ELECTRONICS TEST CENTRE
MPB TECHNOLOGIES INC.

Test Report Prepared By:
Electronics Test Centre
27 East Lake Hill
Airdrie, Alberta
Canada T2B 2B7
enquire@etc-mpbtech.com
phone: (403) 912-0037
fax: (403) 912-0083

MPBT Report No.: d05e2371 Rev: 2 Date: 13 August, 2001

Report for Emissions Testing of: Nike HRM100 Digital Chest Belt

In accordance with: FCC Part 15, Subpart C (2000)

Test Personnel: Quang Tan Nguyen

Prepared for: Dynastream
Suit 243, Bay #1
206-5th Avenue West
Cochrane, Alberta
T4C 1X3

_____
Client Acceptance
Authorized Signatory

Digitally signed by David G. Raynes
cn=David G. Raynes, ou=Electronics Test Centre (Airdrie), o=MPB Technologies Inc., c=CA
Date: 2001.08.13 14:52:45 -07'00'
Reason: I have reviewed this document
Airdrie, Alberta, Canada

_____
David Raynes
Laboratory Supervisor
Electronics Test Centre (Airdrie)
Authorized Signatory

This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

TABLE OF CONTENTS

This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

1.0 INTRODUCTION

1.1 SCOPE

The purpose of this report is to present the findings and results of compliance testing performed in accordance with CFR Title 47 FCC Part 15, Subpart C, Intentional Radiators.

1.2 APPLICANT

This test report has been prepared for Dynastream, located in Cochrane, Alberta, Canada.

1.3 APPLICABILITY

All test procedures, limits, and results defined in this document apply to the Dynastream DHRM unit, referred to herein as the Equipment Under Test (EUT).

The results contained in this report relate only to the item tested.

This report does not imply product endorsement by NVLAP or the Canadian or US governments.

1.4 TEST SAMPLE DESCRIPTION

The test sample provided for testing was a Nike HRM100 Digital Chest Belt:

Product Type:	Sports / Recreation
Model Number:	N/A
Serial Number:	203
Cables:	Power cable from the batteries to the DHRM
Power Requirements:	3 VDC
Peripheral Equipment:	External DC power (two AA batteries) source were connected to the DHRM
Brief Functional Description:	Targetted to athletes who want to be able to measure their heart rate while being active. Transmits a 50-bit digital signal every second to a watch worn on the athlete's wrist.

More detailed information is provided by Dynastream in Appendix A.

This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

1.5 GENERAL TEST CONDITIONS AND ASSUMPTIONS

The EUT was set up and exercised using the configurations, modes of operation and arrangements defined in this report only. All inputs and outputs to and from other equipment associated with the EUT were adequately simulated.

All testing, unless otherwise noted, was performed under the following environmental conditions:

Temperature:	17 to 23 °C
Humidity:	30 to 50 %

This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

1.6 SCOPE OF TESTING

Testing was performed in accordance with FCC Part 15 Subpart C (2000), and ANSI C63.4 (1992).

1.6.1 VARIATIONS IN TEST METHODS

There were no variations from the test procedures outlined above.

1.6.2 MARGINAL EMISSIONS MEASUREMENTS

As noted in Section 4, some emissions were measured to be within -6 dB of the specified limit:

1.6.3 TEST SAMPLE MODIFICATIONS

There were no equipment modifications during test performance.

2.0 ABBREVIATIONS

AP	Average Peak
CE	-Conducted Emissions
E	-Field - Electric Field
H	-Field - Magnetic Field
N/T	-Not Tested
N/A	-Not Applicable
PK	-Peak
QP	-Quasi Peak
RE	-Radiated Emissions

3.0 MEASUREMENT UNCERTAINTY

For Radiated E-Field Emissions and Conducted Emissions, the uncertainties in the measurements were calculated using the methods outlined in the NAMAS document, NIS81: May 1984.

Frequency	= ± 1 kHz
Amplitude (RE)	= ± 4.01 dB
Amplitude (CE)	= ± 3.25 dB

This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

4.0 TEST CONCLUSION

The EUT was subjected to the following tests. Compliance status is indicated as **PASS, Marginal Pass,** or **FAIL**.

The following table summarizes the test results in terms of the specification and class or level applied, the unique test sample identification, the EUT modification state, and configuration as applicable.

TEST CASE	TEST TYPE	SPECIFICATION	TEST SAMPLE	MOD. STATE	CONFIGURATION	RESULT
§4.1	Conducted Emissions	FCC Part 15.207	Nike HRM100 Digital Chest Belt	nil	Simulated Installation	**N/A**
§4.2	Radiated Emissions	FCC Parts 15.249, 15.209 and 15.205	Nike HRM100 Digital Chest Belt	nil	Simulated Installation	**PASS**

STATEMENT OF COMPLIANCE

The client equipment referred to in this report was found to comply with the requirements as stated above.

This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

4.1 CONDUCTED EMISSIONS ON AC POWER LINES

Test Lab: Electronics Test Centre (Airdrie) Test Personnel: Quang Tan Nguyen Test Date: None	Product: Nike HRM100 Digital Chest Belt

Test Result, Nike HRM100 Digital Chest Belt: Not Applicable

Objectives/Criteria	Specifications
The Conducted emissions produced by a system or sub-system shall not exceed the limits for the specifications as stated. **Emission levels should meet the requirements with a margin of 6dB**. The EUT was not assessed for Conducted Emissions because there is no direct connection to the AC mains.	FCC Part 15 Subpart B Frequency [MHz] / Limit (QP) [dBµV] 0.45 – 30 / 47.96

Line 1:			Line 2:		
Frequency [MHz]	RF Voltage [dBµV]	Delta [dB from limit]	Frequency [MHz]	RF Voltage [dBµV]	Delta [dB from limit]

This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

4.2 RADIATED EMISSIONS

4.2.1 OPERATION IN THE BAND 902 TO 928 MHZ EXCLUDING SPREAD SPECTRUM SYSTEMS

Test Lab: MPB Technologies Inc. Airdrie Test Personnel: Quang Tan Nguyen Test Date: 5 July 2001	Product: Nike HRM100 Digital Chest Belt

Test Result, Nike HRM100 Digital Chest Belt: **PASS**

Objectives/Criteria	Specifications
The fundamental frequency and its harmonics shall not exceed these Radiated E-Field limits, measured at a distance of 3m from the EUT. Emissions outside these bands shall be attenuated to 50 dB below the level of the fundamental frequency or to the general limits in 15.209, whichever is less strict. **Emission levels should meet the requirements with a margin of 6dB.**	FCC Part 15.249 Fundamental Frequency [MHz] / Limit of Fundamental [dBµV/m] / Limit of Harmonics [dBµV/m] 902-928: 94 QP / 54 QP 2400-2483.5: 94 AP / 54 AP 5725-5875: 94 AP / 54 AP 24000-24250: 108 AP / 68 AP

Vertical:			**Horizontal:**		
Frequency [MHz]	Field Strength [dBµV/m]	Delta [dB from limit]	Frequency [MHz]	Field Strength [dBµV/m]	Delta [dB from limit]
Fundamental: 916.3	71.3	-22.7	Fundamental: 916.2	64.1	-29.9
2nd Harmonic: 1832.7	43.1	-10.9	2nd Harmonic: 1832.7	40.2	-13.8
3rd Harmonic: 2749.1	48.8	-5.2	3rd Harmonic: 2749.2	53.3	-0.7

There were no emissions measured within -6 dB of the specified limit. Refer to the test data and plots (found after 4.2.2) for more detail.

This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

4.2.2 RESTRICTED BANDS OF OPERATION

Test Lab: MPB Technologies Inc. Airdrie Test Personnel: Quang Tan Nguyen Test Date: 5 July 2001	Product: Nike HRM100 Digital Chest Belt
Test Result, Nike HRM100 Digital Chest Belt: **PASS**	
Objectives/Criteria	Specifications
The Radiated E-Field emissions produced by a system or sub-system, measured at a distance of 3m from the EUT, shall not exceed these limits *within the restricted bands of operation (RBOs)*. **Emission levels should meet the requirements with a margin of 6dB.** Note: The RBOs of Part 15.205 are listed at the bottom of this page.	FCC Part 15.209 Frequency [MHz] / Limit (QP @ 3m) [dBµV/m] 30 - 88 / 40.00 88 - 216 / 43.52 216 - 960 / 46.02 above 960 / 53.98

Vertical:			**Horizontal:**		
Frequency [MHz]	Field Strength [dBµV/m]	Delta [dB from limit]	Frequency [MHz]	Field Strength [dBµV/m]	Delta [dB from limit]
1101.9	32.5	-21.5			
1427.0	34.3	-25.7			

There were no emissions measured within -6 dB of the specified limit. Refer to the test data and plots for more detail.

This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

4.2.3 RESTRICTED FREQUENCY BANDS OF OPERATION

Restricted Frequency Bands [MHz]					
Start	**End**	**Start**	**End**	**Start**	**End**
4.17725	4.17775	123	138	3345.8	3358
4.20725	4.20775	149.9	150.05	3600	4400
6.215	6.218	156.52	156.53	4500	5150
6.26775	6.26825	156.7	156.9	5350	5460
6.31175	6.31225	162.01	167.17	7250	7750
8.291	8.294	167.72	173.2	8025	8500
8.362	8.366	240	285	9000	9200
8.37625	8.38675	322	335.4	9300	9500
8.41425	8.41475	399.9	410	10600	12700
12.29	12.293	608	614	13250	13400
12.51975	12.52025	960	1240	14470	14500
12.57675	12.57725	1300	1427	15350	16200
13.36	13.41	1435	1626.5	17700	21400
16.42	16.423	1645.5	1646.5	22010	23120
16.69475	16.69525	1660	1710	23600	24000
16.80425	16.80475	1718.8	1722.2	31200	31800
25.5	25.67	2200	2300	36430	36500
37.5	38.25	2310	2390		

This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

TEST DATA
RADIATED EMISSIONS
30-1000 MHz

Dynastream
Cochrane, Alberta
Nike HRM100 Digital Chest Belt
Project Number d05e2371

Test Frequency [MHz]	Meter Reading [dB(uV)]		Gain/Loss Factor [dB]	Transducer Factor [dB]	Level [dB(uVolts)]	Limit:1	2	3	4
916.1579	48.8	pk	6.3	22.8	77.9	56.9	46	82.2	N/A
Azimuth: 140	Height:99	Vert	Margin [dB]			21	31.9	-4.3	N/A
916.1579	53.1	pk	6.3	23.2	82.6	56.9	46	82.2	N/A
Azimuth: 162	Height:99	Horz	Margin [dB]			25.7	36.6	.4	N/A
916.2464	34.58	qp	6.3	23.2	64.08	56.9	46	82.2	N/A
Azimuth: 5	Height:112	Horz	Margin [dB]			7.18	18.08	-18.12	N/A
916.2707	42.21	qp	6.3	22.8	71.31	56.9	46	82.2	N/A
Azimuth: 0	Height:174	Vert	Margin [dB]			14.41	25.31	-10.89	N/A

LIMIT 1: FCC Part 15 Class A 3m
LIMIT 2: FCC Part 15 Class B 3m
LIMIT 3: FCC Part 22
LIMIT 4: NONE

pk - Peak detector
qp - Quasi-Peak detector
av - Average detector

This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

TEST DATA
RADIATED EMISSIONS
1-2 GHz

Dynastream
Cochrane, Alberta
Nike HRM100 Digital Chest Belt
Project Number d05e2371

Test Frequency [MHz]	Meter Reading [dB(uV)]		Gain/Loss Factor [dB]	Transducer Factor [dB]	Level [dB(uVolts)]	Limit: 1	2	3	4
1833	54.3	pk	-32.4	28.4	50.3	60	54	N/A	N/A
Azimuth: N/A	Height:99	Horz	Margin [dB]			-9.7	-3.7	N/A	N/A
1101.174	54.6	pk	-30.9	25.1	48.8	60	54	N/A	N/A
Azimuth: N/A	Height:99	Vert	Margin [dB]			-11.2	-5.2	N/A	N/A
1425.181	57.4	pk	-32.2	26.4	51.6	60	54	N/A	N/A
Azimuth: N/A	Height:99	Vert	Margin [dB]			-8.4	-2.4	N/A	N/A
1833.125	50.6	pk	-32.4	28.4	46.6	60	54	N/A	N/A
Azimuth: N/A	Height:99	Vert	Margin [dB]			-13.4	-7.4	N/A	N/A
1101.93	38.3	av	-30.9	25.1	32.5	60	54	N/A	N/A
Azimuth: 230	Height:121	Vert	Margin [dB]			-27.5	-21.5	N/A	N/A
1427.02	40.1	av	-32.2	26.4	34.3	60	54	N/A	N/A
Azimuth:176	Height:169	Vert	Margin [dB]			-25.7	-19.7	N/A	N/A
1832.7	47.1	av	-32.4	28.4	43.1	60	54	N/A	N/A
Azimuth: 262	Height:168	Vert	Margin [dB]			-16.9	-10.9	N/A	N/A
1832.721	44.2	av	-32.4	28.4	40.2	60	54	N/A	N/A
Azimuth: 6	Height:117	Horz	Margin [dB]			-19.8	-13.8	N/A	N/A

LIMIT 1: FCC CLASS A
LIMIT 2: FCC CLASS B
LIMIT 3: NONE
LIMIT 4: NONE

pk - Peak detector
qp - Quasi-Peak detector
av - Average detector

This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

TEST DATA
RADIATED EMISSIONS
2-5 GHz

Dynastream
Cochrane, Alberta
Nike HRM100 Digital Chest Belt
Project Number d05e2371

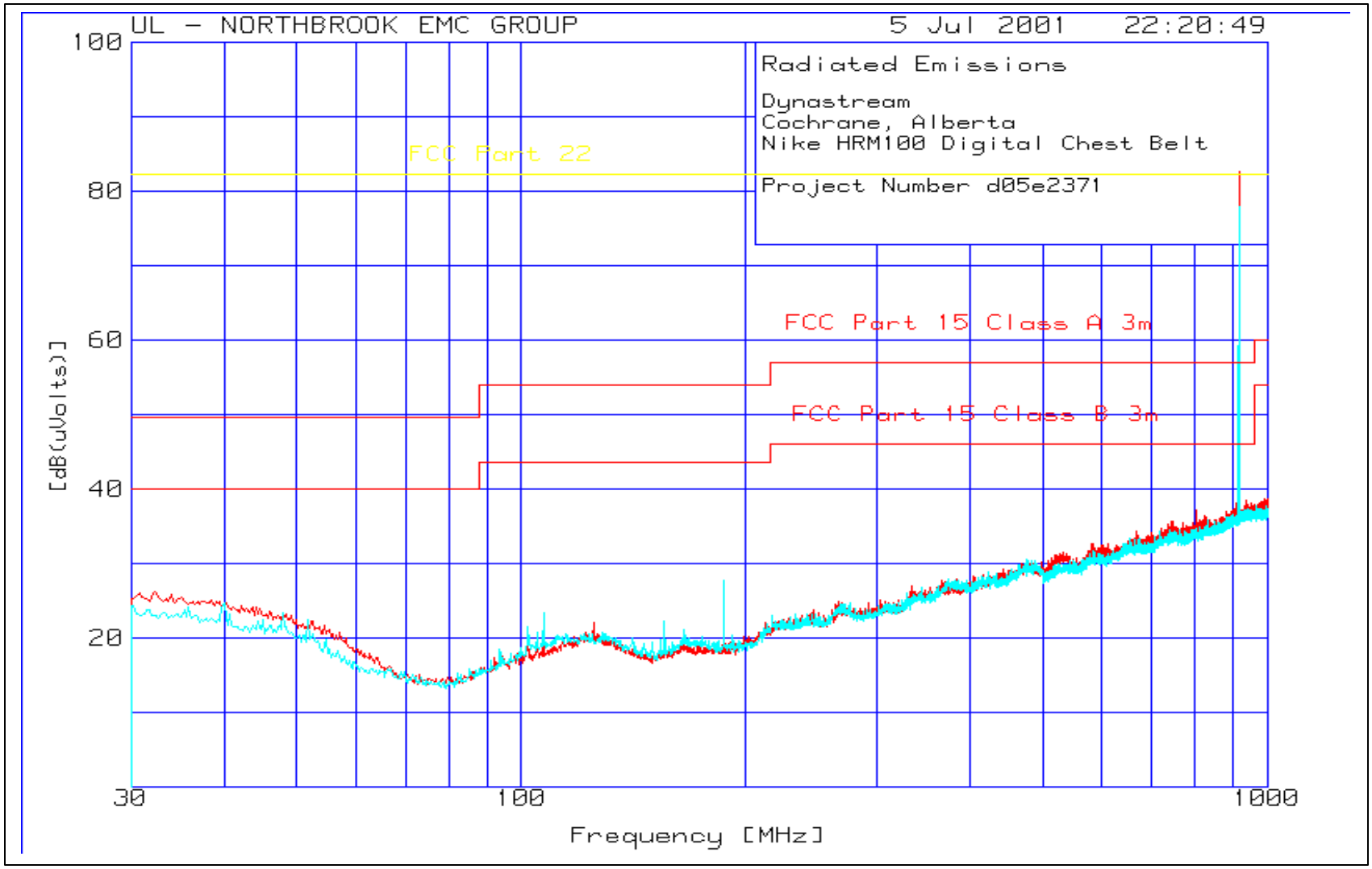
Test Frequency [MHz]	Meter Reading [dB(uV)]		Gain/Loss Factor [dB]	Transducer Factor [dB]	Level [dB(uVolts)]	Limit:1	2	3	4
2749.438	51	pk	-33.1	30.9	48.8	60	54	N/A	N/A
Azimuth: N/A	Height:400	Horz	Margin [dB]			-11.2	-5.2	N/A	N/A
2749.438	54.4	pk	-33.1	30.9	52.2	60	54	N/A	N/A
Azimuth: N/A	Height:99	Vert	Margin [dB]			-7.8	-1.8	N/A	N/A
2749.1535	55.47	av	-33.1	30.9	53.27	60	54	N/A	N/A
Azimuth: 5	Height:174	Horz	Margin [dB]			-6.73	-.73	N/A	N/A
2749.1473	51.04	av	-33.1	30.9	48.84	60	54	N/A	N/A
Azimuth: 254	Height:168	Vert	Margin [dB]			-11.16	-5.16	N/A	N/A

LIMIT 1: FCC CLASS A
LIMIT 2: FCC CLASS B
LIMIT 3: NONE
LIMIT 4: NONE

pk - Peak detector
qp - Quasi-Peak detector
av - Average detector

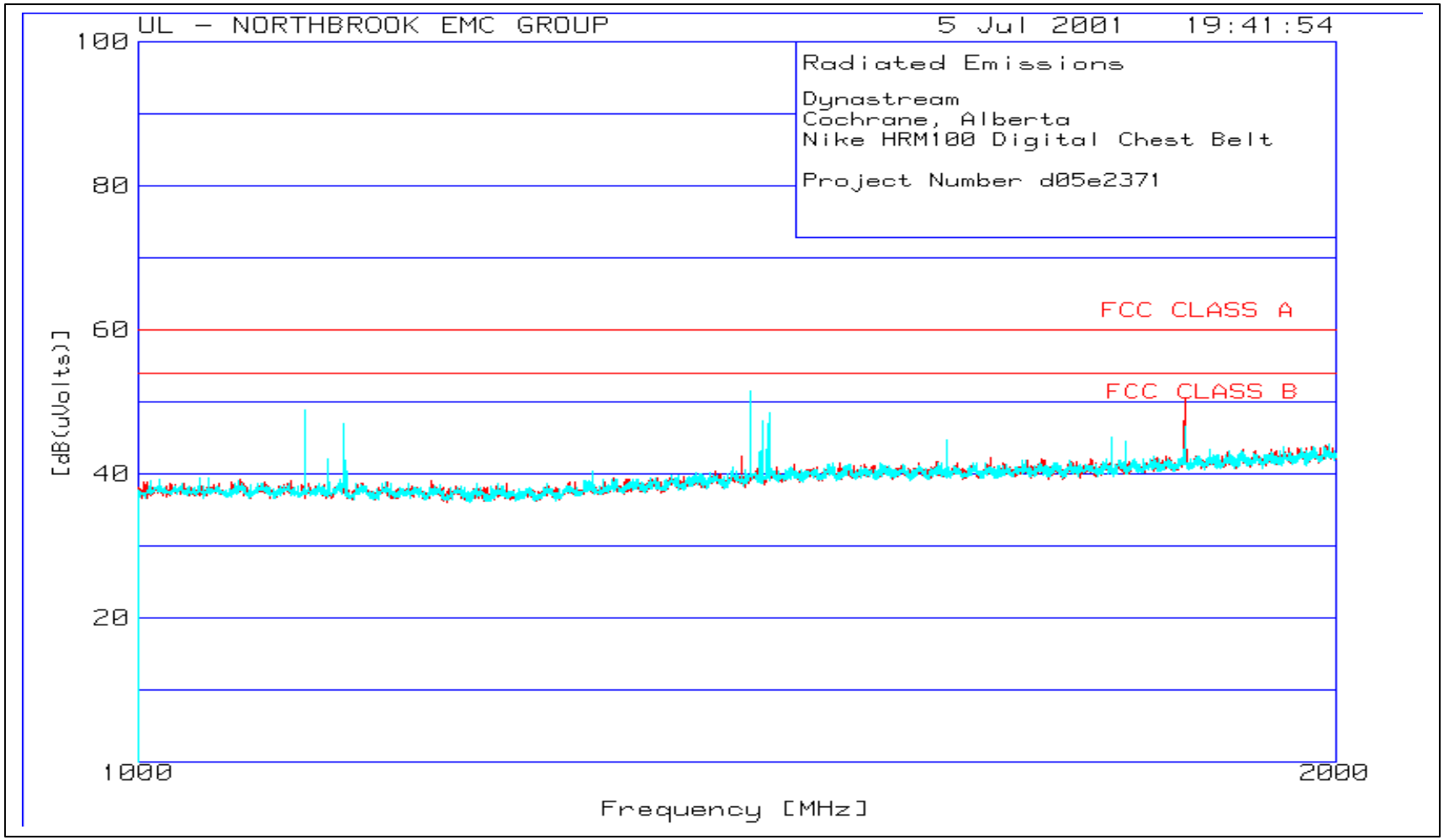
This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

RADIATED EMISSIONS 30 – 1000 MHZ



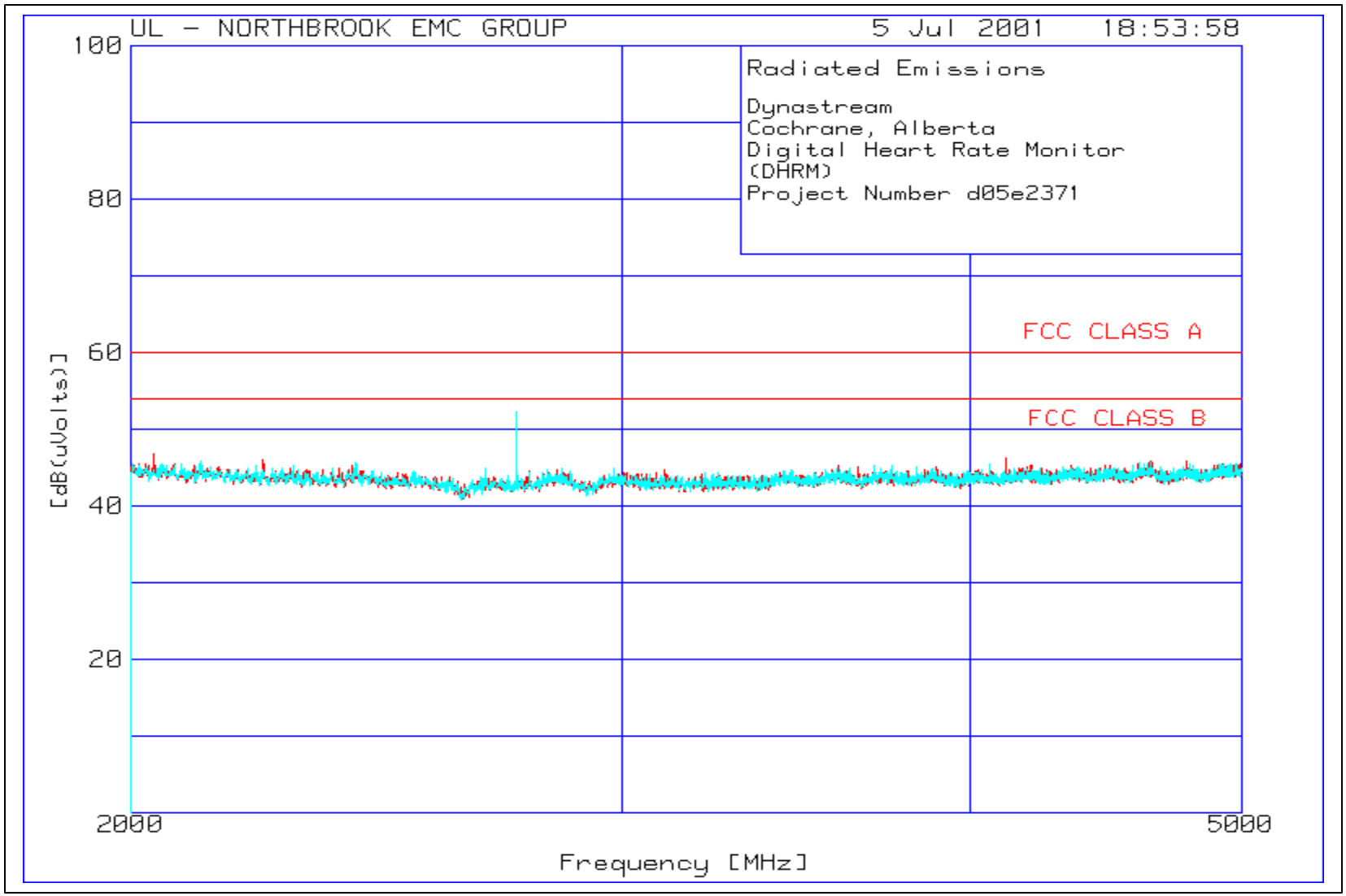
This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

RADIATED EMISSIONS 1 – 2 GHZ



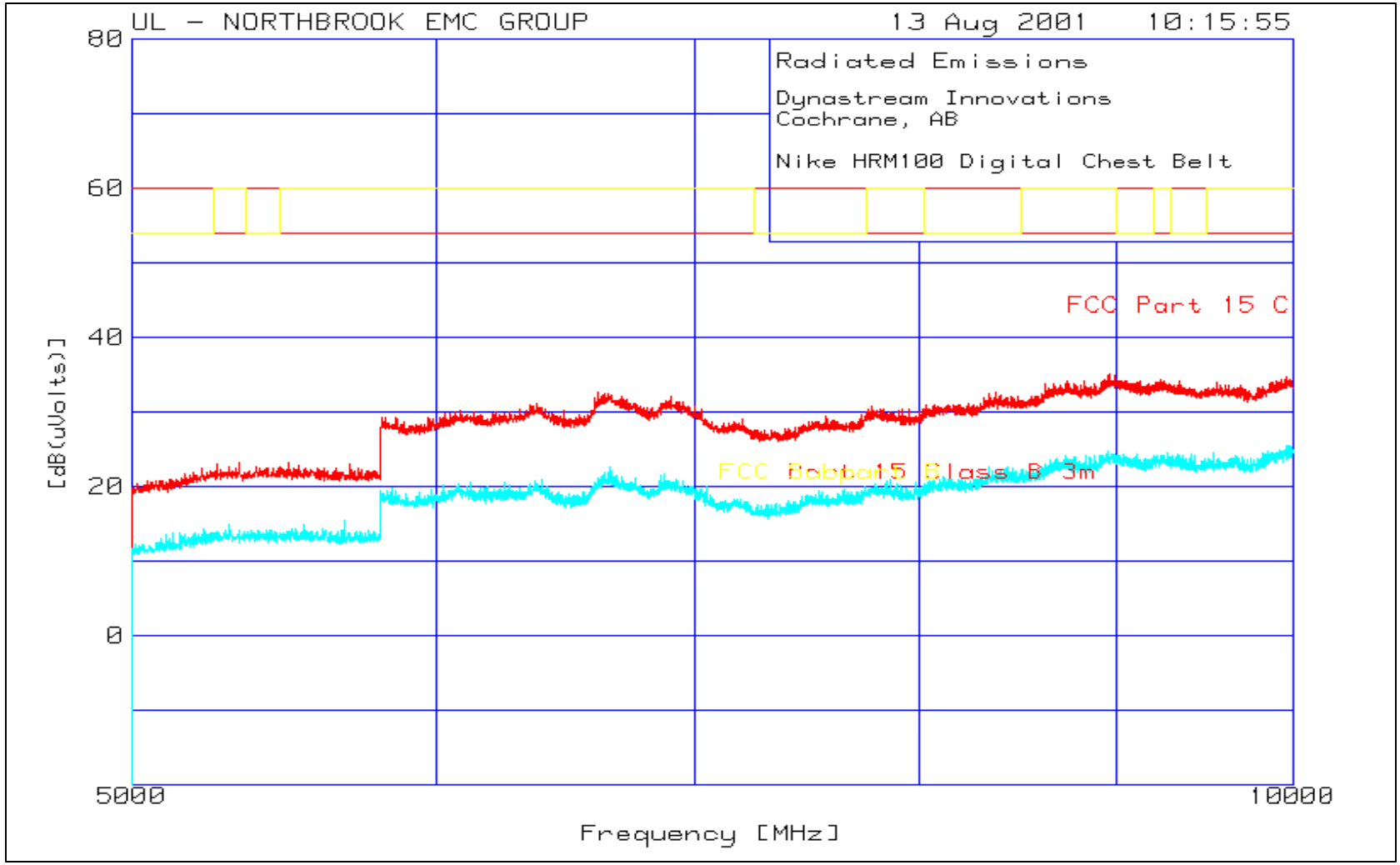
This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

RADIATED EMISSIONS 2 – 5 GHZ



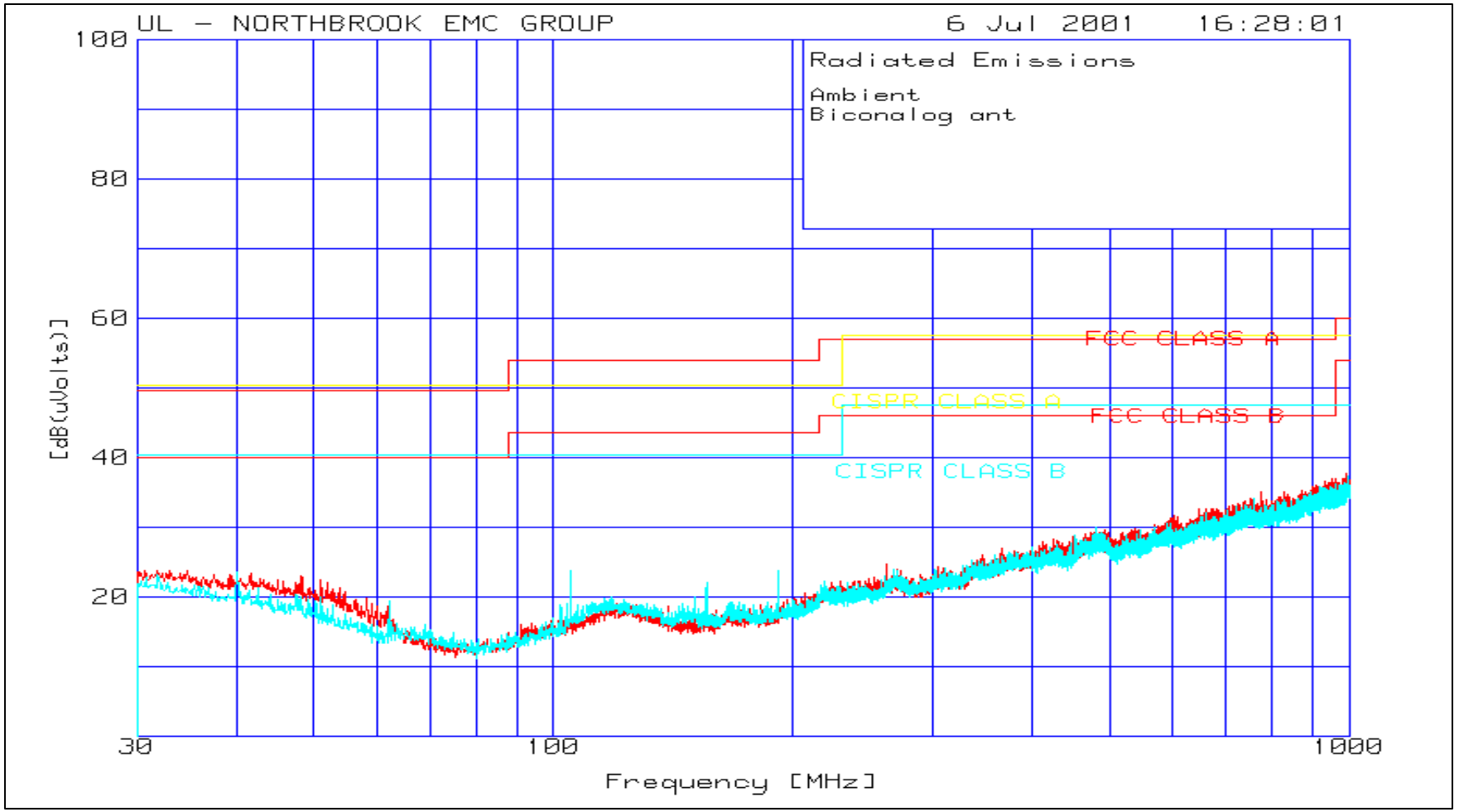
This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

RADIATED EMISSIONS 5 – 10 GHZ



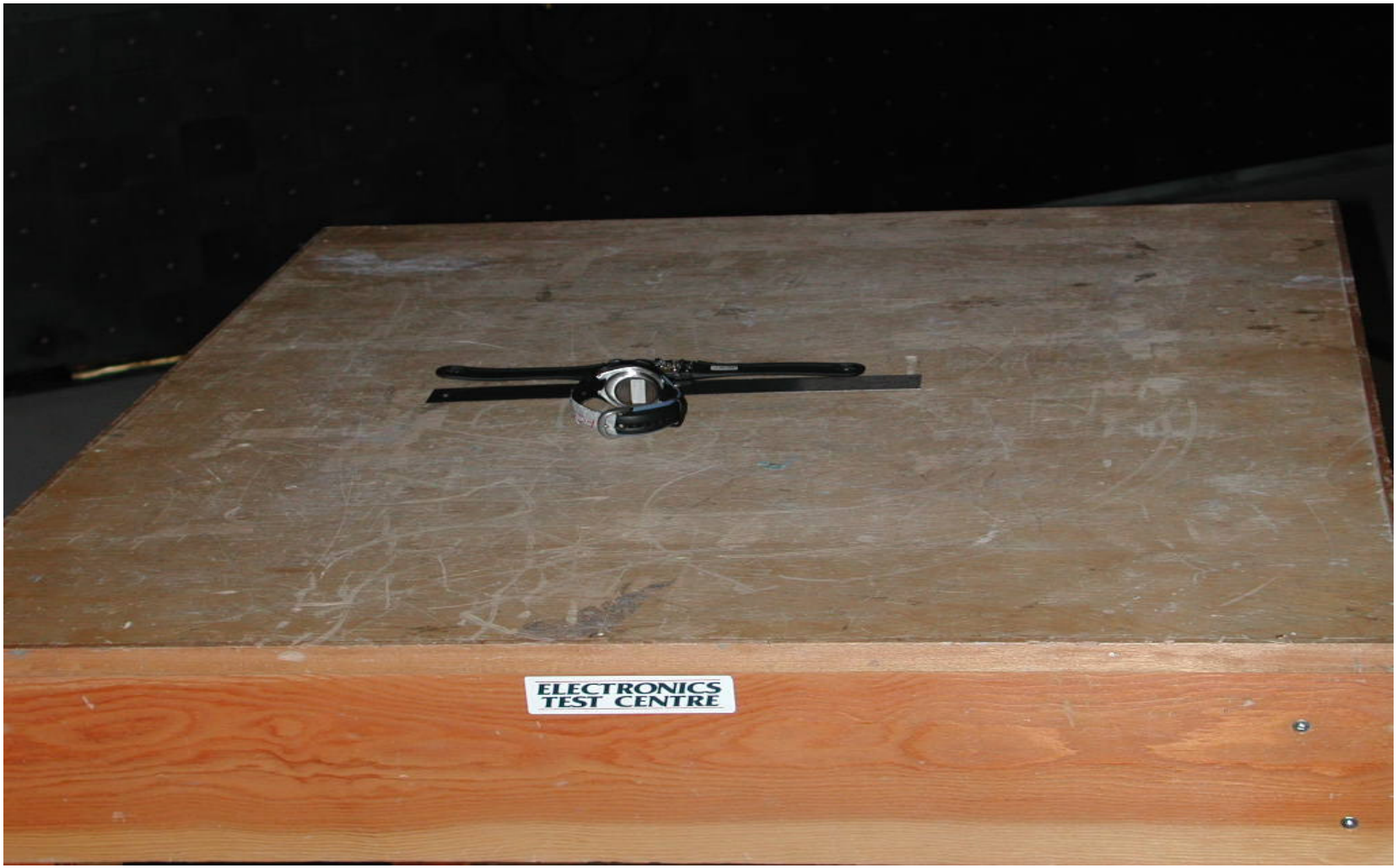
This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

RADIATED EMISSIONS AMBIENT
30 – 1000 MHZ



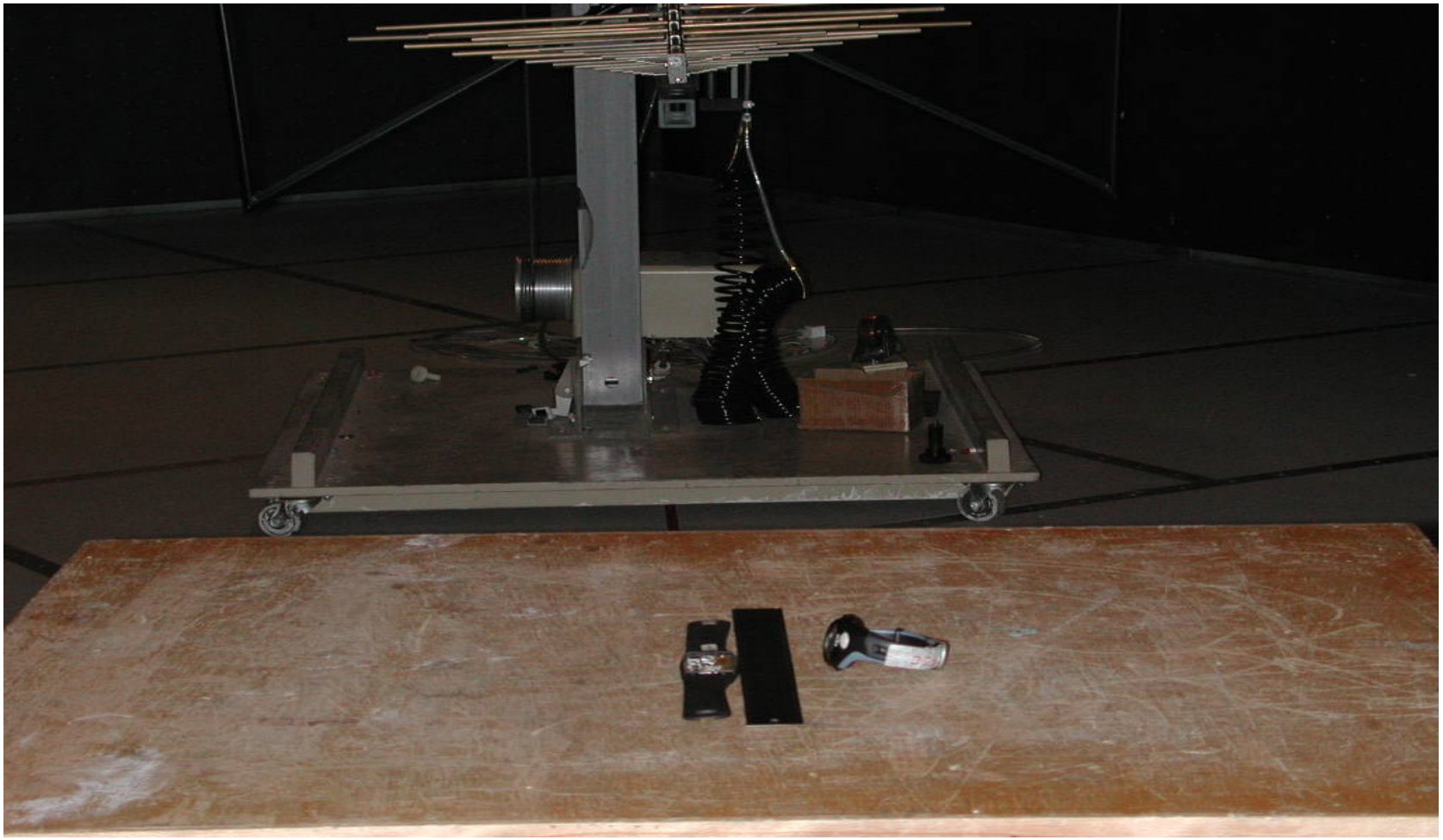
This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

RADIATED EMISSIONS PHOTO



This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

RADIATED EMISSIONS PHOTO



This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

5.0 TEST FACILITY

5.1 LOCATION

The EUT was tested for Electromagnetic Compatibility at the Electronics Test Centre, located in Airdrie, Alberta, Canada.

The RF Anechoic Chamber (RFAC) is identified as Chamber 1, located in the main building complex at the Electronics Test Centre. Its usable working space measures 10.6 m long x 7.3 m wide x 6.5 m high.

This test site is listed with the FCC under Registration Number 99541. Measurements taken at this site are accepted by Industry Canada per file number IC 2046-1.

The floor, walls and ceiling consist of annealed steel panels. The walls and ceiling are covered with ferrite tile, augmented by RF absorbant foam material on the end wall nearest the turntable, and on the adjacent walls and the ceiling. The chamber floor supports a 15 cm high internal floor, constructed of annealed steel panels, that forms the ground plane, and is bonded to the chamber walls.

The 3-m diameter turntable is flush-mounted with the floor. A sub-floor cable-way is provided to route cables between the turntable pit and EUT support equipment. Cables reach the EUT through an opening in the centre of the turntable.

Test instrumentation and EUT support equipment is located in two shielded vestibules located at the side of the main room. Cables are routed through bulkhead panels between the rooms as required. Power feeds are routed into the main room and vestibules through line filters providing at least 100 dB of attenuation between 10 kHz and 10 GHz.

5.2 GROUNDING PLAN

The EUT was located on a wooden table 80 cm above the ground planes. The EUT was not grounded, per Dynastream's specifications.

5.3 POWER

AC power was supplied via an Underwriter's Laboratories ULW100-69, 100 dB, 100 Ampere wall mounted filter. Bonding to ground is implemented at the chamber wall.

5.4 EMISSIONS PROFILE

Ambient conducted and radiated electromagnetic emission profiles were generated throughout the tests and are included in the test data.

This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

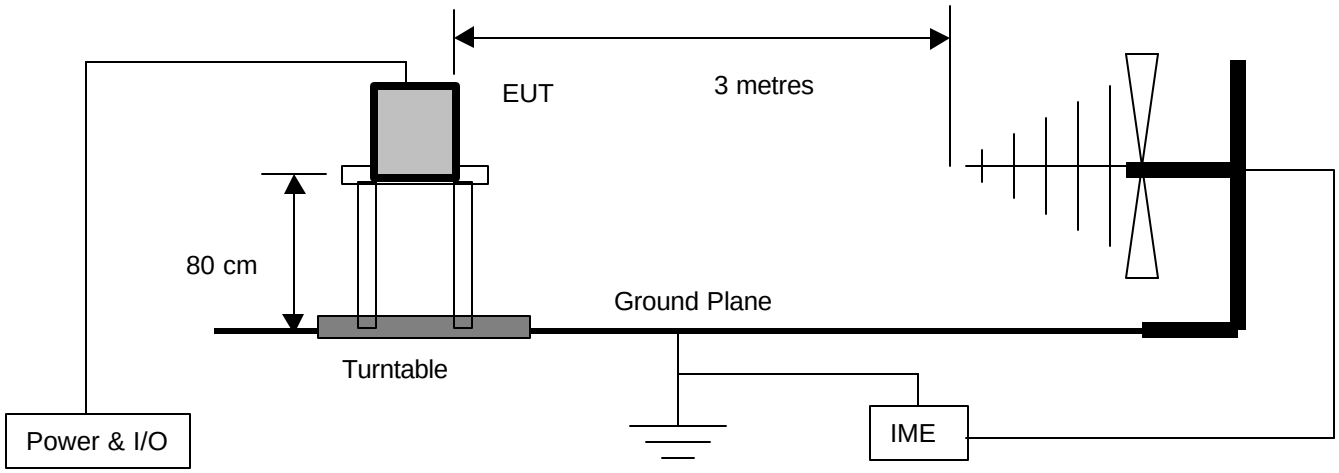
5.5 TEST CONFIGURATION

5.5.1 Tabletop Equipment

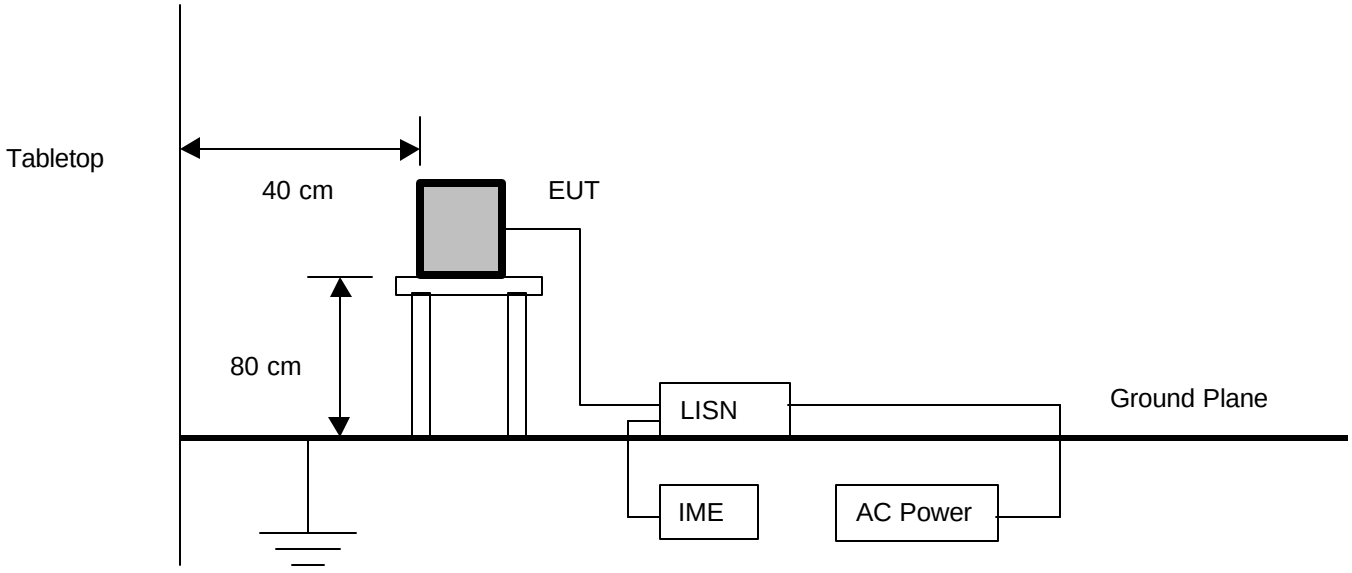
Radiated Emissions

The following diagrams illustrate the configuration of the EUT test and measurement equipment for Radiated and Conducted Emissions Testing of tabletop equipment.

Tabletop



Conducted Emissions

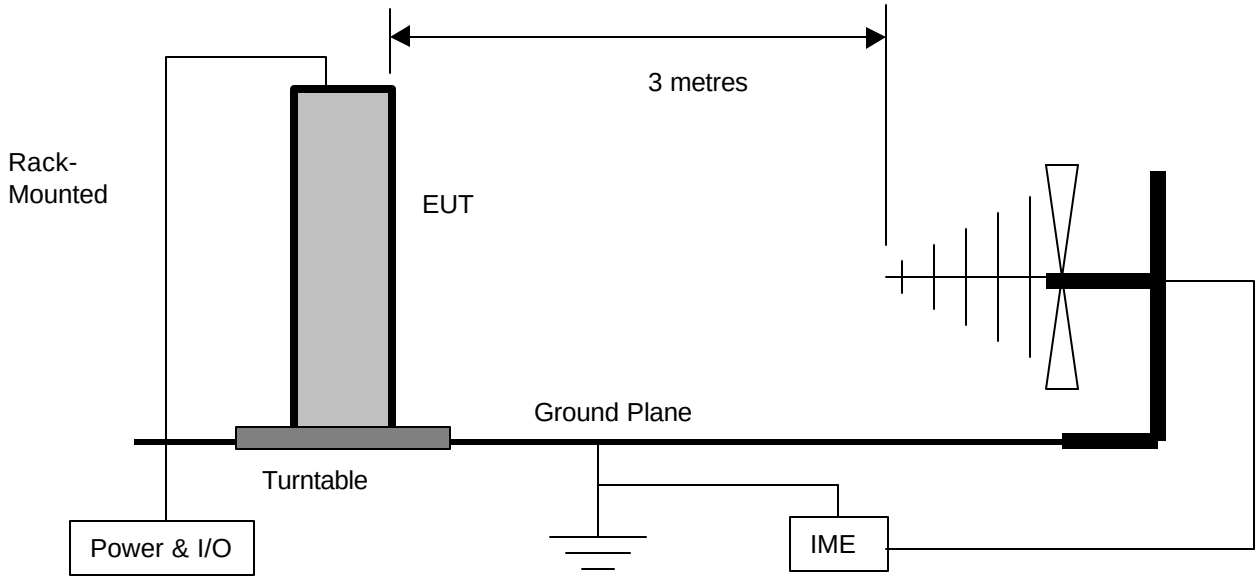


This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

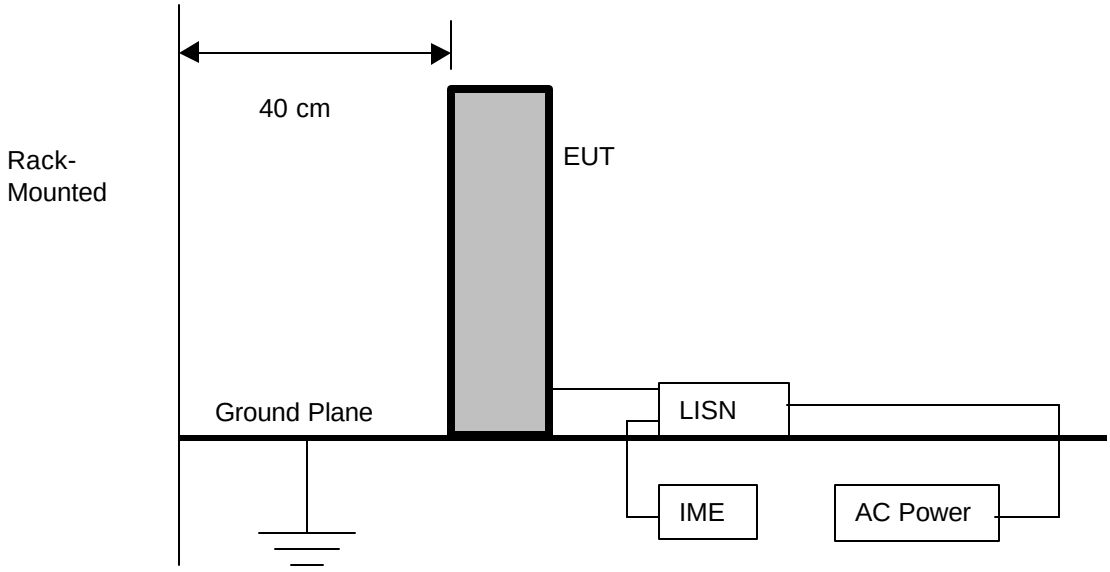
5.5.2 Rack Mount

The following diagrams illustrate the configuration of the EUT test and measurement equipment for Radiated and Conducted Emissions Testing of rack mounted equipment.

Radiated Emissions



Conducted Emissions



This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

6.0 TEST EQUIPMENT

The following equipment was used for this procedure. All measurement devices are calibrated annually, traceable to NIST.

6.1 RADIATED EMISSIONS

a) Spectrum Analyzer with RF Preselector
b) CISPR Quasi-peak Adapter
c) Power Isolation Transformers
d) Biconilog antenna (20 MHz to 2 GHz)
e) Antenna mast positioner, and controller
f) Flush-mounted turntable, and controller
g) Personal Computer and EMC software

6.2 CONDUCTED EMISSIONS

a) Spectrum Analyzer with RF Preselector
b) Line Impedance Stabilization Network, 50 µH
c) CISPR Quasi-peak Adapter
d) Isolation Transformer
e) Personal Computer and EMC software

6.3 CALIBRATION

All measurement instrumentation conforms to ANSI C63.2. Calibration is maintained in accordance with manufacturer recommendations. Each measurement device is labeled with its ETC asset number and calibration due date.

6.3.1 CALIBRATION ACCURACY

Test equipment used to provide quantitative measurements are calibrated with standards traceable to the National Research Council, National Institute of Standards and Technology or other national standards. Instrumentation systems for emissions measurements have the following accuracies:

Frequency = ± 1 kHz
Amplitude (RE) = ± 4.01 dB
Amplitude (CE) = ± 3.25 dB

This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

6.3.2 TEST EQUIPMENT DESCRIPTION

The equipment used in the tests was selected from the following list.

Instrument	Manufacturer	Model No.	Asset No.	Calibration Due
Spectrum Analyzer	Hewlett Packard	8566B	9565	11 April 2002
Spectrum Analyzer	Hewlett Packard	8566B	9168	30 January 2002
RF Preselector	Hewlett Packard	85685A	9563	21 September 2001
RF Preselector	Hewlett Packard	85685A	9728	30 March 2002
Quasi-Peak Adapter	Hewlett Packard	85650A	9243	16 August 2001
Line Impedance Stabilization Network	EMCO	3825/2r	9331	2 November 2001
Line Impedance Stabilization Network	EMCO	3825/2r	9259	2 November 2001
Biconilog Antenna	ARA	Lpb-2520/A	4318	13 June 2002
Dual Ridged Guide Antenna	EMCO	3115	9588	6 August 2001
Low Noise Amplifier	MITEQ	JS43-01001800-21-5P	4354	14 February 2002
Power Meter	Hewlett Packard	436A	9061	3 August 2001
Power Sensor	Hewlett Packard	8482A	9758	3 August 2001

This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.

Appendix A

Nike HRM100 Digital Chest Belt

Test Sample Description

(from data provided by Dynastream)

Product Name	Nike HRM100 Digital Chest Belt			Number of units to be tested	1
Part/Model No.	None		Serial No.	203	
Product Application: Sport / Recreation		Product Category			
Commercial ✓ Military ☐		Telecommunication ☐ Information Technology ☐ Surface Transportation ☐		Aerospace ☐ Test & Measurement ☐ Other ✓ Sports/Recreation	
GENERAL INFORMATION REQUIRED FOR ALL PRODUCTS					
What are the dimensions and weight?	3*20*.05 cm 10 gram		Typical installation instructions or configuration (Please Attach)		N/A
What countries would you like to market you product in	North America		List of internally generated frequencies		916.5 MHz
Power Requirements: (Voltage, AC/DC, Hz, Current)	3 VDC		Duration of self-test (delay between fault and alarm)		N/A
Peripheral support equipment (to be supplied by client)	External DC source for the testing			Are we to do the submission?	YES
Description and number of interconnecting leads & cables	Power cable from the batteries to the HRM				
Brief functional description	Targetted to athletes who want to be able to measure their heart rate while being active. Transmits a 50-bit digital signal every second to a watch worn on the athlete's wrist.				
Any additional information?	None				
WIRELESS PRODUCTS ONLY					
Is your unit a transmitter, receiver or transceiver?	Transmitter		Is this the spread spectrum device?		NO
What is the power output?	≤ 100mW		If yes, is it a direct sequencer or frequency hopper		N/A
How many Antennas?	1		What is the bandwidth to your operating frequency?		≈20 kHz
How many channels (frequencies)?	1		Is your antenna removable?		NO
What is the separation of those channels?	N/A		What type of connector?		None
What is the operating frequency(s)?	916.5MHz		Is the transmitting signal always on?		NO
How many different antennas are available for sale with the unit?	0		What is the gain of each antenna?		None

Prepared By:		Title:	Date:
	Victor Beda	EET	5 July, 2001

This report shall not be reproduced, except in full, without prior written approval of
MPB Technologies Inc.