TEST REPORT

Report No.: HK09061397-1

NAUTILUS INC.

Application
For
Certification
(Original Grant)
(FCC ID: XJO8970007)
(IC: 8449A-8970007)

Transmitter

Prepared and Checked by:

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Date: Aug 04, 2009

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GENERAL INFORMATION

NAUTILUS INC.
BRAND NAME: Schwinn, MODEL: MPOWER Bike Speed Sensor

FCC ID: XJO8970007
IC: 8449A-8970007

Grantee:	NAUTILUS INC.
Grantee Address:	16400 SE Nautilus Drive, Vancouver, Washington, 98683 USA.
Contact Person:	Dan Munson
Tel:	1-360-859-2837
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Manufacturer:	IDT Technology Limited
Manufacturer Address:	Block C, 9/F Kaiser Estate, Phase 1, No. 41, Man Yuen Street, Hunghom, Kowloon, Hong Kong.
Brand Name:	Schwinn
Model:	MPOWER Bike Speed Sensor
Type of EUT:	Transmitter
Description of EUT:	2.4GHz Bike Speed Sensor
Serial Number:	N/A
FCC ID / IC	XJO8970007 / 8449A-8970007
Date of Sample Submitted:	June 26, 2009
Date of Test:	July 03, 2009
Report No.:	HK09061397-1
Report Date:	Aug 04, 2009
Environmental Conidtions:	Temperature: +10 to 40°C Humidity: 10 to 90%

SUMMARY OF TEST RESULT

NAUTILUS INC.
BRAND NAME: Schwinn, MODEL: MPOWER Bike Speed Sensor

FCC ID: XJO8970007
IC: 8449A-8970007

TEST SPECIFICATION	REFERENCE	RESULTS
Maximum Peak Output Power	15.247(b), (c) / RSS-210 A8.4	N/A
Hopping Channel Carrier Frequencies Separation	15.247(e) / RSS-210 A8.1	N/A
20dB Bandwidth of the Hopping Channel	15.247(a) / RSS-210 A8.1	N/A
Number of Hopping Frequencies	15.247(e) / RSS-210 A8.1	N/A
Average Time of Occupancy of Hopping Frequency	15.247(e) / RSS-210 A8.1	N/A
Anteann Conducted Spurious Emissions	15.247(d) / RSS-210 A8.5	N/A
Radiated Spurious Emissions	15.247(d) / RSS-210 A8.5	N/A
Transmitter Power Line Conducted Emissions	15.207 / RSS-Gen 7.2.2	N/A
Transmitter Field Strength	15.227 / RSS-310 3.8	N/A
Transmitter Field Strength	15.229 / RSS-210 A2.7	N/A
Transmitter Field Strength, Bandwidth and Timing Requirement	15.231(a) / RSS-210 A1.1.1	N/A
Transmitter Field Strength, Bandwidth and Timing Requirement	15.231(e) / RSS-210 A1.1.5	N/A
Transmitter Field Strength and Bandwidth Requirement	15.239 / RSS-210 A2.8	N/A
Transmitter Field Strength and Bandwidth Requirement	15.249 / RSS-210 A2.9	Pass
Transmitter Field Strength and Bandwidth Requirement	15.235 / RSS-310 3.9	N/A
Receiver / Digital Device Radiated Eissions	15.109 / ICES-003	N/A
Digital Device Conducted Emissions	15.107 / ICES-003	N/A

Note: 1. The EUT uses a permanently attached antenna which, in accordance to section 15.203, is considered sufficient to comply with the pervisions of this section.
2. Pursuant to FCC part 15 Section 15.215(c), the 20 dB bandwidth of the emission was contained within the frequency band designated (mentioned as above) which the EUT operated. The effects, if any, from frequency sweeping, frequency hopping, other modulation techniques and frequency stability over excepted variations in temperature and supply voltage were considered.

Table of Contents

1.0 General Description

1.1 Product Description

The Equipment Under Test (EUT) is a bike speed sensor transmitter operating at single channel 2457MHz. The EUT is powered by 3.0VDC (1 x 3.0V "CR2032" battery). The EUT detect the cycle of a fitness bike by relay and magnet attached on the wheel. The rpm data is than transmitted out with a frequency of 2.4GHz transmission module.

Antenna Type : Internal, Integral

For electronic filing, the brief circuit description is saved with filename: descri.pdf.

1.2 Related Submittal(s) Grants

This is a single application for certification of a transmitter.

The transceiver, associated with this transmitter, has FCC ID: XJO8970006 and IC: 8449A-8970006 is filed same time.

1.3 Test Methodology

Radiated emission measurements was performed according to the procedures in ANSI C63.4 (2003). All radiated measurements were performed in an Open Area Test Site. Preliminary scans were performed in the Open Area Test Site only to determine worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the **"Justification Section"** of this Application.

1.4 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located at Garment Centre, 576 Castle Peak Road, Kowloon, Hong Kong. This test facility and site measurement data have been placed on file with the FCC and IC.

2.0 System Test Configuration

2.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in ANSI C63.4 (2003).

The device was powered from 1 x new 3.0V "CR2032" battery.

For maximizing emissions, the EUT was rotated through 360°, the antenna height was varied from 1 meter to 4 meters above the ground plane, and the antenna polarization was changed. This step by step procedure for maximizing emissions led to the data reported in Exhibit 3.0.

The unit was operated standalone and placed in the center of the turntable.

The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). The EUT was mounted to a plastic stand if necessary and placed on the wooden turntable, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes.

2.2 EUT Exercising Software

There was no special software to exercise the device. Once the unit is powered up, it transmits the RF signal continuously.

2.3 Special Accessories

There are no special accessories necessary for compliance of this product.

2.4 Equipment Modification

No modifications were installed by Intertek Testing Services Hong Kong Ltd.

2.5 Measurement Uncertainty

When determining of the test conclusion, the Measurement Uncertainty of test has been considered.

2.6 Support Equipment List and Description

Receiver - 2.4GHz Bike Power Sensor
Receiver - 2.4GHz Bike Console
Receiver - ANT Simulator (model: T1991)

3.0 **Emission Results**

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

3.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any), Average Factor (optional) from the measured reading. The basic equation with a sample calculation is as follows:
FS = RA + AF + CF - AG - AV
where FS = Field Strength in dBµV/m
RA = Receiver Amplitude (including preamplifier) in dBµV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB
AV = Average Factor in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows:
FS = RR + LF
where FS = Field Strength in dBµV/m
RR = RA - AG - AV in dBµV
LF = CF + AF in dB

Assume a receiver reading of 52.0 dBµV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB are added. The amplifier gain of 29 dB and average factor of 5 dB are subtracted, giving a field strength of 27 dBµV/m. This value in dBµV/m was converted to its corresponding level in µV/m.

RA = 52.0 dBµV/m
AF = 7.4 dB RR = 18.0 dBµV
CF = 1.6 dB LF = 9.0 dB
AG = 29.0 dB
AV = 5.0 dB
FS = RR + LF
FS = 18 + 9 = 27 dBµV/m
Level in µV/m = Common Antilogarithm [(27 dBµV/m)/20] = 22.4 µV/m

3.2 Radiated Emission Configuration Photograph

The worst case in radiated emission was found at 9827.800 MHz

For electronic filing, the worst case radiated emission configuration photographs are saved with filename: radiated photos.pdf.

3.3 Radiated Emission Data

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Judgment: Passed by 0.3 dB

3.4 Conducted Emission Configuration Photograph

Not Applicable.

3.5 Conducted Emission Data

Not Applicable.

Applicant: NAUTILUS INC. Date of Test: July 03, 2009
Model: MPOWER Bike Speed Sensor
Worst-Case Operating Mode: Transmitting

Table 1

Radiated Emissions

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-amp (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Average Factor (-dB)	Calculated at 3m (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)
H	2456.950	84.6	33	29.4	81.0	0	81.0	94.0	-13.0
H	4913.900	46.8	33	34.9	48.7	0	48.7	54.0	-5.3
V	7370.850	48.6	33	37.9	53.5	0	53.5	54.0	-0.5
H	9827.800	46.3	33	40.4	53.7	0	53.7	54.0	-0.3
H	12284.750	43.5	33	40.5	51.0	0	51.0	54.0	-3.0
H	14741.700	43.1	33	38.4	48.5	0	48.5	54.0	-5.5

NOTES: 1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative sign in the column shows value below limit.

4. Horn antenna is used for the emission over 1000MHz.

Applicant: NAUTILUS INC. Date of Test: July 03, 2009
Model: MPOWER Bike Speed Sensor
Worst-Case Operating Mode: Digital Part

Table 2

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-amp (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)
V	34.080	37.1	16	10.0	31.1	40.0	-8.9
V	38.510	36.8	16	10.0	30.8	40.0	-9.2
V	45.905	35.6	16	10.0	29.6	40.0	-10.4
V	53.010	34.5	16	11.0	29.5	40.0	-10.5
V	62.105	35.0	16	10.0	29.0	40.0	-11.0
V	80.004	38.6	16	6.0	28.6	40.0	-11.4

NOTES: 1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative sign in the column shows value below limit.

4. Horn antenna is used for the emission over 1000MHz.

4.0 Equipment Photographs

For electronic filing, the photographs are saved with filename: external photos.pdf and internal photos.pdf.

5.0 Product Labelling

For electronics filing, the FCC ID and IC label artwork and the label location are saved with filename: label.pdf.

6.0 Technical Specifications

For electronic filing, the block diagram and schematic of the tested EUT are saved with filename: block.pdf and circuit.pdf respectively.

7.0 Instruction Manual

For electronic filing, a preliminary copy of the Instruction Manual is saved with filename: manual.pdf.

This manual will be provided to the end-user with each unit sold/leased in the United States and Canada.

8.0 Miscellaneous Information

The miscellaneous information includes details of the test procedure and measured bandwidth calculation of factor such as pulse desensitization.

8.1 Measured Bandwidth

For electronic filing, the plot shows the fundamental emission when modulated is saved with filename: bw.pdf. From the plot, the bandwidth is observed to be 1026kHz, at 20dBc.

From the following plots, they show that the fundamental emissions are confined in the specified band (2400.0MHz and 2483.5MHz). In case of the fundamental emissions are within two standard bandwidths from the bandedge, the delta measurement technique is used for determining bandedge compliance. Standard bandwidth is the bandwidth specified by ANSI C63.4 (2003) for frequency being measured.

8.2 Discussion Pulse Desensitivity

Pulse desensitivity is not applicable for this device. Since the transmitter transmits the RF signal continuously.

8.3 Calculation of Average Factor

The average factor is not applicable for this device as the transmitted signal is a continuously signal.

8.4 Emissions Test Procedures

The following is a description of the test procedure used by Intertek Testing Services Hong Kong Ltd. in the measurements of transmitter operating under the Part 15, Subpart C rules.

The test set-up and procedures described below are designed to meet the requirements of ANSI C63.4 - 2003. A typical or an unmodulated CW signal at the operating frequency of the EUT has been supplied to the EUT for all measurements. Such a signal is supplied by a signal generator and an antenna in close proximity to the EUT. The signal level is sufficient to stabilize the local oscillator of the EUT.

The transmitting equipment under test (EUT) is placed on a wooden turntable which is four feet in diameter and approximately one meter in height above the ground plane. During the radiated emissions test, the turntable is rotated and any cables leaving the EUT are manipulated to find the configuration resulting in maximum emissions. The EUT is adjusted through all three orthogonal axis to obtain maximum emission levels. The antenna height and polarization are also varied during the testing to search for maximum signal levels. The height of the antenna is varied from one to four meters.

Detector function for radiated emissions is in peak mode. Average readings, when required, are taken by measuring the duty cycle of the equipment under test and subtracting the corresponding amount in dB from the measured peak readings. A detailed description for the calculation of the average factor can be found in Exhibit 8.3.

The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower.

8.4 Emissions Test Procedures (cont'd)

The EUT is warmed up for 15 minutes prior to the test.

AC power to the unit is varied from 85% to 115% nominal and variation in the fundamental emission field strength is recorded. If battery powered, a new, fully charged battery is used.

Conducted measurements were made as described in ANSI C63.4 - 2003.

The IF bandwidth used for measurement of radiated signal strength was 100 kHz or greater when frequency is below 1000 MHz. Where pulsed transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. A discussion of whether pulse desensitivity is applicable to this unit is included in this report (See Exhibit 8.1). Above 1000 MHz, a resolution bandwidth of 1 MHz is used.

Transmitter measurements are normally conducted at a measurement distance of three meters. However, to assure low enough noise floor in the forbidden bands and above 1 GHz, signals are acquired at a distance of one meter or less. All measurements are extrapolated to three meters using inverse scaling, unless otherwise reported. Measurements taken at a closer distance are so marked.

9.0 Confidentiality Request

For electronic filing, a preliminary copy of the confidentiality request is saved with filename: request.pdf.

10.0 Equipment List

1) Radiated Emissions Test

Equipment	EMI Test Receiver	Biconical Antenna	Log Periodic Antenna
Registration No.	EW-0014	EW-0954	EW-0446
Manufacturer	R&S	EMCO	EMCO
Model No.	ESVS30	3104C	3146
Calibration Date	Jun 01, 2009	Sep. 30, 2008	Oct. 02, 2008
Calibration Due Date	Jun 01, 2010	Mar. 30, 2010	Apr. 02, 2010