10.35 (115%)	608.137150	608.137150	0.00	n/a
9.9 (110%)	608.137150	608.137150	0.00	n/a
9.45 (105%)	608.137150	608.137150	0.00	n/a
9 (100%)	608.137150	608.137150	0.00	n/a
8.55 (95%)	608.137150	608.137150	0.00	n/a
8.1 (90%)	608.137150	608.137150	0.00	n/a
7.65 (85%)	608.137150	608.137150	0.00	n/a
5.5 (end point)	608.137150	608.137150	0.00	n/a

NORTHWEST EMC

EMISSIONS DATA SHEET

Rev BETA 01/30/01

EUT:	90341-05			Work Order:	SPAC0339
Serial Number:	PAR 12			Date:	07/29/03
Customer:	Spacelabs Medical			Temperature:	see below
Attendees:	N/A	Tested by:	Greg Kiemel	Humidity:	30% RH
Customer Ref. No.:	N/A	Power:	N/A	Job Site:	EV09

TEST SPECIFICATIONS

Specification:	47 CFR 2.1055	Year:	Most Current	Method:	TIA/EIA - 603	Year:	1993

SAMPLE CALCULATIONS

COMMENTS

EUT OPERATING MODES

Transmitting

DEVIATIONS FROM TEST STANDARD

None

REQUIREMENTS

The frequency stability shall be measured with variation of ambient temperature and primary supply voltage.

RESULTS	MINIMUM FREQUENCY STABILITY
Pass	9.74 ppm

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST

Frequency Stability

Frequency Stability with Variation of Ambient Temperature (Primary Supply = 120V, 60Hz)

Temp (°C)	Assigned Frequency (MHz)	Measured Frequency (MHz)	Tolerance (ppm)	Specification (ppm)
-30	613.837280	613.831300	9.74	n/a
-20	613.837280	613.835850	2.33	n/a
-10	613.837280	613.837750	0.77	n/a
0	613.837280	613.838680	2.28	n/a
10	613.837280	613.838750	2.39	n/a
20	613.837280	613.838580	2.12	n/a
30	613.837280	613.837200	0.13	n/a
40	613.837280	613.836750	0.86	n/a
50	613.837280	613.836450	1.35	n/a

Frequency Stability with Variation of Battery Voltage (Ambient Temperature = 25°C)

Voltage (VDC)	Assigned Frequency (MHz)	Measured Frequency (MHz)	Tolerance (ppm)	Specification (ppm)
10.35 (115%)	613.837280	613.837280	0.00	n/a
9.9 (110%)	613.837280	613.837280	0.00	n/a
9.45 (105%)	613.837280	613.837280	0.00	n/a
9 (100%)	613.837280	613.837280	0.00	n/a
8.55 (95%)	613.837280	613.837280	0.00	n/a
8.1 (90%)	613.837280	613.837280	0.00	n/a
7.65 (85%)	613.837280	613.837280	0.00	n/a
5.5 (end point)	613.837280	613.837280	0.00	n/a