



Electromagnetic Compatibility Test Report

Tests Performed on a NewSpin Golf, LLC

SwingSmart Transceiver, Model NS001

Radiometrics Document RP-7178



Product Detail:

FCC ID: Z8JNS001

IC: 10006A-NS001

Equipment type: FHSS 2.4 GHz Transceiver

Test Standards:

US CFR Title 47, Chapter I, FCC Part 15 Subpart C

FCC Part 15 CFR Title 47: 2009

Industry Canada RSS-210, Issue 8: 2010 as required for Category I Equipment

This report concerns: Original Grant for Certification

FCC Part 15.247

Tests Performed For:

NewSpin Golf, LLC

1637 Burr Oaks Drive

Libertyville, IL 60046

Test Facility:

Radiometrics Midwest Corporation

12 East Devonwood

Romeoville, IL 60446

(815) 293-0772

Test Date(s): (Month-Day-Year)

November 21 to December 12, 2011

Document RP-7178 Revisions:

Rev.	Issue Date	Affected Sections	Revised By
0	December 12, 2011		
1	December 16, 2011	Cover	Joseph Strzelecki

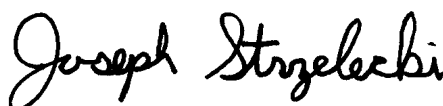
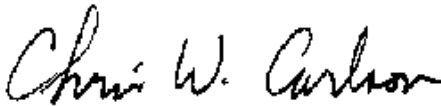
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Testing of the NewSpin Golf, LLC, Model NS001, SwingSmart

1 ADMINISTRATIVE DATA

<i>Equipment Under Test:</i> A NewSpin Golf, LLC, SwingSmart Model: NS001 Serial Number: R3 This will be referred to as the EUT in this Report	
<i>Date EUT Received at Radiometrics: (Month-Day-Year)</i> November 21, 2011	<i>Test Date(s): (Month-Day-Year)</i> November 21 to 30, 2011
<i>Test Report Written By:</i> Joseph Strzelecki Senior EMC Engineer	<i>Test Witnessed By:</i> Mike McClaughry NewSpin Golf, LLC
<i>Radiometrics' Personnel Responsible for Test:</i> 	<i>Test Report Approved By</i> 
Joseph Strzelecki Senior EMC Engineer NARTE EMC-000877-NE	Chris W. Carlson Director of Engineering NARTE EMC-000921-NE

2 TEST SUMMARY AND RESULTS

The EUT (Equipment Under Test) is a SwingSmart, Model NS001, manufactured by NewSpin Golf, LLC. The detailed test results are presented in a separate section. The following is a summary of the test results.

Environmental Phenomena	Frequency Range	FCC Section	RSS- Section	Test Result
RF AC Mains Conducted Emissions	0.15 - 30 MHz	15.207	GEN; 7.2.2	Note 2
RF Radiated Emissions	30-25,000 MHz	15.209	GEN; 7.2.5	Pass
Carrier Frequency Separation	2400 to 2483 MHz	15.247 a	A8.1 (2)	Pass
Number of Hopping Frequencies	2400 to 2483 MHz	15.247 a	A8.1 (2)	Pass
Time of Occupancy (Dwell Time)	2400 to 2483 MHz	15.247 a	A8.1 (2)	Pass
20 dB Bandwidth Test	2400 to 2483 MHz	15.247 a	210; A8.1 (4)	Pass
Peak Output Power	2400 to 2483 MHz	15.247 b	210; A8.1 (1)	Pass
Band-edge Compliance of RF Conducted Emissions	2400 to 2483 MHz	15.247 d	210; A8.4 (2)	Pass
Spurious Radiated Emissions	30 MHz to 25 GHz	15.247 d	210; A8.5	Pass

Note 1: The RSS-210 specification is not currently covered in Radiometrics' Scope of Accreditation. This is technically very similar to FCC, CFR 47 Part 15 which is on Radiometrics scope.

Note 2: Not required since the EUT only operates with battery power.

2.1 RF Exposure Compliance Requirements

Since the power output is 3.9 mW, the EUT meets the FCC requirement for RF exposure, and is exempt from RSS-102. There are no power level adjustments and the antenna is permanently attached. The detailed calculations for RF Exposure are presented in a separate document.

3 EQUIPMENT UNDER TEST (EUT) DETAILS

3.1 EUT Description

The EUT is a SwingSmart, Model NS001, manufactured by NewSpin Golf, LLC. The EUT was in good working condition during the tests, with no known defects.

The EUT is a motion sensing device that communicates via Bluetooth to a host device. The EUT is intended to be mounted on the shaft of a golf club.

3.1.1 FCC Section 15.203 & RSS-GEN Antenna Requirements

The antenna is permanently attached to the printed circuit board. The antenna is internal to the EUT and it is not readily available to be modified by the end user. Therefore, it meets the 15.203 Requirements.

3.2 Related Submittals

NewSpin Golf, LLC is not submitting any other products simultaneously for equipment authorization related to the EUT.

4 TESTED SYSTEM DETAILS

4.1 Tested System Configuration

The system was configured for testing in a typical fashion. The EUT was placed on an 80-cm high, nonconductive test stand. The testing was performed in conditions as close as possible to installed conditions.

The EUT was tested as a stand-alone device. Power was supplied with a new battery. The EUT was tested stand alone and while attached to a typical golf club.

The identification for all equipment, plus descriptions of all cables used in the tested system, are:

Tested System Configuration List

Item	Description	Type*	Manufacturer	Model Number	Serial Number
1	SwingSmart	E	NewSpin Golf, LLC	NS001	R3

* Type: E = EUT, P = Peripheral, S = Support Equipment; H = Host Computer

4.2 Special Accessories

No special accessories were used during the tests in order to achieve compliance.

4.3 Equipment Modifications

No modifications were made to the EUT at Radiometrics' test facility in order to comply with the standards listed in this report.

5 TEST SPECIFICATIONS AND RELATED DOCUMENTS

Document	Date	Title
FCC CFR Title 47	2011	Code of Federal Regulations Title 47, Chapter 1, Federal Communications Commission, Part 15 - Radio Frequency Devices
ANSI C63.4-2003	2003	Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
IC RSS-210 Issue 8	2010	Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands) Category I Equipment
IC RSS-Gen Issue 3	2010	General Requirements and Information for the Certification of Radiocommunication Equipment (RSS-Gen)
FCC DA 00-705	2000	Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems

The test procedures used are in accordance with the FCC DA 00-705, Industry Canada RSS-GEN and ANSI document C63.4-2003, "Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". The specific procedures are described herein. Radiated testing was performed at an antenna to EUT distance of 3 meters. The antenna was raised and lowered from 1 to 4 meters.

6 RADIOMETRICS' TEST FACILITIES

The results of these tests were obtained at Radiometrics Midwest Corp. in Romeoville, Illinois, USA. Radiometrics is accredited by A2LA (American Association for Laboratory Accreditation) to conform to ISO/IEC 17025: 2005 "General Requirements for the Competence of Calibration and Testing Laboratories". Radiometrics' Lab Code is 121191 and Certification Number is 1495.01. Radiometrics' scope of accreditation includes all of the test methods listed herein. A copy of the accreditation can be accessed on our web site (www.radiomet.com). Radiometrics accreditation status can be verified at A2LA's web site (www.a2la2.org).

The following is a list of shielded enclosures located in Romeoville, Illinois used during the tests:

Chamber A: Is an anechoic chamber that measures 24' L X 12' W X 12' H. The walls and ceiling are fully lined with ferrite absorber tiles. The floor has a 10' x 10' section of ferrite absorber tiles located in the center. Panashield of Rowayton, Connecticut manufactured the chamber. The enclosure is NAMAS certified.

Chamber E: Is a custom made anechoic chamber that measures 52' L X 30' W X 18' H. The walls and ceiling are fully lined with RF absorber. Pro-shield of Collinsville, Oklahoma manufactured the chamber.

Test Station F: Is an area that measures 10' D X 12' W X 10' H. The floor and back wall are metal shielded. This area is used for conducted emissions measurements.

A separate ten-foot long, brass plated, steel ground rod attached via a 6 inch copper braid grounds each of the above chambers. Each enclosure is also equipped with low-pass power line filters.

Testing of the NewSpin Golf, LLC, Model NS001, SwingSmart

The FCC has accepted these sites as test site number US1065. The FCC test site Registration Number is 732175. Details of the site characteristics are on file with the Industry Canada as site number IC3124A-1.

A complete list of the test equipment is provided herein. The calibration due dates are indicated on the equipment list. The equipment is calibrated in accordance to ANSI/NCSL Z540-1 with traceability to the National Institute of Standards and Technology (NIST).

7 DEVIATIONS AND EXCLUSIONS FROM THE TEST SPECIFICATIONS

There were no deviations or exclusions from the test specifications.

8 CERTIFICATION

Radiometrics Midwest Corporation certifies that the data contained herein was taken under conditions that meet or exceed the requirements of the test specification and the data contained herein was taken with calibrated test equipment. The results relate only to the EUT listed herein.

9 TEST EQUIPMENT TABLE

RMC ID	Manufacturer	Description	Model No.	Serial No.	Frequency Range	Cal Period	Cal Date
AMP-05	RMC/Celeritek	Pre-amplifier	MW110G	1001	1.0-12GHz	12 Mo.	01/19/11
AMP-20	Avantek	Pre-amplifier	SF8-0652	15221	8-18GHz	12 Mo.	01/18/11
AMP-22	Anritsu	Pre-amplifier	MH648A	M23969	0.1-1200MHz	12 Mo.	01/18/11
AMP-29	HP / Agilent	Amplifier	11975A	2304A00158	2-8 GHz	12 Mo.	04/05/11
ANT-13	EMCO	Horn Antenna	3115	2502	1.0-18GHz	24 Mo.	11/18/10
ANT-44	Impossible Machine	Super Log Antenna	SL-20M2G	1002	20-2000MHz	24 Mo.	11/25/09
ANT-48	RMC	Std Gain Horn	HW2020	1001	18-26 GHz	12 Mo.	04/05/11
MXR-02	HP / Agilent	Harmonic Mixer	11970K	2332A00489	18-26.5GHz	12 Mo.	04/05/11
PRE-01	Hewlett Packard	Preselector	85685A	2510A00143	20 Hz-2GHz	24 Mo.	01/11/10
REC-03	Anritsu	Spectrum Analyzer	MS2601B	MT94589	0.01-2200MHz	12 Mo.	03/18/11
REC-07	Anritsu	Spectrum Analyzer	MS2601A	MT53067	0.01-2200MHz	12 Mo.	01/21/11
REC-08	Hewlett Packard	Spectrum Analyzer	8566B	2648A13481 2209A01436	30Hz-22GHz	24 Mo.	10/28/11
THM-02	Fluke	Temp/Humid Meter	971	93490471	N/A	24 Mo.	04/01/10

Note: All calibrated equipment is subject to periodic checks.

10 TEST SECTIONS

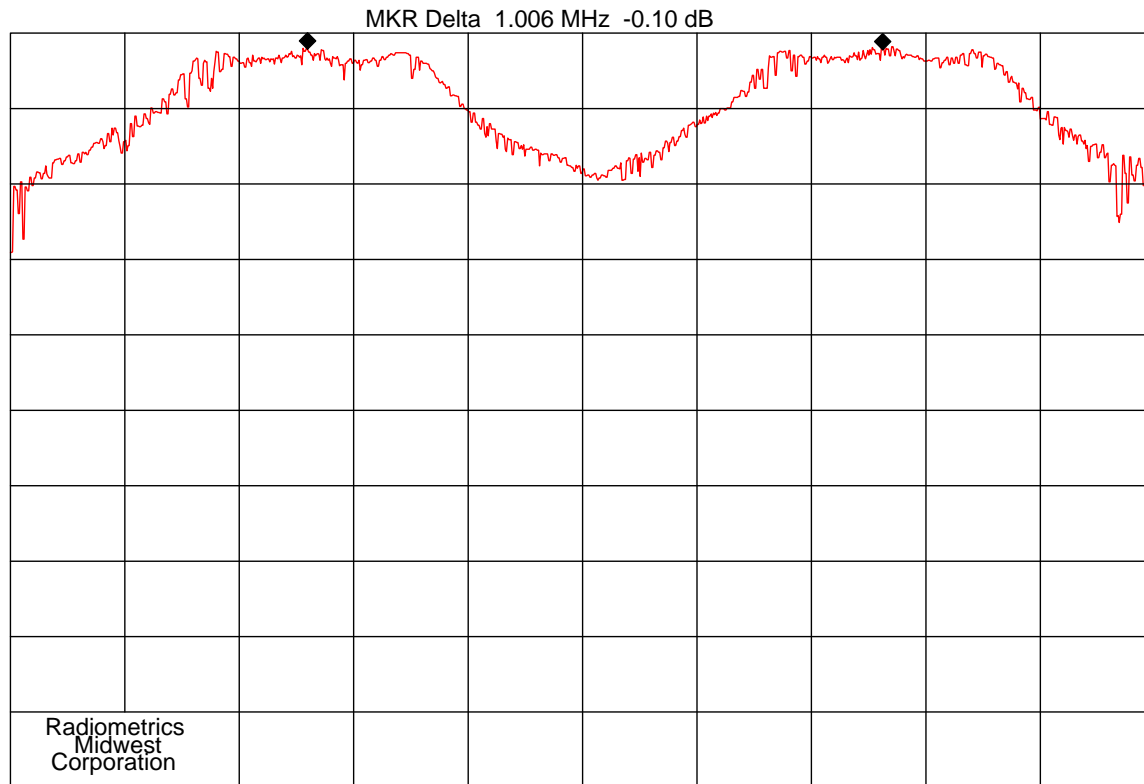
10.1 AC Conducted Emissions

Since the EUT is battery operated and does not permit operation while while charging, AC conducted emissions are not required.

10.2 Carrier Frequency Separation

The EUT has its hopping function enabled. The spectrum analyzer was set to the MAX HOLD mode to read peak emissions. The sweep was set to AUTO. The trace was allowed to stabilize. The marker-delta function was used to determine the separation between the peaks of the adjacent channels.

Testing of the NewSpin Golf, LLC, Model NS001, SwingSmart



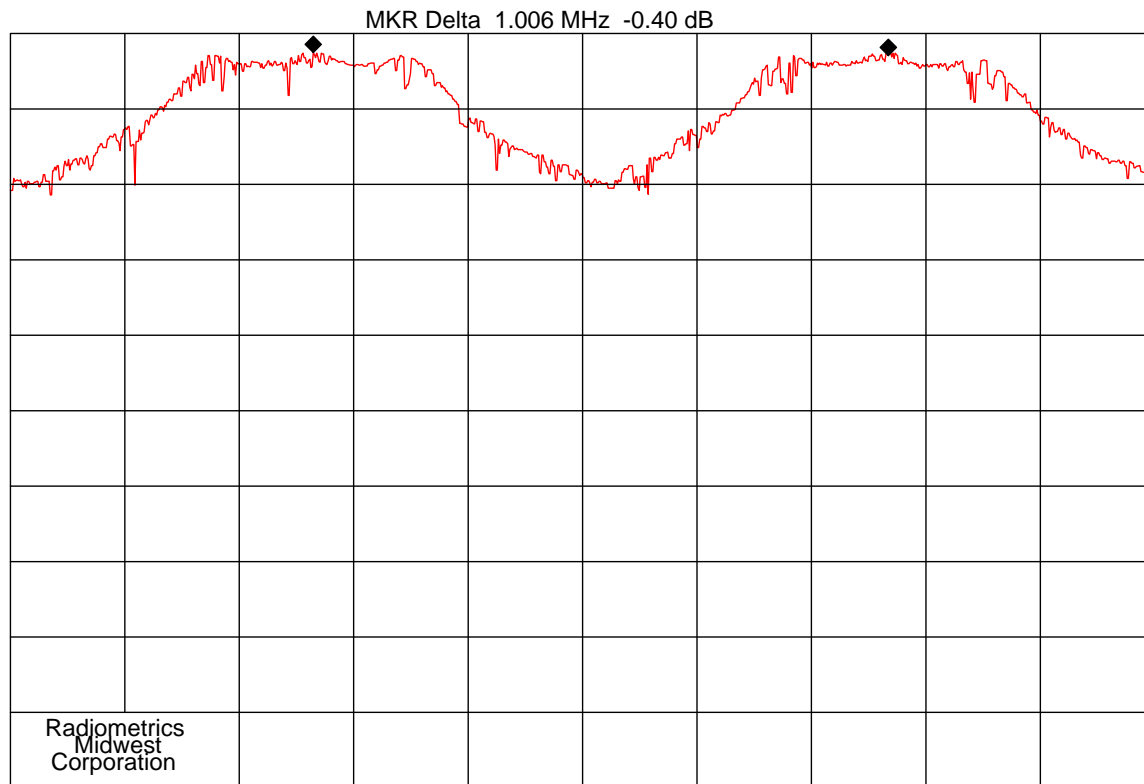
Company: NewSpin Golf
CENTER 2.402 50 GHz
RES BW 100 kHz
10 dB/

Notes: Carrier Freq. Separation, 2402 MHz

ITEM : R1.02.00-01
REF 97.0 dBuV
VBW 300 kHz
Time: 13:58

Date : 11-21-2011
SPAN 2.00 MHz
ATTEN 0 dB
SWP 20.0 msec
File: CFS-1

Testing of the NewSpin Golf, LLC, Model NS001, SwingSmart



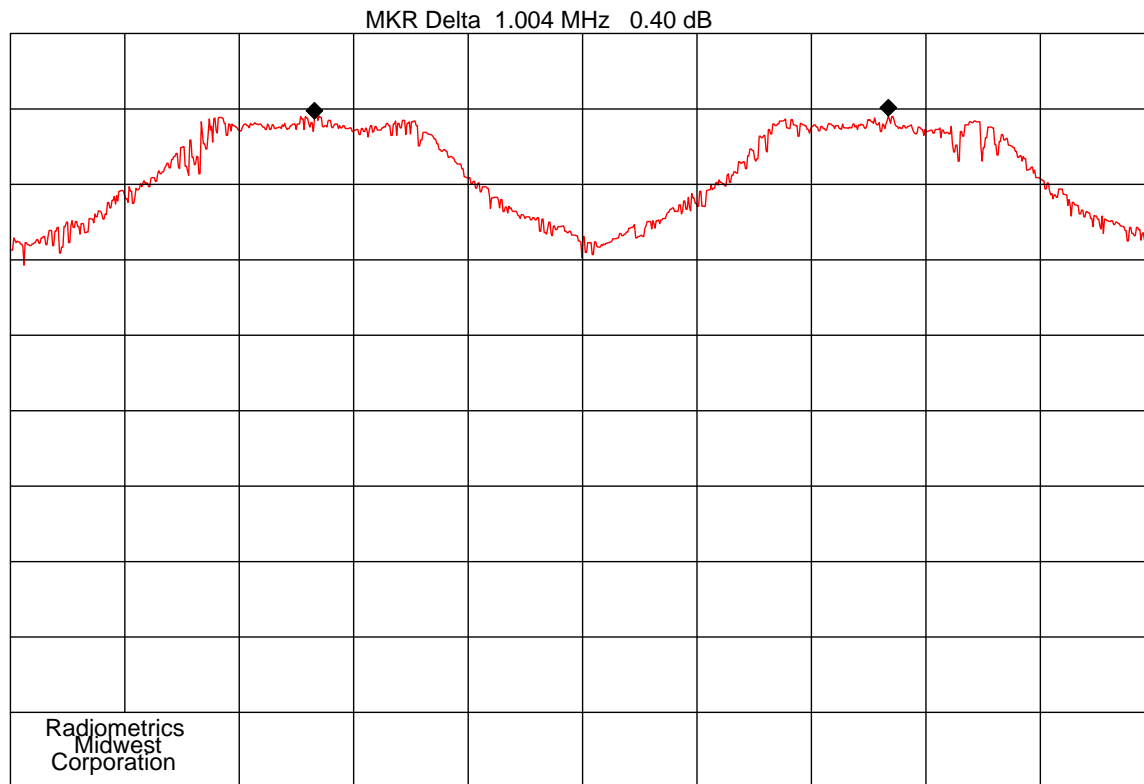
Company: NewSpin Golf
CENTER 2.440 50 GHz
RES BW 100 kHz
10 dB/

Notes: Carrier Freq. Separation, 2441 MHz

ITEM : R1.02.00-01
REF 97.0 dBuV
VBW 300 kHz
Time: 14:01

Date : 11-21-2011
SPAN 2.00 MHz
ATTEN 0 dB
SWP 20.0 msec
File: CFS-2

Testing of the NewSpin Golf, LLC, Model NS001, SwingSmart



Company: NewSpin Golf
CENTER 2.479 50 GHz
RES BW 100 kHz
10 dB/

Notes: Carrier Freq. Separation, 2480 MHz

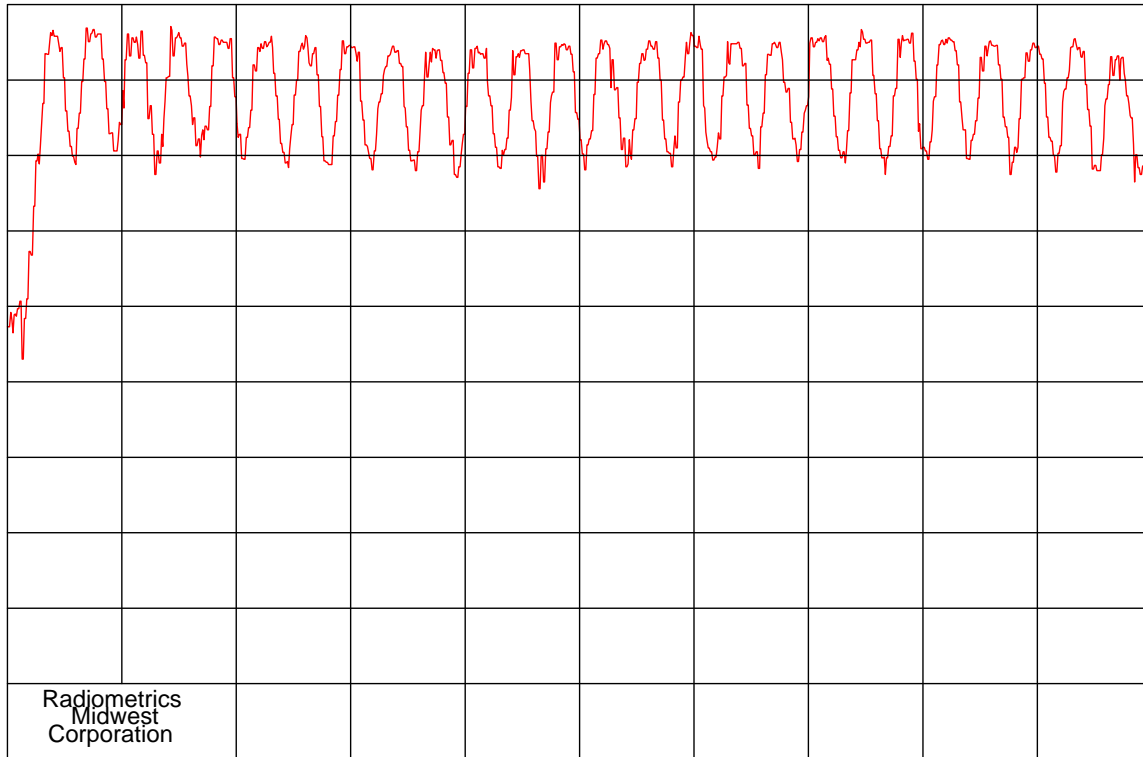
ITEM : R1.02.00-01
REF 97.0 dBuV
VBW 300 kHz
Time: 14:03

Date : 11-21-2011
SPAN 2.00 MHz
ATTEN 0 dB
SWP 20.0 msec
File: CFS-3

10.3 Number of Hopping Frequencies

The EUT has its hopping function enabled. The spectrum analyzer was set to the MAX HOLD mode to read peak emissions. The sweep was set to AUTO. The trace was allowed to stabilize.

Testing of the NewSpin Golf, LLC, Model NS001, SwingSmart



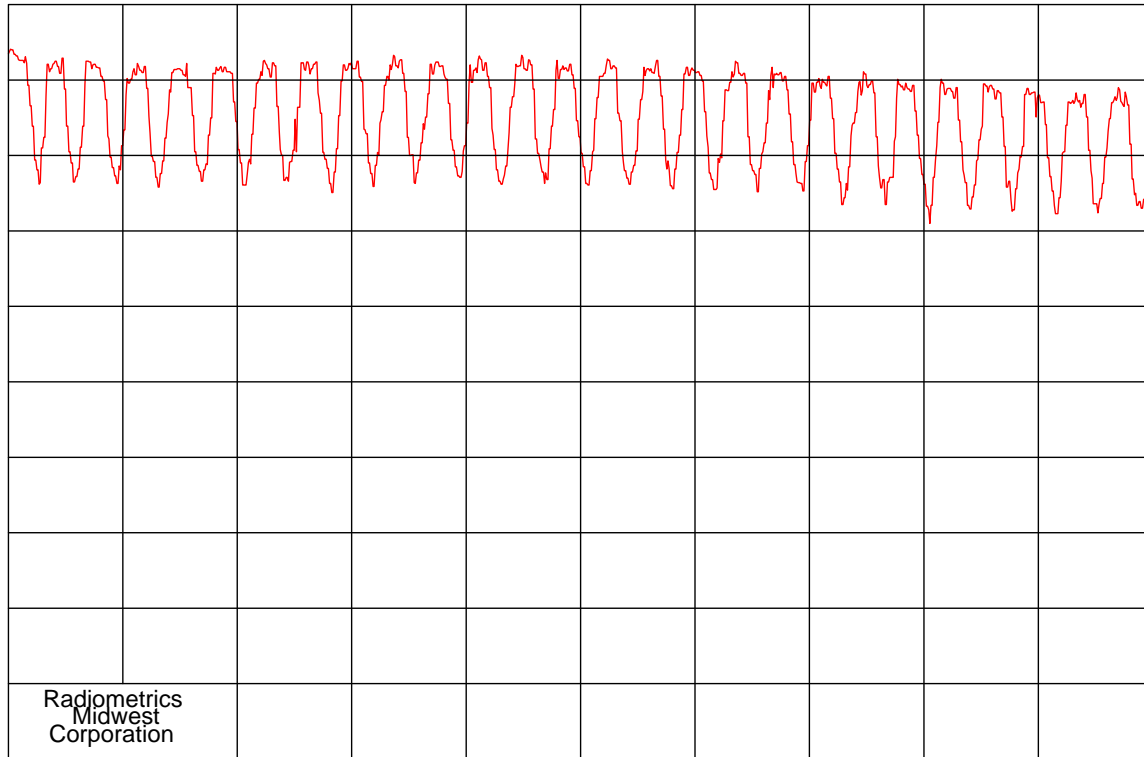
Company: NewSpin Golf
START 2.401 0 GHz
RES BW 100 kHz
10 dB/

Notes: # of Hopping Frequencies, First 1/3 of Band

ITEM : R1.02.00-01
REF 97.0 dBuV
VBW 300 kHz
Time: 13:40

Date : 11-21-2011
STOP 2.428 0 GHz
ATTEN 0 dB
SWP 20.0 msec
File: NHF-1

Testing of the NewSpin Golf, LLC, Model NS001, SwingSmart



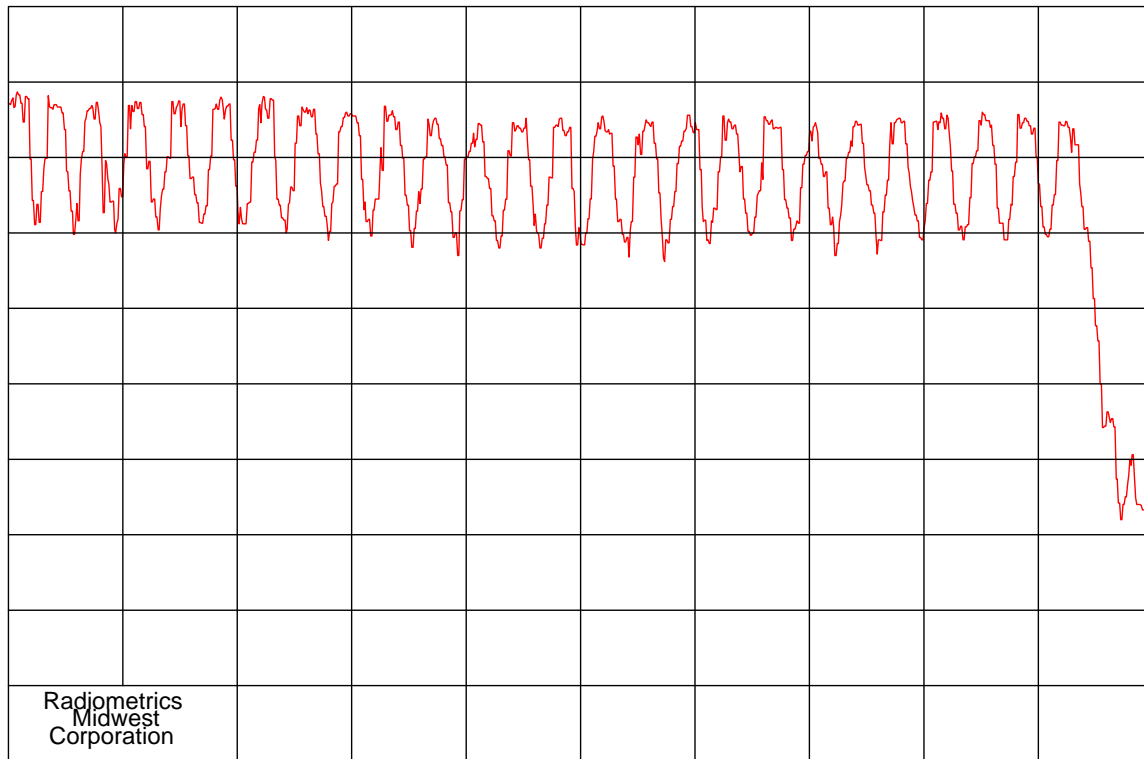
Company: NewSpin Golf
CENTER 2.441 5 GHz
RES BW 100 kHz
10 dB/

Notes: # of Hopping Frequencies, Second 1/3 of Band

ITEM : R1.02.00-01
REF 97.0 dBuV
VBW 300 kHz
Time: 13:44

Date : 11-21-2011
SPAN 27.0 MHz
ATTEN 0 dB
SWP 20.0 msec
File: NHF-2

Testing of the NewSpin Golf, LLC, Model NS001, SwingSmart



Radiometrics
Midwest
Corporation
Company: NewSpin Golf
CENTER 2.468 5 GHz
RES BW 100 kHz
10 dB/
Notes: # of Hopping Frequencies, Last 1/3 of Band

ITEM : R1.02.00-01
REF 97.0 dBuV
VBW 300 kHz
Time: 13:46

Date : 11-21-2011
SPAN 27.0 MHz
ATTEN 0 dB
SWP 20.0 msec
File: NHF-3

10.4 Time of Occupancy (Dwell Time)

10.4.1 Dwell Time in a 30 second period

The Bluetooth "slot" of 625 μ S provides a hop rate of 1600 hops/second, so with 79 channels each channel is hopped to an average of 20.3 times per second. Using the averaging effect of 15.35 shows that the allowed power increase via hopping in spurious power levels should be $20 \cdot \log(1/79) = 38$ dB. Bluetooth uses a 1 MHz channel bandwidth and the detector bandwidth is also 1 MHz for spurious measurement, so all the power is effectively in the detector bandwidth.

The period time = $0.4 \text{ (ms)} \cdot 79 = 31.6 \text{ (s)}$

2402 MHz

DH1 time slot = $0.405 \text{ (ms)} \cdot (1600/(2 \cdot 79)) \cdot 31.6 = 129.6 \text{ (mS)}$

DH3 time slot = $1.675 \text{ (ms)} \cdot (1600/(4 \cdot 79)) \cdot 31.6 = 268.0 \text{ (mS)}$

DH5 time slot = $2.925 \text{ (ms)} \cdot (1600/(6 \cdot 79)) \cdot 31.6 = 312.0 \text{ (ms)}$

2440 MHz

DH1 time slot = $0.405 \text{ (ms)} \cdot (1600/(2 \cdot 79)) \cdot 31.6 = 129.6 \text{ (mS)}$

DH3 time slot = $1.675 \text{ (ms)} \cdot (1600/(4 \cdot 79)) \cdot 31.6 = 268.0 \text{ (mS)}$

DH5 time slot = $2.906 \text{ (ms)} \cdot (1600/(6 \cdot 79)) \cdot 31.6 = 309.9 \text{ (mS)}$

Testing of the NewSpin Golf, LLC, Model NS001, SwingSmart

2480 MHz

DH1 time slot = $0.416 \text{ (ms)} * (1600/(2*79)) * 31.6 = 133.12 \text{ (mS)}$

DH3 time slot = $1.662 \text{ (ms)} * (1600/(4*79)) * 31.6 = 265.92 \text{ (mS)}$

DH5 time slot = $2.906 \text{ (ms)} * (1600/(6*79)) * 31.6 = 309.97 \text{ (mS)}$

Judgment: Pass Time of occupancy = 0.312 mS

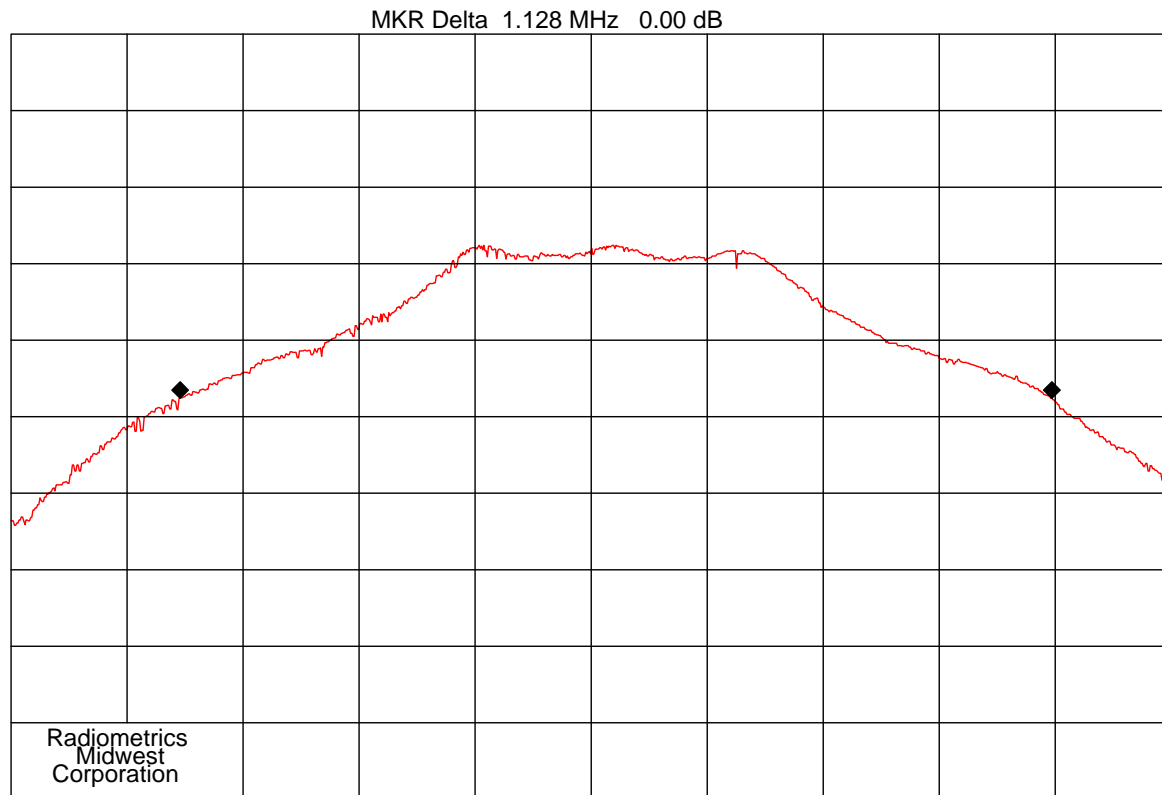
10.5 Occupied Bandwidth

The spectrum analyzer was set to the MAX HOLD mode to record the worst case of the modulation. The EUT was transmitting at its maximum data rate. The trace was allowed to stabilize.

The marker-to-peak function was set to the peak of the emission. Then the marker-delta function was used to measure 6 or 20 dB down one side of the emission. The marker-delta function was reset and then moved to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the bandwidth of the emission.

Channel MHz	20 dB EBW MHz
2402	1.128
2441	1.116
2480	1.136

Testing of the NewSpin Golf, LLC, Model NS001, SwingSmart

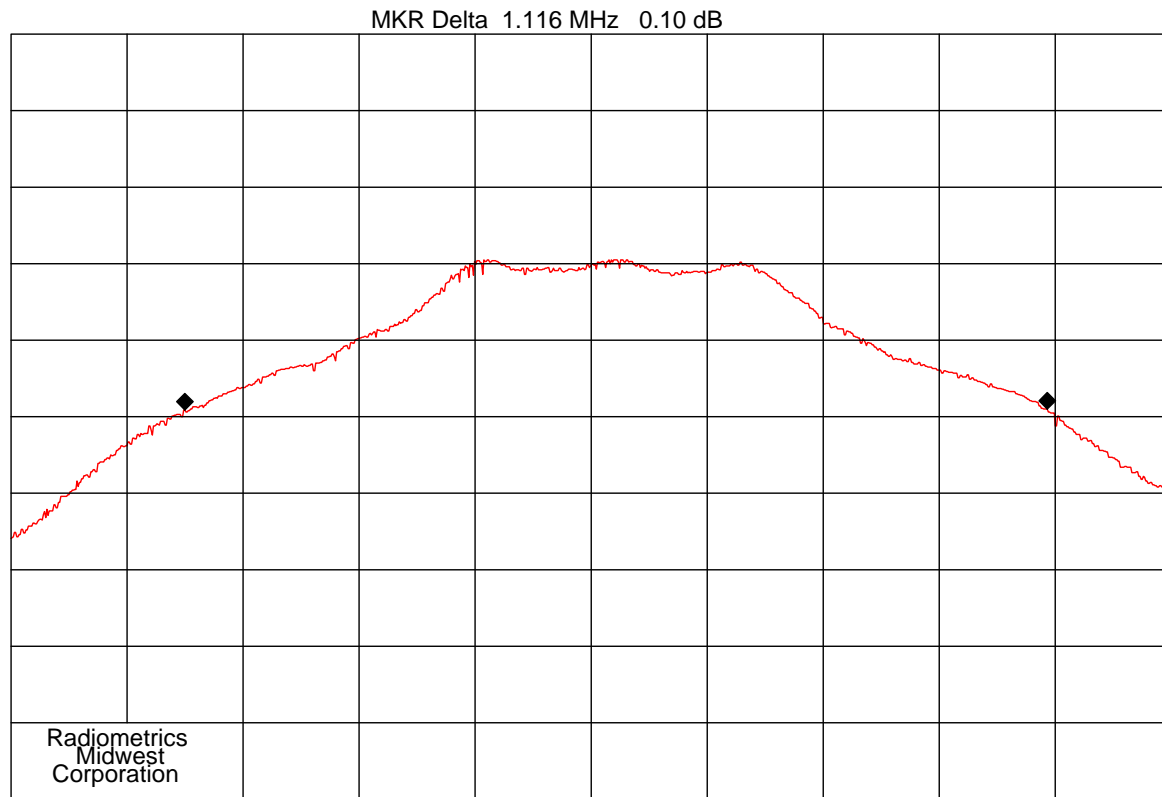


Company: NewSpin Golf LL
CENTER 2.402 00 GHz
RES BW 100 kHz
10 dB/
Notes: 20 dB Bandwidth, 2402 MHz

ITEM : NS001
REF 0.0 dBm
VBW 300 kHz
Time: 14:15

Date : 12-12-2011
SPAN 1.50 MHz
ATTEN 10 dB
SWP 20.0 msec
File: BWM-1

Testing of the NewSpin Golf, LLC, Model NS001, SwingSmart

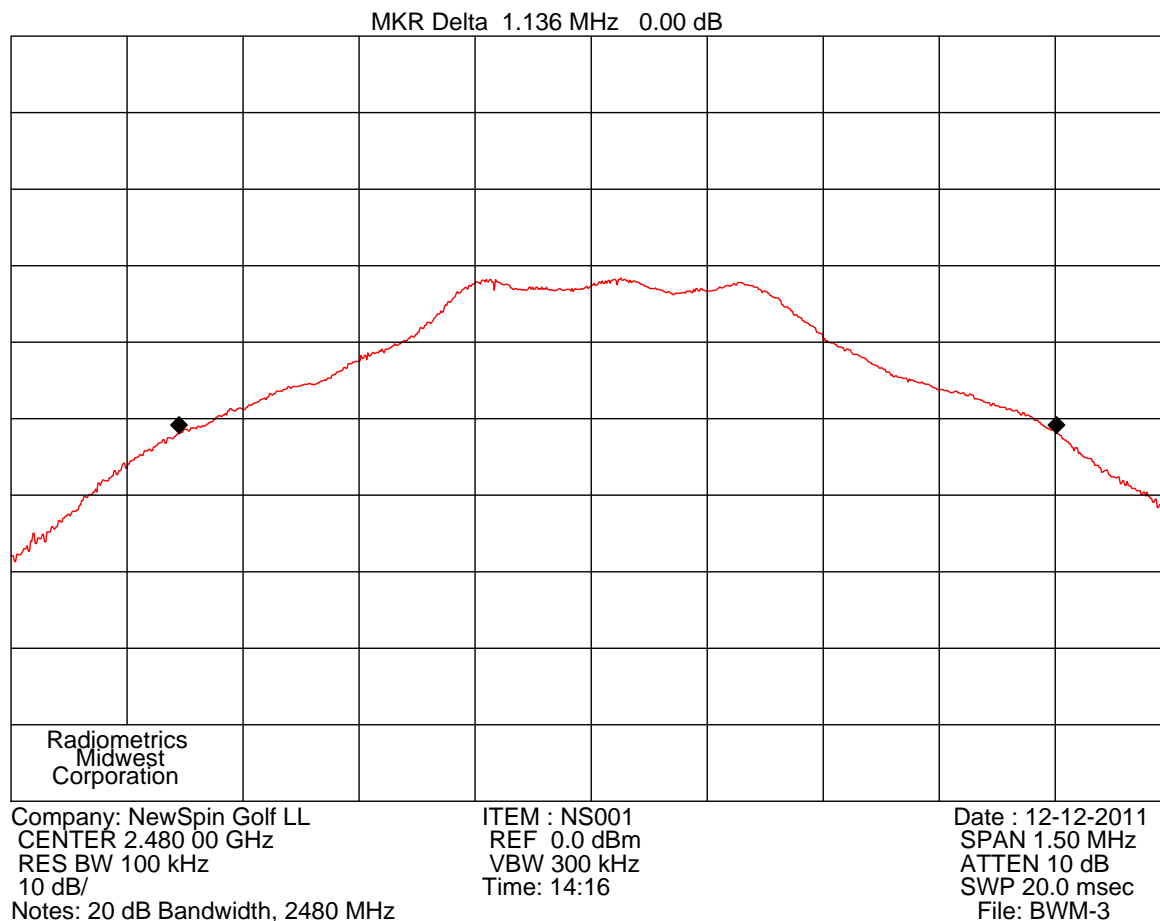


Company: NewSpin Golf LLC
CENTER 2.441 00 GHz
RES BW 100 kHz
10 dB/
Notes: 20 dB Bandwidth, 2441 MHz

ITEM : NS001
REF 0.0 dBm
VBW 300 kHz
Time: 14:06

Date : 12-12-2011
SPAN 1.50 MHz
ATTEN 10 dB
SWP 20.0 msec
File: BWM-2

Testing of the NewSpin Golf, LLC, Model NS001, SwingSmart



10.6 Peak Output Power

Since antenna conducted tests cannot be performed on the EUT, radiated tests were performed to show compliance with this requirement.

The field strength was measured using the procedures described in section 10.9, with the following exceptions: The analyzer was tuned to the highest point of the maximized fundamental emission. Using this peak level, the transmitter's power spectral density was calculated using the following equation:

$$P = (E \times d)^2 / (30 \times G)$$

Where: E = the measured maximum peak field strength in V/m, using the bandwidths in this section.

G = The numeric gain of the transmitting antenna over an isotropic radiator.

d = Distance in meters from which the field strength was measured. (3 meters)

P = The EUT power in watts

The trace was allowed to stabilize. The marker-to-peak function was used to measure the peak of the emission. The indicated level is the peak output power. Note 30 dBm = 1 watt. Since the gain of the antenna is always less than 6 dB, the limit is not reduced.

Testing of the NewSpin Golf, LLC, Model NS001, SwingSmart

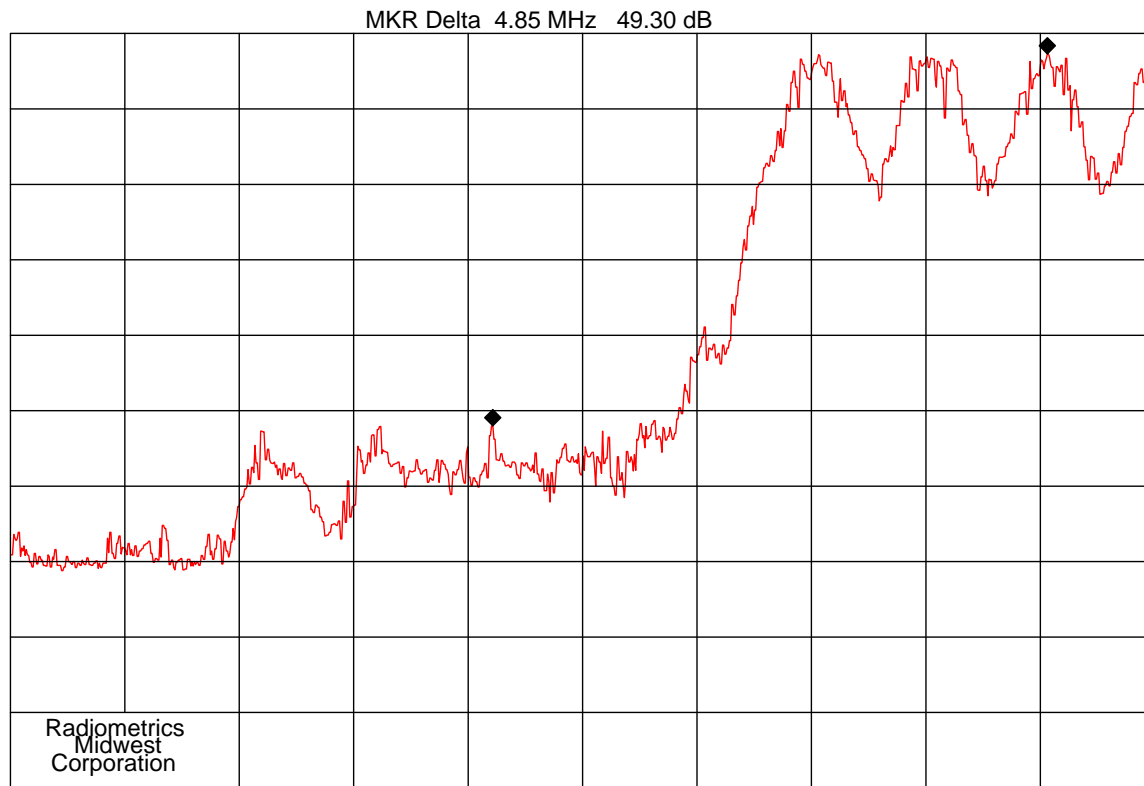
Span = 5 MHz kHz; RBW = 3 MHz kHz ; VBW = 3 MHz; Detector = Peak

Freq	Peak		Meas	EUT	EUT	Limit
MHz	dBuV/m	V/m	Dist	Watts	dBm	dBm
2402	99.1	0.0901571	3	2.44E-03	3.87	30
2441	96	0.0630957	3	1.19E-03	0.77	30
2480	95.9	0.0623735	3	1.17E-03	0.67	30

Judgment: Pass by 26.13 dB

10.7 Band-edge Compliance of RF Conducted Emissions

The spectrum analyzer was set to the MAX HOLD mode to record the worst case of the modulation at the band-edge, with the EUT set for continuous hopping. The trace was allowed to stabilize.

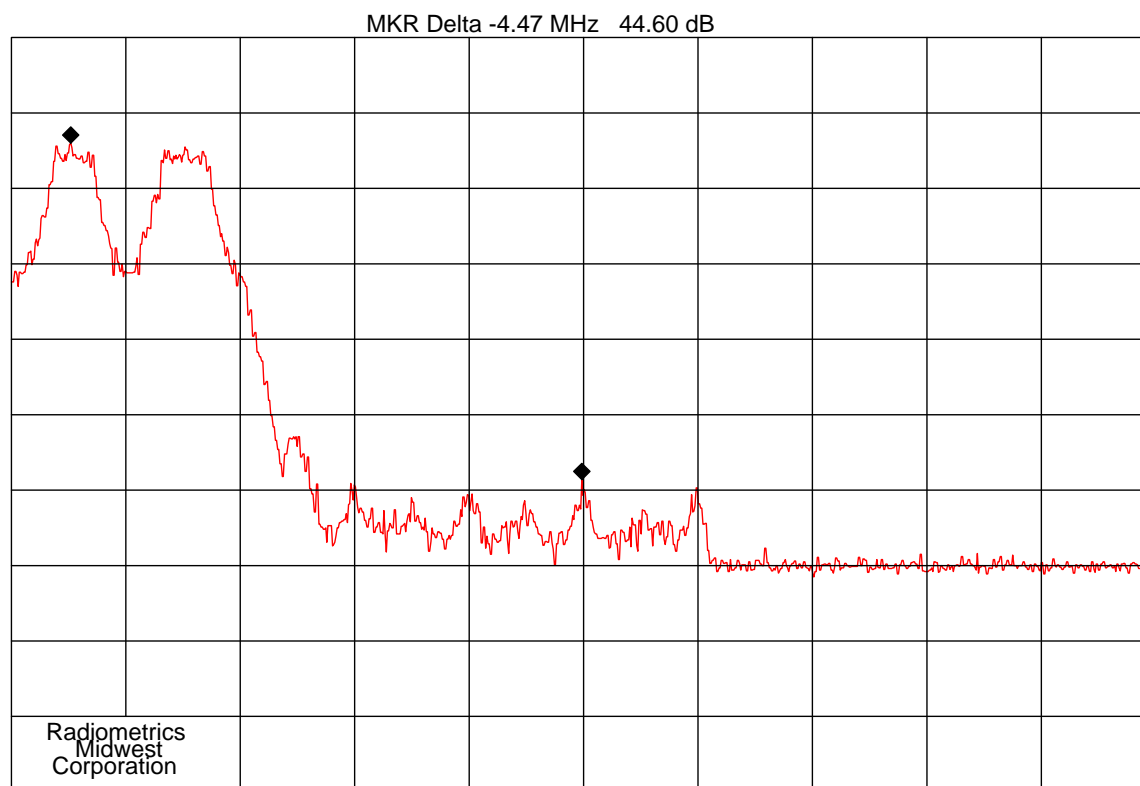


Company: NewSpin Golf
 CENTER 2.400 0 GHz
 RES BW 100 kHz
 10 dB/
 Notes: Band Edge Test, 2400 MHz Edge

ITEM : R1.02.00-01
 REF 97.0 dBuV
 VBW 300 kHz
 Time: 13:33

Date : 11-21-2011
 SPAN 10.0 MHz
 ATTEN 0 dB
 SWP 20.0 msec
 File: BE-1C

Testing of the NewSpin Golf, LLC, Model NS001, SwingSmart



Company: NewSpin Golf
CENTER 2.483 5 GHz
RES BW 100 kHz
10 dB/

Notes: Band Edge Test, 2483.5 MHz Edge

ITEM : R1.02.00-01
REF 97.0 dBuV
VBW 300 kHz
Time: 13:36

Date : 11-21-2011
SPAN 10.0 MHz
ATTEN 0 dB
SWP 20.0 msec
File: BE-2B

Channel	Band Edge Delta Readings in dB	
	2400	Minimum Allowed
	Band Edge	dB
2402 Lower Band edge	49.3	20
2480 Upper Band edge	44.6	20

Judgment: Pass by 14.6 dB

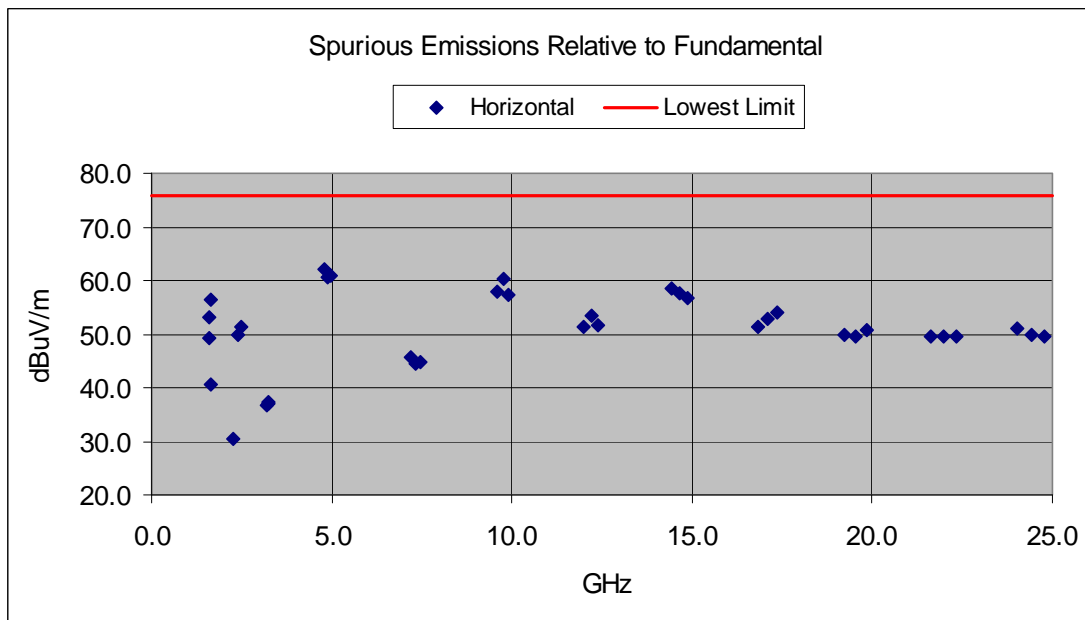
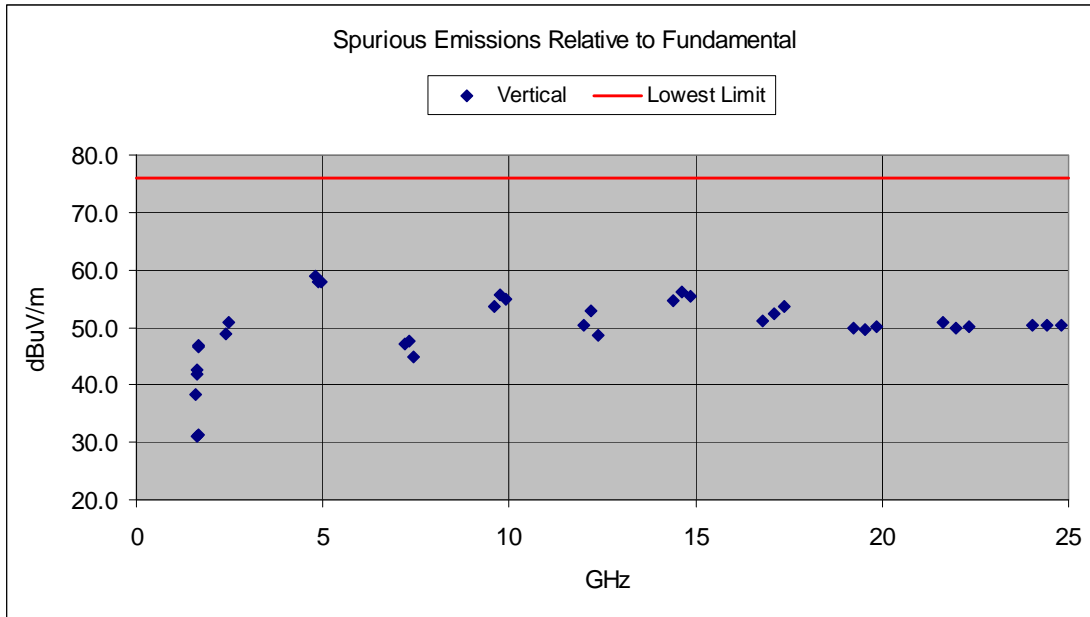
10.8 Spurious RF Conducted Emissions

Since antenna conducted tests cannot be performed on the EUT, radiated tests were performed to show compliance with this requirement.

The EUT was tested in continuous mode and peak readings were made from the lowest frequency generated in the EUT up through the 10th harmonic. The limit is 20 dB lower than the peak of the lowest fundamental. The data is shown graphically.

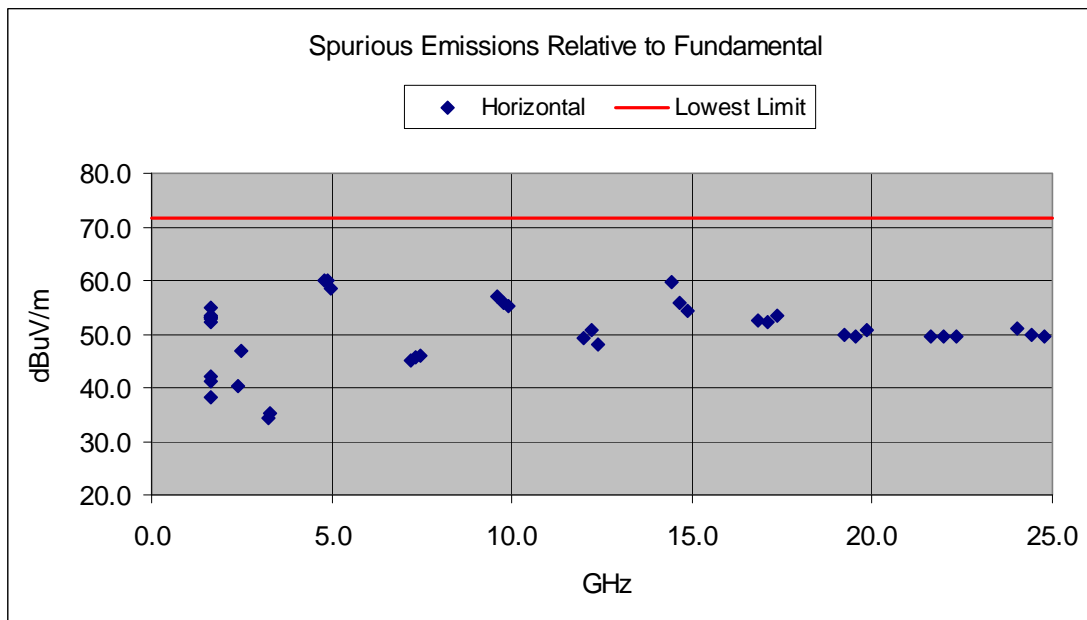
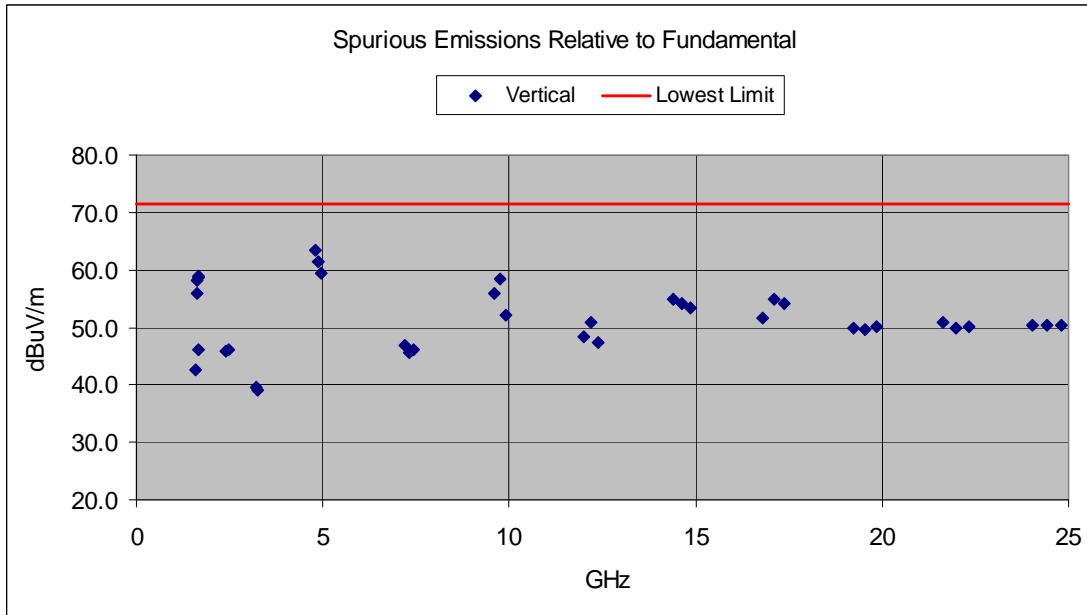
Stand Alone

Testing of the NewSpin Golf, LLC, Model NS001, SwingSmart



On Club

Testing of the NewSpin Golf, LLC, Model NS001, SwingSmart



Judgement: Pass by 8.1 dB

10.9 Spurious Radiated Emissions (Restricted Band)

Radiated emission measurements were performed with linearly polarized broadband antennas. The results obtained with these antennas can be correlated with results obtained with a tuned dipole antenna. The radiated emission measurements were performed with a spectrum analyzer. The bandwidth used from 150 kHz to 30 MHz is 9 or 10 kHz and the bandwidth from 30 MHz to 1000 MHz is 100 or 120 kHz. Above 1 GHz, a 1 MHz bandwidth is used. A 10 dB linearity check is performed prior to start of testing in order to determine if an overload condition exists.

Testing of the NewSpin Golf, LLC, Model NS001, SwingSmart

From 30 to 1000 MHz, an Anritsu spectrum analyzer was used. For tests from 1 to 25 GHz, an HP 8566 spectrum analyzer was used. For tests from 1 to 10 GHz, a high pass filter was used to reduce the fundamental emission. A harmonic mixer was used from 18 to 25 GHz. Figure 4 herein lists the details of the test equipment used during radiated emissions tests.

The was device was rotated through three orthogonal axis as per 13.1.4.1 of ANSI C63.4 during the radiated tests.

Final radiated emissions measurements were performed inside of an anechoic chamber at a test distance of 3 meters. The anechoic chamber is designated as Chamber E. This Chamber meets the Site Attenuation requirements of ANSI C63.4 and CISPR 16-1. Chamber E is located at 12 East Devonwood Ave. Romeoville, Illinois EMI test lab.

The entire frequency range from 30 to 25000 MHz was slowly scanned with particular attention paid to those frequency ranges which appeared high. Measurements were performed using two antenna polarizations, (vertical and horizontal). The worst case emissions were recorded. All measurements may be performed using either the peak, average or quasi-peak detector functions. If the peak detector data exceeds or is marginally close to the limits, the measurements are repeated using a quasi-peak detector or average function as required by the specification for final determination of compliance.

The detected emission levels were maximized by rotating the EUT, adjusting the positions of all cables, and by scanning the measurement antenna from 1 to 4 meters above the ground.

10.9.1 Radiated Emissions Field Strength Sample Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and by subtracting the Amplifier Gain from the measured reading. The basic equation is as follows:

$$FS = RA + AF + CF - AG$$

Where: FS = Field Strength

RA = Receiver Amplitude

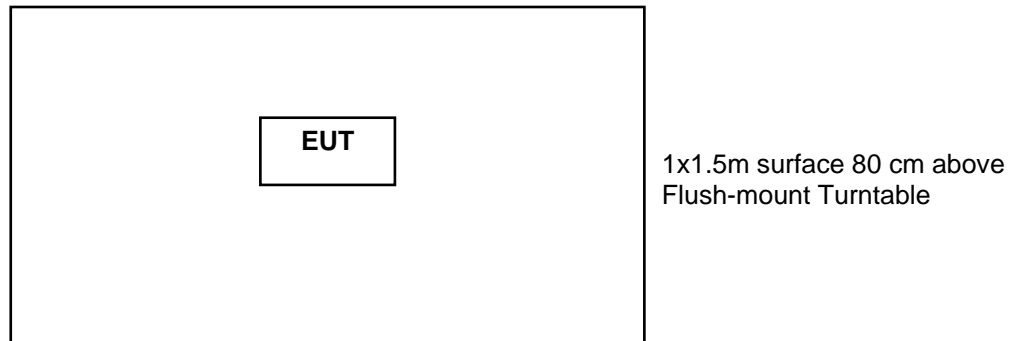
AF = Antenna Factor

CF = Cable Attenuation Factor

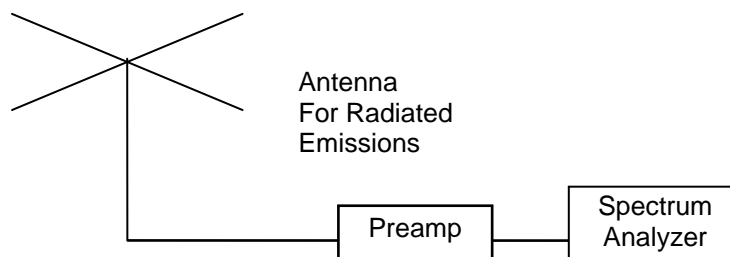
AG = Amplifier Gain

PKA = Peak to Average Factor (This is zero for non-average measurements)

The Peak to average factor is used when average measurements are required. It is calculated by the highest duty cycle in percent over any 100mS transmission. The factor in dB is $20 * \log(\text{Duty cycle}/100)$.

Figure 1. Drawing of Radiated Emissions Setup**Notes:**

- AC outlet with low-pass filter at the base of the turntable
- Antenna height varied from 1 to 4 meters
- Distance from antenna to tested system is 3 meters
- Not to Scale

**10.9.2 Radiated Emissions Test Results While Transmitting**

This section contains the results of the intentional and spurious emissions from 30 MHz to 25 GHz while transmitting. The EUT was tested stand alone and while attached to a typical golf club.

The following spectrum analyzer settings were used.

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz

VBW \geq RBW

Sweep = auto

Detector function = peak

Trace = max hold

A Video Bandwidth of 10 Hz was used for Average measurements above 1 GHz.

Testing of the NewSpin Golf, LLC, Model NS001, SwingSmart

Manufacturer	NewSpin Golf, LLC	Specification	FCC Part 15 Subpart C & RSS-210
Model	NS001	Test Date	November 23, 2011
Serial Number	R3	Test Distance	3 Meters
Abbreviations	Pol = Antenna Polarization; V = Vertical; H = Horizontal; BC = Biconical (ANT-3); LP = Log-Periodic (ANT-6); HN = Horn (ANT-13) P = peak; Q = QP		
Notes	Corr. Factors = Cable Loss – Preamp Gain This was tested in all three axis		

Spurious and non Harmonic Emissions

Freq. MHz	Analyzer Reading dBuV	Detector Function	Ant Polarity	Corr. Factors dB	Field Strength dBuV/m		Margin Under Limit dB
					EUT	Limit	
Configuration : Stand alone							
63.6	28.8	P	H/44	-18.3	10.5	40.0	29.5
205.2	28.4	P	H/44	-16.8	11.6	43.5	31.9
395.4	27.5	P	H/44	-10.5	17.0	46.0	29.0
62.8	25.0	P	V/44	-18.2	6.8	40.0	33.2
87.6	26.6	P	V/44	-19.8	6.8	40.0	33.2
178.0	31.0	P	V/44	-17.6	13.4	43.5	30.1
508.8	27.2	P	V/44	-8.0	19.2	46.0	26.8
1602.0	51.0	P	H/13	-1.6	49.4	74.0	24.6
1615.5	54.7	P	H/13	-1.6	53.1	74.0	20.9
1647.0	57.8	P	H/13	-1.4	56.4	74.0	17.6
1647.0	41.9	A	H/13	-1.4	40.5	54.0	13.5
2250.5	29.6	A	H/13	0.7	30.3	54.0	23.7
3207.0	32.2	A	H/13	4.5	36.7	54.0	17.3
3223.0	32.6	A	H/13	4.6	37.2	54.0	16.8
3231.0	32.4	A	H/13	4.7	37.1	54.0	16.9
1603.0	40.0	P	V/13	-1.6	38.4	74.0	35.6
1639.0	44.0	P	V/13	-1.5	42.5	74.0	31.5
1641.0	32.5	A	V/13	-1.5	31.0	54.0	23.0
1642.0	43.4	P	V/13	-1.5	41.9	74.0	32.1
1645.3	48.3	P	V/13	-1.5	46.8	74.0	27.2
1648.0	32.7	A	V/13	-1.4	31.3	54.0	22.7
1649.3	48.1	P	V/13	-1.4	46.7	74.0	27.3
Configuration : On club							
59.2	28.1	P	H/44	-16.9	11.2	40.0	28.8
198.0	27.9	P	H/44	-17.0	10.9	43.5	32.6
412.2	28.7	P	H/44	-9.3	19.4	46.0	26.6
55.2	29.6	P	V/44	-15.6	14.0	40.0	26.0
215.2	27.5	P	V/44	-15.5	12.0	43.5	31.5
409.8	29.3	P	V/44	-9.5	19.8	46.0	26.2
1640.9	54.5	P	H/13	-1.5	53.0	74.0	21.0
1641.0	42.7	A	H/13	-1.5	41.2	54.0	12.8
1644.0	53.7	P	H/13	-1.5	52.2	74.0	21.8
1645.6	54.3	P	H/13	-1.5	52.8	74.0	21.2
1651.0	43.4	A	H/13	-1.4	42.0	54.0	12.0
1652.0	54.8	P	H/13	-1.4	53.4	74.0	20.6
1652.7	39.7	A	H/13	-1.4	38.3	54.0	15.7
1652.8	54.4	P	H/13	-1.4	53.0	74.0	21.0

Testing of the NewSpin Golf, LLC, Model NS001, SwingSmart

Freq. MHz	Analyzer Reading dBuV	Detector Function	Ant Polarity	Corr. Factors dB	Field Strength dBuV/m		Margin Under Limit dB
					EUT	Limit	
1653.6	56.2	P	H/13	-1.4	54.8	74.0	19.2
3258.0	29.4	P	H/13	4.8	34.2	74.0	39.8
3308.0	30.3	P	H/13	4.9	35.2	74.0	38.8
1604.3	44.3	P	V/13	-1.6	42.7	74.0	31.3
1609.0	57.6	P	V/13	-1.6	56.0	74.0	18.0
1635.0	59.8	P	V/13	-1.6	58.2	74.0	15.8
1653.0	60.3	P	V/13	-1.4	58.9	74.0	15.1
1653.3	47.6	P	V/13	-1.4	46.2	74.0	27.8
1654.5	60.1	P	V/13	-1.4	58.7	74.0	15.3
3223.0	35.0	A	V/13	4.6	39.6	54.0	14.4
3253.0	34.4	A	V/13	4.8	39.2	54.0	14.8

Judgment: Passed by 12.8 dB

Testing of the NewSpin Golf, LLC, Model NS001, SwingSmart

Fundamental, Harmonic and Band edge emissions (Stand alone)

		Spectrum Analyzer Readings									EUT	Peak	Ave	Peak	Ave	Margin		
hrm	Tx	Peak				Ave	Peak				Ave	Corr.	Emission	Tot. FS		Limit		Under
#	Freq	Vertical Polarization				Horizontal Polarization				Fact.	Freq MHz	dBuV/m	dBuV/m	Limit				
		X	Y	Z	Max	X	Y	Z	Max									
1	2402	98.0	84.4	92.7	78.9	89.6	99.0	96.7	79.9	0.1	2402	99.1	80.0	125	94	14.0		
be	2402	48.7	35.1	43.4	29.6	40.3	49.7	47.4	30.6	0.1	2400	49.8	30.7	74	54	23.3		
2	2402	53.7	44.8	50.6	34.6	48.0	56.9	45.9	37.8	5.3	4804	62.2	43.1	74	54	10.9		
3	2402	38.2	35.0	36.1	19.1	35.0	36.9	35.0	17.8	8.9	7206	47.1	28.0	74	54	26.0		
4	2402	41.4	41.2	39.9	22.3	38.7	43.0	45.6	26.5	12.3	9608	57.9	38.8	74	54	15.2		
5	2402	36.2	36.6	38.4	19.3	39.4	36.4	37.3	20.3	12.0	12010	51.4	32.3	74	54	21.7		
6	2402	37.4	38.3	38.1	19.2	39.6	42.0	40.9	22.9	16.4	14412	58.4	39.3	74	54	14.7		
1	2441	95.7	85.2	88.0	76.6	87.0	95.8	90.8	76.7	0.2	2441	96.0	76.9	125	94	17.1		
2	2441	52.6	47.6	50.9	33.5	46.5	55.3	48.1	36.2	5.3	4882	60.6	41.5	74	54	12.5		
3	2441	38.1	36.2	35.3	19.0	35.0	35.0	35.0	15.9	9.5	7323	47.6	28.5	74	54	25.5		
4	2441	41.5	43.3	41.8	24.2	41.1	45.3	47.9	28.8	12.4	9764	60.3	41.2	74	54	12.8		
5	2441	38.4	38.3	41.2	22.1	41.7	39.8	37.8	22.6	11.6	12205	53.3	34.2	74	54	19.8		
6	2441	38.2	38.7	39.8	20.7	39.3	41.3	39.7	22.2	16.3	14646	57.6	38.5	74	54	15.5		
1	2480	95.1	79.9	86.5	76.0	82.4	95.5	91.5	76.4	0.4	2480	95.9	76.8	125	94	17.2		
BE	2480	50.5	35.3	41.9	31.4	37.8	50.9	46.9	31.8	0.4	2484	51.3	32.2	74	54	21.8		
2	2480	52.5	50.5	50.9	33.4	48.1	55.6	51.3	36.5	5.3	4960	60.9	41.8	74	54	12.2		
3	2480	35.0	35.0	35.0	15.9	35.0	35.0	35.0	15.9	9.9	7440	44.9	25.8	74	54	28.2		
4	2480	39.7	42.5	41.5	23.4	39.2	44.3	44.9	25.8	12.5	9920	57.4	38.3	74	54	15.7		
5	2480	37.4	37.0	36.9	18.3	40.6	39.0	39.4	21.5	11.1	12400	51.7	32.6	74	54	21.4		
6	2480	37.1	37.7	39.2	20.1	37.0	40.3	39.4	21.2	16.3	14880	56.6	37.5	74	54	16.5		
Column numbers (see below for explanations)																		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17		

Judgment: Passed by 10.9 dB

No other emissions were detected from 15 to 25 GHz.

- Column #1. hrm = Harmonic; BE = Band Edge emissions
 Column #2. Frequency of Transmitter.
 Column #3. Uncorrected readings from the spectrum analyzer with First Axis Rotation.
 Column #4. Uncorrected readings from the spectrum analyzer with Second Axis Rotation.
 Column #5. Uncorrected readings from the spectrum analyzer with Third Axis Rotation.
 Column #6. Average Reading based on peak reading reduced by the Duty cycle correction
 Column #7. Uncorrected readings from the spectrum analyzer with First Axis Rotation.
 Column #8. Uncorrected readings from the spectrum analyzer with Second Axis Rotation.
 Column #9. Uncorrected readings from the spectrum analyzer with Third Axis Rotation.
 Column #10. Average Reading based on peak reading reduced by the Duty cycle correction
 Column #11. Corr. Factors = Cable Loss – Preamp Gain + Antenna Factor
 Column #12. Frequency of Tested Emission
 Column #13. Highest peak field strength at listed frequency.
 Column #14. Highest Average field strength at listed frequency.
 Column #15. Peak Limit.
 Column #16. Average Limit.
 Column #17. The margin (last column) is the worst case margin under the peak or average limits for that row.

Testing of the NewSpin Golf, LLC, Model NS001, SwingSmart

Fundamental, Harmonic and Band edge emissions (On Club)

		Spectrum Analyzer Readings									EUT	Peak	Ave	Peak	Ave	Margin		
hrm	Tx	Peak				Ave	Peak				Ave	Corr.	Emission	Tot. FS		Limit		Under
#	Freq	Vertical Polarization				Horizontal Polarization				Fact.	Freq MHz	dBuV/m	dBuV/m	Limit				
		X	Y	Z	Max	X	Y	Z	Max									
1	2402	91.9	95.1	93.2	76.0	88.7	89.4	84.1	70.3	0.1	2402	95.2	76.1	125	94	17.9		
be	2402	42.6	45.8	43.9	26.7	39.4	40.1	34.8	21.0	0.1	2400	45.9	26.8	74	54	27.2		
2	2402	57.7	58.1	51.1	39.0	52.8	54.7	53.9	35.6	5.3	4804	63.4	44.3	74	54	9.7		
3	2402	38.0	35.4	35.8	18.9	36.1	35.0	35.2	17.0	8.9	7206	46.9	27.8	74	54	26.2		
4	2402	43.6	42.1	41.2	24.5	44.2	42.5	44.6	25.5	12.3	9608	56.9	37.8	74	54	16.2		
5	2402	36.4	36.3	0.0	17.3	36.8	36.6	37.2	18.1	12.0	12010	49.2	30.1	74	54	23.9		
6	2402	37.4	38.5	0.0	19.4	35.8	41.4	43.3	24.2	16.4	14412	59.7	40.6	74	54	13.4		
1	2441	88.2	94.5	92.6	75.4	88.7	90.0	88.1	70.9	0.2	2441	94.7	75.6	125	94	18.4		
2	2441	49.8	50.1	56.1	37.0	54.6	51.8	52.6	35.5	5.3	4882	61.4	42.3	74	54	11.7		
3	2441	36.2	35.0	36.2	17.1	36.1	35.0	35.2	17.0	9.5	7323	45.7	26.6	74	54	27.4		
4	2441	41.3	43.6	46.1	27.0	41.6	43.5	41.6	24.4	12.4	9764	58.5	39.4	74	54	14.6		
5	2441	38.0	36.6	39.3	20.2	38.3	39.0	37.8	19.9	11.6	12205	50.9	31.8	74	54	22.2		
6	2441	37.6	37.6	37.9	18.8	39.4	38.4	38.0	20.3	16.3	14646	55.7	36.6	74	54	17.4		
1	2480	87.3	90.2	88.3	71.1	87.3	91.1	90.0	72.0	0.4	2480	91.5	72.4	125	94	21.6		
BE	2480	42.7	45.6	43.7	26.5	42.7	46.5	45.4	27.4	0.4	2484	46.9	27.8	74	54	26.2		
2	2480	51.7	52.8	54.2	35.1	49.6	52.4	53.2	34.1	5.3	4960	59.5	40.4	74	54	13.6		
3	2480	36.2	35.0	36.2	17.1	35.2	35.0	36.1	17.0	9.9	7440	46.1	27.0	74	54	27.0		
4	2480	39.7	39.3	35.9	20.6	42.7	42.0	41.8	23.6	12.5	9920	55.2	36.1	74	54	17.9		
5	2480	36.0	35.2	36.3	17.2	36.9	36.5	36.9	17.8	11.1	12400	48.0	28.9	74	54	25.1		
6	2480	34.0	37.0	37.2	18.1	37.6	37.3	38.0	18.9	16.3	14880	54.3	35.2	74	54	18.8		
Column numbers (see below for explanations)																		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17		

Judgment: Passed by 9.7 dB

No other emissions were detected from 15 to 25 GHz.

- Column #1. hrm = Harmonic; BE = Band Edge emissions
 Column #2. Frequency of Transmitter.
 Column #3. Uncorrected readings from the spectrum analyzer with First Axis Rotation.
 Column #4. Uncorrected readings from the spectrum analyzer with Second Axis Rotation.
 Column #5. Uncorrected readings from the spectrum analyzer with Third Axis Rotation.
 Column #6. Average Reading based on peak reading reduced by the Duty cycle correction
 Column #7. Uncorrected readings from the spectrum analyzer with First Axis Rotation.
 Column #8. Uncorrected readings from the spectrum analyzer with Second Axis Rotation.
 Column #9. Uncorrected readings from the spectrum analyzer with Third Axis Rotation.
 Column #10. Average Reading based on peak reading reduced by the Duty cycle correction
 Column #11. Corr. Factors = Cable Loss – Preamp Gain + Antenna Factor
 Column #12. Frequency of Tested Emission
 Column #13. Highest peak field strength at listed frequency.
 Column #14. Highest Average field strength at listed frequency.
 Column #15. Peak Limit.
 Column #16. Average Limit.
 Column #17. The margin (last column) is the worst case margin under the peak or average limits for that row.

Testing of the NewSpin Golf, LLC, Model NS001, SwingSmart

10.10 Unintentional Radiated Emissions (Receive Mode)

Manufacturer	NewSpin Golf, LLC	Specification	FCC Part 15.247 & RSS-210
Model	NS001	Test Date	11/23/2011
Serial Number	R3	Test Distance	3 Meters
Abbreviations	Pol = Antenna Polarization; V = Vertical; H = Horizontal; P = peak; Q = QP		
Notes	Corr. Factors = Cable Loss – Preamp Gain		
Configuration	Receive mode; This was tested in all three axis		

Freq. MHz	Analyzer Reading dBuV	Detector Function	Ant Polarity	Corr. Factors dB	Field Strength dBuV/m		Margin Under Limit dB
					EUT	Limit	
Notes : Stand Alone							
51.2	27.7	P	H/44	-14.5	13.2	40.0	26.8
219.6	27.9	P	H/44	-15.0	12.9	46.0	33.1
411.0	28.7	P	H/44	-9.4	19.3	46.0	26.7
38.8	29.8	P	V/44	-12.6	17.2	40.0	22.8
210.0	29.1	P	V/44	-16.1	13.0	43.5	30.5
361.4	26.7	P	V/44	-11.2	15.5	46.0	30.5
1600.7	47.3	P	H/13	-0.3	47.0	74.0	27.0
1603.9	50.6	P	H/13	-0.2	50.4	74.0	23.6
1620.0	51.9	P	H/13	-0.2	51.7	74.0	22.3
1638.6	55.8	P	H/13	0.0	55.8	74.0	18.2
1601.8	55.5	P	V/13	-0.2	55.3	74.0	18.7
1621.1	56.1	P	V/13	-0.2	55.9	74.0	18.1
1637.9	56.6	P	V/13	-0.1	56.5	74.0	17.5
1638.6	40.2	A	H/13	0.0	40.2	54.0	13.8
1601.8	39.6	A	V/13	-0.2	39.4	54.0	14.6
1621.1	40.4	A	V/13	-0.2	40.2	54.0	13.8
1637.9	41.3	A	V/13	-0.1	41.2	54.0	12.8
Notes : On club							
41.2	28.1	P	V/44	-12.8	15.3	40.0	24.7
191.2	27.6	P	V/44	-17.1	10.5	43.5	33.0
387.8	28.2	P	V/44	-10.9	17.3	46.0	28.7
1601.7	55.3	P	V/13	-0.2	55.1	74.0	18.9
1601.7	40.4	A	V/13	-0.2	40.2	54.0	13.8
1616.4	42.4	A	V/13	-0.2	42.2	54.0	11.8
1621.2	56.0	P	V/13	-0.2	55.8	74.0	18.2
1636.5	60.5	P	V/13	-0.1	60.4	74.0	13.6
1637.9	43.6	A	V/13	-0.1	43.5	54.0	10.5
60.0	28.5	P	H/44	-17.1	11.4	40.0	28.6
213.2	28.4	P	H/44	-15.7	12.7	43.5	30.8
374.2	28.0	P	H/44	-11.2	16.8	46.0	29.2
1600.5	51.5	P	H/13	-0.3	51.2	74.0	22.8
1601.6	52.9	P	H/13	-0.2	52.7	74.0	21.3
1601.7	39.8	A	H/13	-0.2	39.6	54.0	14.4
1616.4	53.3	P	H/13	-0.2	53.1	74.0	20.9
1619.7	42.6	A	H/13	-0.2	42.4	54.0	11.6
1623.2	51.1	P	H/13	-0.2	50.9	74.0	23.1
1636.6	56.1	P	H/13	-0.1	56.0	74.0	18.0

Testing of the NewSpin Golf, LLC, Model NS001, SwingSmart

Freq. MHz	Analyzer Reading dBuV	Detector Function	Ant Polarity	Corr. Factors dB	Field Strength dBuV/m		Margin Under Limit dB
					EUT	Limit	
1637.3	40.4	A	H/13	-0.1	40.3	54.0	13.7
1637.8	55.2	P	H/13	-0.1	55.1	74.0	18.9
1639.1	54.1	P	H/13	0.0	54.1	74.0	19.9
1929.4	47.1	P	H/13	1.8	48.9	74.0	25.1

Judgment: Pass by 10.5 dB