Electromagnetic Compatibility

Test of:	Heart Rate Variability Monitor
Model Number:	TF5
Applicant:	MIE Medical Research Ltd.
Test Type:	Compliance
Test Specification:	FCC CFR47 October 1999, parts 15.107, 15.109 for unintentional radiators, 15.207, 15.209 and 15.249 for intentional radiators
SGS Serial Number:	DUR23903/FCC/ST/02
Date of Receipt:	21st February 2002, 24th February 2003, 15th May 2003
Date of Test(s):	26th March 2002 – 26th February 2003, 2nd June – 4th June 2003
Date of Issue:	4rd June 2003
Issue Number:	3

This report refers only to the sample submitted for test.

Test Engineer	***Authorised Signatory***
S. Thompson	A. Reynard Technical Manager

CONTENTS

Page Number

1. Client Information

Company Name:	MIE Medical Research Ltd.
Address:	6 Wortley Moor Road Leeds Yorkshire LS12 4JF
Contact Person:	Suzanne Banner
Telephone:	+44 (0) 113 279 3710
Facsimile:	+44 (0) 113 231 0820

2. Details Of Test Laboratory

Company Name:	SGS UK Ltd.
UKAS Accreditation Number:	1116
Address:	South Industrial Estate, Bowburn, Co. Durham, DH6 5AD.
Contact Persons:	Alan Reynard
Telephone:	+44 (0) 191 377 2000
Facsimile:	+44 (0) 191 377 2020

3. Equipment Under Test (EUT)

3.1 Identification Of EUT

Model Number:	TF5
Unique Identifier:	US version 94/99
Description of EUT:	The EUT is a Heart Rate Variability Monitor consisting of: - UHF Transmitter UHF Receiver Egston Power Supply Unit (Model: N2GFMW3 S/N: 01C00046)
Supply Voltage:	UHF Transmitter: 3.7V Lithium Battery UHF Receiver: 9-12V DC via AC/DC Adaptor Egston Power Supply Unit: 110V AC
Classification:	914MHz Intentional Radiator
Ports present:	UHF Transmitter: Battery Charge Port UHF Receiver: 9-12V DC Adaptor and RS232 (both specified by client <3m) Egston Power Supply Unit: 110V AC Mains and 12V DC output (specified by client <3m)
Accessories Supplied:	None

4. Test Specification, Methods and Procedures

4.1 Test Specification(s)

Specification(s)	Title
FCC CFR 47 : October 1999 Parts 15.107, 15.109, 15.207, 15.209 and 15.249	Code Of Federal Regulations

4.2 Purpose Of Test

To perform the relevant tests and assess the product for compliance with the above specification, so that the manufacturer can obtain certification.

4.3 Methods and Procedures

The standards listed on the previous page refer to the following tests: -

CFR 47 Clause	Test
15.107	Conducted Emissions unintentional radiator (UHF Receiver and PSU)
15.109	Radiated Emissions unintentional radiator (UHF Receiver and PSU)
15.207	Conducted Emissions Intentional radiator (UHF Transmitter and Power Supply)
15.209	Radiated Emissions Intentional radiator (UHF Transmitter)
15.249	Radiated Emissions Intentional Radiator (UHF Transmitter)

5. Deviations or Exclusions from the Test Specifications

There were no deviations from the test specifications.

6. Operation of the EUT During Testing / Configuration and Peripherals

6.1 Operating Mode and Environmental Conditions

The operating modes and environmental conditions used for each individual test are described in the test results section of this report.

6.2 Configuration and Peripherals

A Toshiba laptop (S/N: T2110CS), Compaq (S/N: GSIC JYHZ M1FZ SGS No.: 20998), and a Hi-Grade Notino Laptop computer supplied by SGS were connected to the RS232 port for the testing for testing purposes

7. Test Results

7.1 General Comments

The test methods used are referred to in the individual test results sections of this test report.

7.2 Modifications Made to the EUT

The antenna feeder transformation ratio (Transmitter) was changed from 6mm to 1mm for the field strength test of the fundamental carrier, occupied bandwidth and conducted emissions test.

All other tests were performed on an unmodified unit.

7.3 Summary of Test Results

CFR 47 Clause	Test	EUT	Result
15.107	Conducted Emissions	UHF Receiver & Egston Power Supply Unit	Complied
15.109	Radiated Emissions	UHF Receiver & Egston Power Supply Unit	Complied
15.207	Conducted Emissions	UHF Transmitter & Egston Power Supply Unit	Complied
15.209	Radiated Emissions	UHF Transmitter	Complied
15.249	Radiated Emissions	UHF Transmitter	Complied

Result

In the configuration tested, the EUT complies with the requirements of the standards detailed above.

Full details of all tests can be found in the test results section of this report.

7.4 Conducted Emissions Test Results - Receiver

CFR 47 Clause:	15.107
Limit:	CISPR 22, Class B (As specified in FCC document FCC 02-157 (ET Docket No. 98-90), adopted May 23rd 2002)
Frequency Range:	0.15 – 30 MHz.
Date of test:	26th February 2003
Method of measurement:	ANSI C63.4 : 1992
Resolution Bandwidth:	9kHz

Operating Mode

The compliance test was performed with the receiver connected to the power supply.

Test Results (Receiver Only)

Live Terminal Worst Case Emissions

Frequency (MHz)	Quasi Peak Measurement (dBμV)	Quasi Peak Limit (dBμV)	Average Measurement (dBμV)	Average Limit (dBμV)
0.24	52.91	62.1	43.41	52.1
0.726	46.2	56	42.7	46
1.212	31.29	56	28.19	46
24.00	43.89	60	42.89	50

Neutral Terminal Worst Case Emissions

Frequency (MHz)	Quasi Peak Measurement (dBμV)	Quasi Peak Limit (dBμV)	Average Measurement (dBμV)	Average Limit (dBμV)
0.249	58.91	61.79	49.79	51.79
0.735	42.9	56	38.81	46
1.725	10.79	56	10.79	46
3.201	20.77	56	10.77	46
24.00	40.89	60	39.49	50

Conducted Emissions Test Configuration*

* Representative setup, original photograph did not reflect the actual test setup.

Conducted Emissions Environmental Conditions

Power Supply	110V 60Hz
Temperature	19°C
Relative Humidity	41%
Barometric Pressure	991mb

Conducted Emissions Measurement Uncertainties

Frequency	± 200kHz
Amplitude	± 3.0dB

The uncertainties stated are calculated in accordance with the requirements of UKAS with a confidence level of 95%.

Test Equipment Used (information correct at date of test)

Equipment Type	Model Number	Last Calibration Date	Calibration Interval
LISN (50Ω)	Thurlby Thandar TTi 1600	10/1/03	2 Years
Chase Receiver	LHR7000	9/3/01	2 Years
Software	Version 6.00b	N/A	N/A
SGS Screened Room	-	N/A	N/A

7.5 Conducted Emissions Test Results - Transmitter

CFR 47 Clause:	15.207
Limit:	CISPR 22, Class B (As specified in FCC document FCC 02-157 (ET Docket No. 98-90), adopted May 23rd 2002)
Frequency Range:	0.15 – 30 MHz.
Date of test:	2nd June 2003
Method of measurement:	ANSI C63.4 : 1992
Resolution Bandwidth:	9kHz

Operating Mode

The compliance test was performed with transmitter battery fully discharged. Charging.

Test Results

Live Terminal Worst Case Emissions

Frequency (MHz)	Quasi Peak Measurement (dBμV)	Quasi Peak Limit (dBμV)	Average Measurement (dBμV)	Average Limit (dBμV)
0.231	48.8	62.4	48.7	52.4
0.465	24.8	56.6	26	46.6
0.694	6.1	56	6.6	46
0.928	6.1	56	6.6	46
0.933	6.1	56	6.6	46
0.937	19.9	56	19.7	46
1.162	6.2	56	6.8	46

Neutral Terminal Worst Case Emissions

Frequency (MHz)	Quasi Peak Measurement (dBμV)	Quasi Peak Limit (dBμV)	Average Measurement (dBμV)	Average Limit (dBμV)
0.244	54.7	62	46	52
0.487	22.1	56.2	17.2	46.2
0.730	6.1	56	6.6	46
0.978	6.1	56	6.6	46
1.707	6.2	56	6.8	46
1.954	6.2	56	6.8	46
2.193	6.2	56	6.9	46

Conducted Emissions Test Configuration

Conducted Emissions Environmental Conditions

Power Supply	110V 60Hz
Temperature	17°C
Relative Humidity	43%
Barometric Pressure	991mb

Conducted Emissions Measurement Uncertainties

Frequency	± 200kHz
Amplitude	± 3.0dB

The uncertainties stated are calculated in accordance with the requirements of UKAS with a confidence level of 95%.

Test Equipment Used (information correct at date of test)

Equipment Type	Model Number	Last Calibration Date	Calibration Interval
LISN (50Ω)	Thurlby Thandar TTi 1600	10/1/03	2 Years
Chase Receiver	LHR7000	14/4/03	2 Years
Software	Version 6.00b	N/A	N/A
SGS Screened Room	-	N/A	N/A

7.6 Radiated Emissions Test Results

CFR Clause	15.249, 15.209 – Transmitter 15.109 – Receiver ANSI C63.4 : 1992 – Occupied bandwidth
Limits	15.249, 15.209 – Transmitter 15.109 – Receiver
Frequency Range	30 MHz to 10GHz Transmitter & Receiver
Date of Test	27th March 2002 – Transmitter Carrier 4th June 2003 – Transmitter Spurious 3rd June 2003 – Receiver 3rd June – Transmitter Occupied bandwidth
Method of measurement:	ANSI C63.4 : 1992
Resolution/Video Bandwidth:	100kHz (30MHz – 1000MHz) 1MHz (1000MHz – 10GHz)

Operating Mode

The compliance test was performed whilst a continuous link between the transmitter and the receiver was established.

Test Results

Note: The tables indicate the compliance measurement when the measurements are performed on the open area test site at 3m for the worst case emissions.

Measurements are maximised by rotating the product through 360 degrees and by varying the height of the antenna between 1 ad 4 metres.

Field Strength is obtained using the following calculation

Spectrum analyser reading (dBuV)	-	Pre-amplifier Gain (dB)	+	Antenna Factor (dB/m)	+	Cable Loss

Quasi Peak Measurements 30 – 1000MHz (Transmitter)

Frequency (MHz)	Quasi Peak Measurement (dBμV/m)	Quasi Peak Limit (dBμV/m)	Antenna Polarity (H/V)
914.507	92.8*	94.0	V
914.507	91.0*	94.0	H

*The EUT was modified for these measurements, refer to section 7.2 of this report.

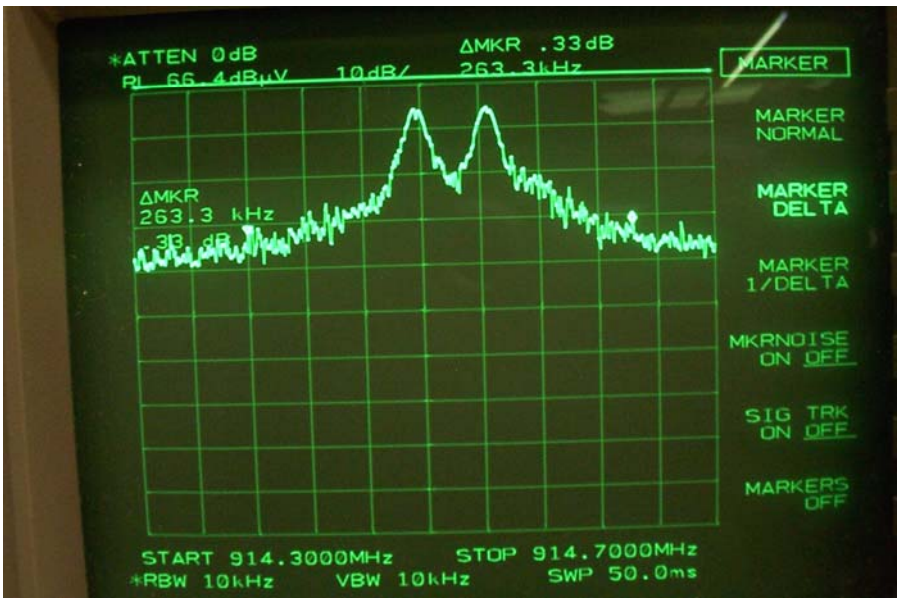
Peak Measurements 1 – 10GHz (Transmitter)

Frequency (GHz)	Peak Measurement (dBμV/m)	Peak Limit (dBμV/m)	Antenna Polarity (H/V)
1.829	43.23*	53.98	V
2.74369	40.57*	53.98	V
3.65801	43.59*	53.98	V
1.829	38.90*	53.98	H
2.743733	36.9*	53.98	H
3.68053	36.26*	53.98	H

Transmitter Occupied bandwidth

The transmitted occupied bandwidth was measured in accordance with ANSI C63.4 : 1992 using a 10kHz RBW and 10kHz VBW. Measurements of the –26dB points relative to the carrier were made. The occupied bandwidth was measured to be:

914.380MHz - 914.6433MHz (263.3kHz)

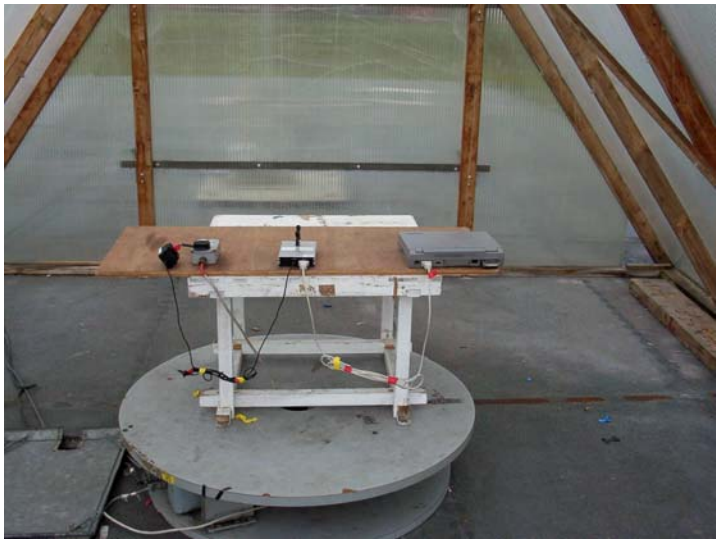


Quasi Peak Measurements (Receiver)

Frequency (MHz)	Quasi Peak Measurement (dBμV/m)	Quasi Peak Limit (dBμV/m)	Antenna Polarity (H/V)
63.403	12.5	40	V
66.950	23.0	40	H
97.06	13.8	40	V
109.679	25.6	43.5	H
127.741	17.6	43.5	V
131.312	18.6	43.5	H

The Electromagnetic spectrum was investigated up to 10GHz. No further emissions from the receiver were observed. (in accordance with FCC part 15.33 (b) (1) and (b) (3))

Radiated Emissions Test Configuration



Radiated Emissions Environmental Conditions

Power Supply (to receiver)	110V 60Hz
Temperature	19°C
Relative Humidity	43%
Barometric Pressure	984mb

Radiated Emissions Measurement Uncertainties

Frequency	± 200kHz
Amplitude	± 4.6dB

The uncertainties stated are calculated in accordance with the requirements of UKAS with a confidence level of 95%.

Test Equipment Used (information correct at date of test)

Transmitter Carrier measurement (27th March 2002)

Equipment Type	Model Number	Last Calibration Date	Calibration Interval
Biconical Antenna	EMCO 3110	10/11/00	2 Years
Log Periodic Antenna	EMCO 3146	9/8/00	2 Years
Hewlett Packard Receiver System	HP8573B	26/11/01	1 Year
Pre-amplifier	ZHL 1042J	17/1/02	1 Year

Transmitter and Receiver measurements carried out on the 3rd and 4th June 2003

Equipment Type	Model Number	Last Calibration Date	Calibration Interval
Biconical Antenna (30 – 200MHz)	EMCO 3109	28/03/03	2 Years
Horn Antenna (1 – 10GHz)	EMCO 3115	26/03/03	2 Years
Log Periodic Antenna (200 – 1000MHz)	EMCO 3146	27/03/03	2 Years
Hewlett Packard Receiver System (30 – 1000MHz)	HP8573B	26/11/01	1 Year
Spectrum analyser 1 – 10GHz	HP8563E	15/11/00	3 Years
Pre-amplifier	ZHL 1042J	19/03/03	1 Year