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DATE: 3 March 2014

I.T.L. (PRODUCT TESTING) LTD.

FCC Radio Test Report

for

Argo Medical Technologies Ltd.

Equipment under test:

ReWalk P Communicator

30-30-0006

Written by: _____
R. Pinchuck, Documentation

Approved by: _____
A. Sharabi, Test Engineer

Approved by: _____
I. Raz, EMC Laboratory Manager

Measurement/Technical Report for
Argo Medical Technologies Ltd.

Equipment under test:

ReWalk P Communicator

30-30-0006

FCC ID: 2ABWK-30-30-0006

This report concerns:	Original Grant: x Class I change: Class II change:
Equipment type:	Digital Transmission System
Limits used:	47CFR15 Section 15.249 (a-b)

Measurement procedure used is KDB 558074 D01, April 1, 2013 and ANSI C63.4-2003.

Application for Certification prepared by:

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Applicant for this device: (different from "prepared by")

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1. General Information

1.1 Administrative Information

Manufacturer:	Argo Medical Technologies Ltd.
Manufacturer's Address:	6th Floor, Kochav Yokneam Building, P.O.B. 161 Yokneam Ilit, 206292 Israel Tel: +972-4-959-0123 Fax: +972-4-959-0125
Manufacturer's Representative:	Shany Zohar
Equipment Under Test (E.U.T):	ReWalk P Communicator
Equipment Model No.:	30-30-0006
Equipment Serial No.:	Not Designated
Date of Receipt of E.U.T:	02.02.14
Start of Test:	02.02.14
End of Test:	04.02.14
Test Laboratory Location:	I.T.L (Product Testing) Ltd. Kfar Bin Nun, ISRAEL 99780
Test Specifications:	FCC Part 15, Subpart C, Section 15.249

1.2 List of Accreditations

The EMC laboratory of I.T.L. is accredited by the following bodies:

1. The American Association for Laboratory Accreditation (A2LA) (U.S.A.), Certificate No. 1152.01.
2. The Federal Communications Commission (FCC) (U.S.A.), Registration No. 90715.
3. The Israel Ministry of the Environment (Israel), Registration No. 1104/01.
4. The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) (Japan), Registration Numbers: C-1350, R-1285.
5. Industry Canada (Canada), IC File No.: 46405-4025; Site No. IC 4025B-1.

I.T.L. Product Testing Ltd. is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this test report have been determined in accordance with I.T.L.'s terms of accreditation unless stated otherwise in the report.

1.3 Product Description

The Rewalk is a battery Powered Orthotic Ambulation Device orthotically fits to the lower limbs and part of the upper body and is intended to enable individuals with lower limb disabilities to perform routine ambulatory functions in an urban terrain (stand, walk on level surfaces and mild slopes) to increase their activity level. The device is not intended for sports or aggressive use.

There are two RF transmitters in the Rewalk system, one is a remote device worn on the wrist of the user. The second resides within the main computer. The RF communication provides information regarding the selection of the operation, warnings and power levels of the batteries.

1.4 Test Methodology

Both conducted and radiated testing were performed according to the procedures in KDB 558074 D01, April 9, 2013 and in ANSI C63.4: 2003. Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.5 Test Facility

The radiated emissions tests were performed at I.T.L.'s testing facility at Kfar Bin-Nun, Israel. This site is a FCC listed test laboratory (FCC Registration No. 90715, date of listing November 21, 2012).
I.T.L.'s EMC Laboratory is also accredited by A2LA, certificate No. 1152.01.

1.6 Measurement Uncertainty

Conducted Emission

Conducted Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4) 0.15 – 30 MHz:

Expanded Uncertainty (95% Confidence, K=2):

± 3.44 dB

Radiated Emission

Radiated Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4) for open site 30-1000MHz:

Expanded Uncertainty (95% Confidence, K=2):

± 4.96 dB

2. System Test Configuration

2.1 Justification

The EUT tested by switching to several test modes. In each test mode the onboard transceiver continuously transmitted pseudo random data at selected carrier frequencies (using the same TX parameters as the operational system like power and modulation).

2.2 EUT Exercise Software

No special exercise software was used to achieve compliance.

2.3 Special Accessories

No special accessories were used to achieve compliance.

2.4 Equipment Modifications

No special modifications were needed to achieve compliance.

2.5 Configuration of Tested System

The configuration of the tested system is described below.

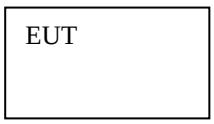


Figure 1. Configuration of Tested System

3. Conducted and Radiated Measurement Test Set-up Photos

Figure 2. Conducted Emission Test

Figure 3. Radiated Emission Test

Figure 4. Radiated Emission Test

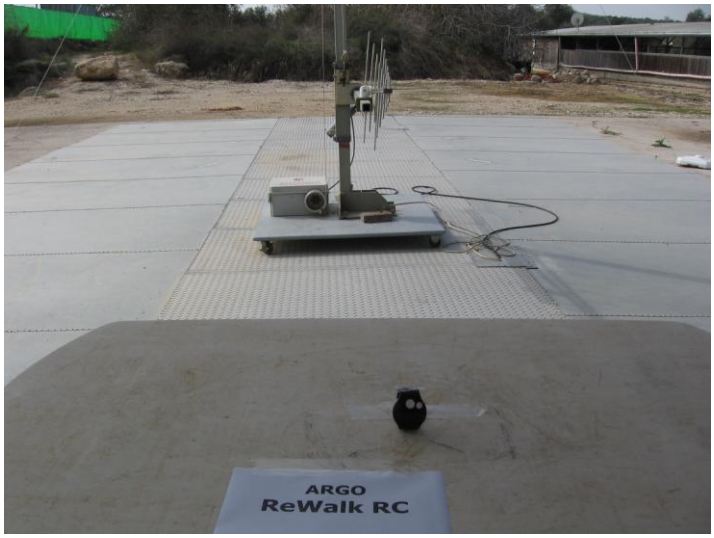


Figure 5. Radiated Emission Test

Figure 6. Radiated Emission Test

4. Conducted Emission

4.1 Test Specification

F.C.C., Part 15, Subpart C

4.2 Test Procedure

The E.U.T operation mode and test set-up are as described in Section 3.1. In order to minimize background noise interference, the conducted emission testing was performed inside a shielded room, with the E.U.T placed on an 0.8 meter high wooden table, 0.4 meter from the room's vertical wall.

The E.U.T was powered from 115 V AC / 60 Hz via a 50 Ohm / 50 µHn Line Impedance Stabilization Network (LISN) on the phase and neutral lines. The LISN's were grounded to the shielded room ground plane (floor), and were kept at least 0.8 meters from the nearest boundary of the E.U.T

The center of the E.U.T AC cable was folded back and forth, in order to form a bundle less than 0.40 meters and a total cable length of 1 meter.

The emission voltages at the LISN's outputs were measured using a computerized receiver, complying with CISPR 16 requirements. The specification limits are loaded to the receiver via a 3.5" floppy disk and are displayed on the receiver's spectrum display.

A frequency scan between 0.15 and 30 MHz was performed at 9 kHz I.F. band width, and using peak detection.

The spectral components having the highest level on each line were measured using a quasi-peak and average detector.

4.3 Measured Data

JUDGEMENT: Passed by 27.5 dB

The margin between the emission levels and the specification limit is, in the worst case, 29.9 dB for the phase line at 3.46 MHz and 27.5 dB at 3.46 MHz for the neutral line.

The EUT met the F.C.C. Part 15, Subpart C specification requirements.

The details of the highest emissions are given in *Figure 7* to *Figure 10.*

TEST PERSONNEL:

Tester Signature: _____ Date: 10.04.14

Typed/Printed Name: A. Sharabi

Conducted Emission

E.U.T Description	ReWalk P Communicator
Type	30-30-0006
Serial Number:	Not Designated

Specification:	F.C.C., Part 15, Subpart C
Lead:	Phase
Detectors:	Peak, Quasi-peak, Average

Signal Number	Frequency (MHz)	Peak (dBuV)	QP (dBuV)	QP Delta L 1 (dB)	Avg (dBuV)	Av Delta L 2 (dB)	Corr (dB)
1	0.202790	38.2	33.3	-30.2	13.4	-40.1	0.0
2	0.287204	31.7	27.1	-33.5	10.3	-40.4	0.0
3	0.835881	31.0	20.8	-35.2	10.9	-35.1	0.0
4	2.189547	26.1	22.5	-33.5	16.1	-29.9	0.0
5	3.463880	27.2	22.7	-33.3	16.1	-29.9	0.0
6	8.188498	21.4	16.6	-43.4	7.9	-42.1	0.0

Figure 7. Detectors: Peak, Quasi-peak, AVERAGE

Note: QP Delta/Av Delta refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Conducted Emission

E.U.T Description	ReWalk P Communicator
Type	30-30-0006
Serial Number:	Not Designated

Specification:	F.C.C., Part 15, Subpart C
Lead:	Phase
Detectors:	Peak, Quasi-peak, Average

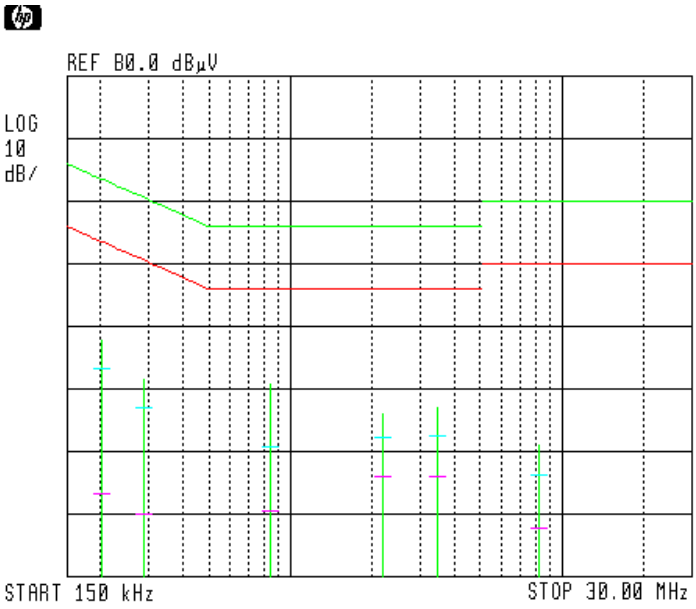


Figure 8. Detectors: Peak, Quasi-peak, Average

Conducted Emission

E.U.T Description	ReWalk P Communicator
Type	30-30-0006
Serial Number:	Not Designated

Specification:	F.C.C., Part 15, Subpart C
Lead:	Neutral
Detectors:	Peak, Quasi-peak, Average

Signal Number	Frequency (MHz)	Peak (dBuV)	QP (dBuV)	QP Delta L 1 (dB)	Avg (dBuV)	Av Delta L 2 (dB)	Corr (dB)
1	0.202789	38.9	31.9	-31.6	20.2	-33.4	0.0
2	0.287207	28.1	24.4	-36.3	12.1	-38.6	0.0
3	0.835878	23.1	18.8	-37.2	10.8	-35.2	0.0
4	2.189546	28.7	22.2	-33.8	17.8	-28.2	0.0
5	3.463880	28.3	23.0	-33.0	18.5	-27.5	0.0
6	8.188498	22.3	15.4	-44.6	9.4	-40.6	0.0

Figure 9. Detectors: Peak, Quasi-peak, AVERAGE

Note: QP Delta/Av Delta refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Conducted Emission

E.U.T Description	ReWalk P Communicator
Type	30-30-0006
Serial Number:	Not Designated

Specification:	F.C.C., Part 15, Subpart C
Lead:	Neutral
Detectors:	Peak, Quasi-peak, Average

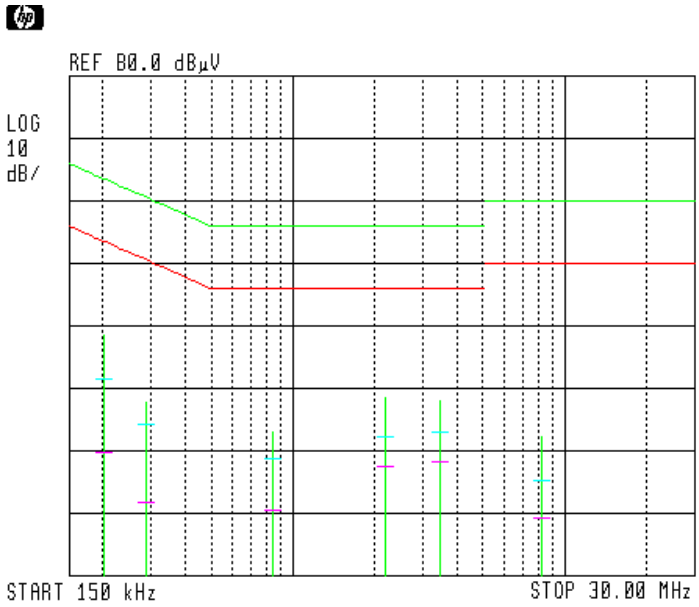


Figure 10 Conducted Emission: NEUTRAL
Detectors: Peak, Quasi-peak, Average

4.4 Test Instrumentation Used, Conducted Measurement

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
LISN	Fischer	FCC-LISN-2A	127	January 1, 2014	1 Year
EMI Receiver	HP	85422E	3906A00276	February 26, 2013	1Year
RF Filter Section	HP	85420E	3705A00248	February 26, 2013	1Year
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A

5. Field Strength of Fundamental

5.1 Test Specification

F.C.C., Part 15, Subpart C, Section 15.249(a)

5.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 3. The E.U.T. was placed on a non-conductive table, 0.8 meters above the O.A.T.S. ground plane.

The EMI receiver was set to the E.U.T. Fundamental Frequency (low, mid and high) and Peak Detection. The turntable and antenna mast were adjusted for maximum level reading on the EMI receiver. The measurement was performed for vertical and horizontal polarizations of the test antenna.

5.3 Measured Data

JUDGEMENT: Passed by 31.6 dB

The EUT met the FCC Part 15, Subpart C, Section 15.249(a) specification requirements.

The details of the highest emissions are given in *Figure 11*.

TEST PERSONNEL:

Tester Signature: _____ Date: 10.04.14

Typed/Printed Name: A. Sharabi

Field Strength of Fundamental

E.U.T Description	ReWalk P Communicator
Model Number	30-30-0006
Serial Number:	Not Designated

Specification: F.C.C., Part 15, Subpart C 15.249(a)

Antenna Polarization: Horizontal/Vertical

Test Distance: 3 meters Detector: Peak

Freq.	Pol.	Peak Reading	Specification	Avg. Factor	Avg. Result	Specification	Margin
(MHz)	V/H	(dBµV/m)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
2405.0	H	84.27	114.0	-22.0	62.27	94.0	-31.73
2405.0	V	79.61	114.0	-22.0	57.61	94.0	-36.39
2427.0	H	84.40	114.0	-22.0	62.4	94.0	-31.6
2427.0	V	79.53	114.0	-22.0	57.53	94.0	-36.47
2475.0	H	84.13	114.0	-22.0	62.13	94.0	-31.87
2475.0	V	75.20	114.0	-22.0	53.2	94.0	-40.80

Figure 11. Field Strength of Fundamental. Antenna Polarization: HORIZONTAL/VERTICAL. Detector: Peak

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

* "Peak Amp." includes "Correction Factors.

"Correction Factors" = Antenna Correction Factor + Cable Loss.

Field Strength of Fundamental

E.U.T Description	ReWalk P Communicator
Model Number	30-30-0006
Serial Number:	Not Designated

Specification: F.C.C., Part 15, Subpart C 15.249(a)

Antenna Polarization: Horizontal/Vertical

Test Distance: 3 meters Detector: Peak

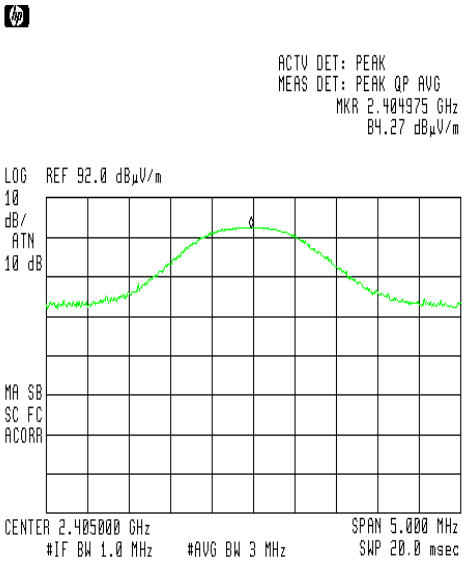


Figure 12. Field Strength of Fundamental. Antenna Polarization: HORIZONTAL Channel: Low

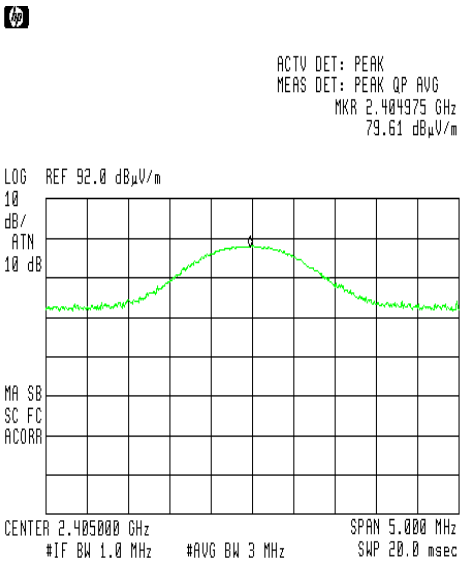


Figure 13. Field Strength of Fundamental. Antenna Polarization: VERTICAL Channel: Low

Field Strength of Fundamental

E.U.T Description	ReWalk P Communicator
Model Number	30-30-0006
Serial Number:	Not Designated

Specification: F.C.C., Part 15, Subpart C 15.249(a)

Antenna Polarization: Horizontal/Vertical
Test Distance: 3 meters Detector: Peak

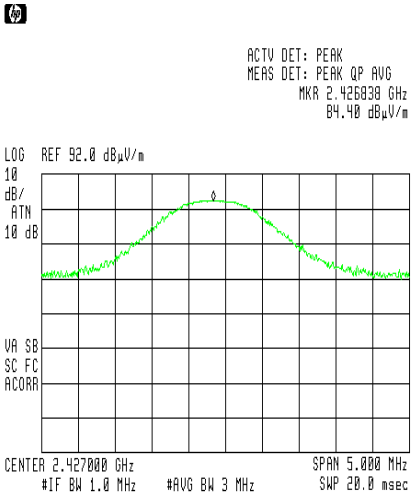


Figure 14. Field Strength of Fundamental. Antenna Polarization: HORIZONTAL Channel: Mid

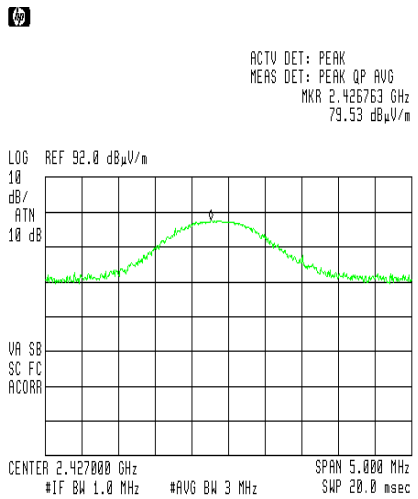


Figure 15. Field Strength of Fundamental. Antenna Polarization: VERTICAL Channel: Mid

Field Strength of Fundamental

E.U.T Description	ReWalk P Communicator
Model Number	30-30-0006
Serial Number:	Not Designated

Specification: F.C.C., Part 15, Subpart C 15.249(a)

Antenna Polarization: Horizontal/Vertical

Test Distance: 3 meters Detector: Peak

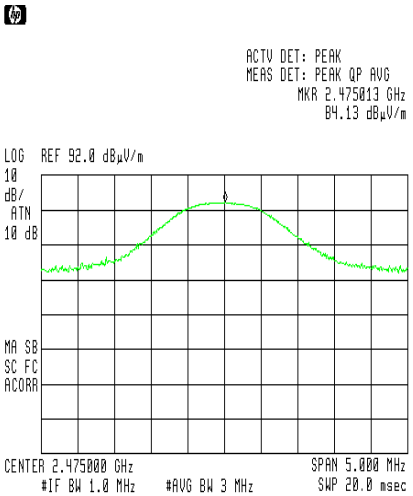


Figure 16. Field Strength of Fundamental. Antenna Polarization: HORIZONTAL Channel: High

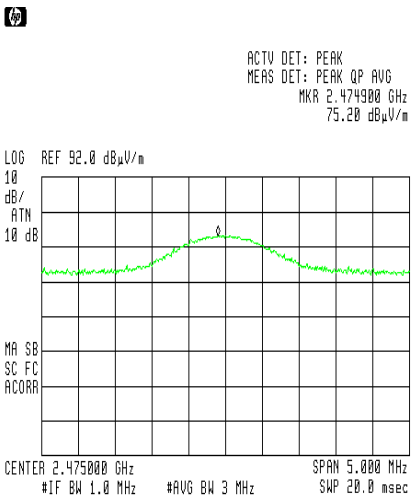


Figure 17. Field Strength of Fundamental. Antenna Polarization: VERTICAL Channel: High

5.4 Test Instrumentation Used, Field Strength of Fundamental

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	February 26, 2013	1 year
RF Section	HP	85420E	3705A00248	February 26, 2013	1 year
Horn Antenna	ETS	3115	29845	March 14, 2012	2 Years
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A

6. Radiated Emission, 9 kHz – 30 MHz

6.1 Test Specification

9 kHz-30 MHz, FCC, Part 15, Subpart C, Section 209

6.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 3.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in Figure 3.1.

The frequency range 9 kHz-30 MHz was scanned.

The emissions were measured using a computerized EMI receiver complying with CISPR 16 requirements. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

In the frequency range 9 kHz-30MHz, the loop antenna was rotated on its vertical axis. The antenna height (center of loop) was 1 meter at a distance of 3 meters.

The E.U.T. was operated at the frequency of 2.4 GHz. This frequency was measured using a peak detector.

6.3 Measured Data

JUDGEMENT: Passed

The EUT met the requirements of the F.C.C. Part 15, Subpart C, Section 209 specification.

TEST PERSONNEL:

Tester Signature: _____ Date: 10.04.14

Typed/Printed Name: A. Sharabi

6.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	February 26, 2013	1 year
RF Section	HP	85420E	3705A00248	February 26, 2013	1 year
Active Loop Antenna	EMCO	6502	9506-2950	November 3, 2013	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A

6.5 Field Strength Calculation

The field strength is calculated directly by the EMI Receiver software, and a "Correction Factors" data disk, using the following equation:

$$FS = RA + AF + CF$$

FS:	Field Strength [dBµv/m]
RA:	Receiver Amplitude [dBµv]
AF:	Receiving Antenna Correction Factor [dB/m]
CF:	Cable Attenuation Factor [dB]

Example: FS = 30.7 dBµV (RA) + 14.0 dB (AF) + 0.9 dB (CF) = 45.6 dBµV

No external pre-amplifiers are used.

7. Spurious Radiated Emission 30 MHz - 25 GHz

7.1 Test Specification

F.C.C., Part 15, Subpart C, Section 15.249(b)

The E.U.T. operation mode and test set-up are as described in Section 3.

See Section 3.1 Justification of the System Test Configuration concerning the E.U.T. orientation for this test.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in *Figure 1*.

The frequency range 30 MHz-1000 MHz was scanned and the list of the highest emissions was verified and updated accordingly.

The levels of the emissions within the frequency ranges of the restricted bands (Section 15.205 of FCC Part 15) were compared to the limits of the table in Section 15.209 (a), General Requirements.

In the frequency range 30 MHz – 2.9 GHz, the emissions were measured using a computerized EMI receiver complying with CISPR 16 requirements. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

In the frequency range 2.9 - 25 GHz, a spectrum analyzer including a low noise amplifier was used. During average measurements, the IF bandwidth was 1 MHz and the video bandwidth was 100Hz. During peak measurements, the IF bandwidth was 1 MHz and the video bandwidth was 3 MHz.
The test distance was 3 meters.
The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.
Verification of the E.U.T emissions was based on the following methods: turning the E.U.T on and off; using a frequency span less than 10 MHz; observation of the signal level during turntable rotation. (Background noise is not affected by the rotation of the E.U.T.)

7.2 Measured Data

JUDGEMENT: Passed

The margin between the emission level and the specification limit was 6.5 dB in the worst case at the frequency of 4810.0 MHz, horizontal polarization.

The EUT met the requirements of the F.C.C. Part 15, Subpart C, Section 15.249 specification.

TEST PERSONNEL:

Tester Signature: _____ Date: 10.04.14

Typed/Printed Name: A. Sharabi

Radiated Emission Above 1 GHz

E.U.T Description	ReWalk P Communicator
Type	30-30-0006
Serial Number:	Not Designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical
Frequency range: 1.0 GHz to 25.0 GHz
Test Distance: 3 meters
Detector: Peak
Operation Frequency: Low/Mid/High

Freq.	Polarity	Peak Amp	Peak. Specification	Peak. Margin
(MHz)	(H/V)	(dBµV/m)	(dB µV/m)	(dB)
2390.0	H	40.0*	74.0	-34.0
2390.0	V	40.1*	74.0	-33.9
4810.0	H	67.5*	74.0	-6.5
4810.0	V	67.4*	74.0	-6.6
4854.0	H	66.5*	74.0	-7.5
4854.0	V	66.3*	74.0	-7.7
2483.5	H	39.9*	74.0	-34.1
2483.5	V	39.8*	74.0	-34.2
4950.0	H	65.5*	74.0	-8.5
4950.0	V	63.2*	74.0	-10.8

Figure 18. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL. Detector: Peak

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

"Peak Amp" includes correction factor.

* "Correction Factor" = Antenna Factor + Cable Loss- Low Noise Amplifier Gain

Radiated Emission Above 1 GHz

E.U.T Description	ReWalk P Communicator
Type	30-30-0006
Serial Number:	Not Designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical
Frequency range: 1.0 GHz to 25.0 GHz
Test Distance: 3 meters
Detector: Average
Operation Frequency: Low/Mid/High

Freq.	Polarity	Avg Factor	Average Amp	Average Specification	Peak. Margin
(MHz)	(H/V)	(dB)	(dBµV/m)	(dB µV/m)	(dB)
2390.0	H	-22.5	17.5*	54.0	-36.5
2390.0	V	-22.5	17.6*	54.0	-36.4
4810.0	H	-22.5	45.0*	54.0	-9.0
4810.0	V	-22.5	44.9*	54.0	-9.1
4854.0	H	-22.5	44.0*	54.0	-10.0
4854.0	V	-22.5	43.8*	54.0	-10.2
2483.5	H	-22.5	17.4*	54.0	-36.6
2483.5	V	-22.5	17.3*	54.0	-36.7
4950.0	H	-22.5	43.0*	54.0	-11.0
4950.0	V	-22.5	40.7*	54.0	-13.3

Figure 19. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL. Detector: Average

Notes:

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

"Average Amp" includes correction factor.

* Correction Factor = Antenna Factor + Cable Loss- Low Noise Amplifier Gain

**Avg Factor calculation:

1. Pulse period = 1 (worst scenario)*
2. Pulse duration = 1 (worst scenario)*
3. Burst duration = 2.5msec
4. Time between bursts = 32.3msec
5. $$\text{Average Factor} = 20\log\left[\frac{\text{Pulse duration}}{\text{Pulse period}} \times \frac{\text{burst duration}}{100\text{msec}} \times \text{Num of burst within } 100\text{msec}\right]$$

$$\text{Average Factor} = 20\log\left[\frac{7.5}{100}\right] = -22.5dB$$

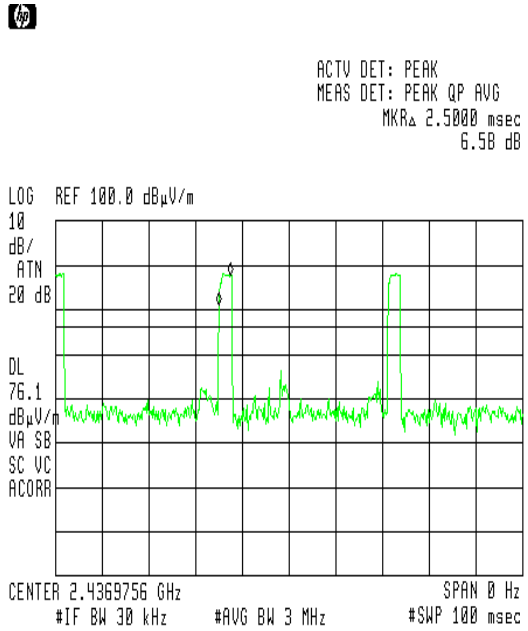


Figure 20. Transmission Burst Duration = 2.5 msec

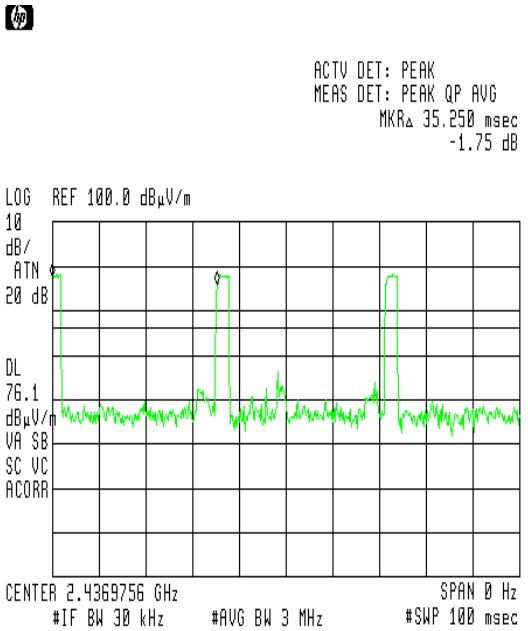


Figure 21. Time between Transmissions 32.3 msec

7.3 Test Instrumentation Used

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
EMI Receiver	HP	85422E	3906A00276	February 26, 2013	1Year
RF Filter Section	HP	85420E	3705A00248	February 26, 2013	1 Year
Antenna Biconical	EMCO	3104	2606	August 30, 2013	1Year
Antenna Log Periodic	ARA	LPD-2010/A	1038	April 2, 2013	1 Year
Horn Antenna	ARA	SWH-28	1007	March 30, 2014	2 Years
Double Ridged Waveguide Horn Antenna	EMCO	3115	29845	March 14, 2012	2 Years
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	August 21, 2013	1 Year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	August 28, 2013	1 Year
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2013	1 Year
Spectrum Analyzer	HP	8546E	3442A00275	February 28, 2013	1 Year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A

7.4 Field Strength Calculation

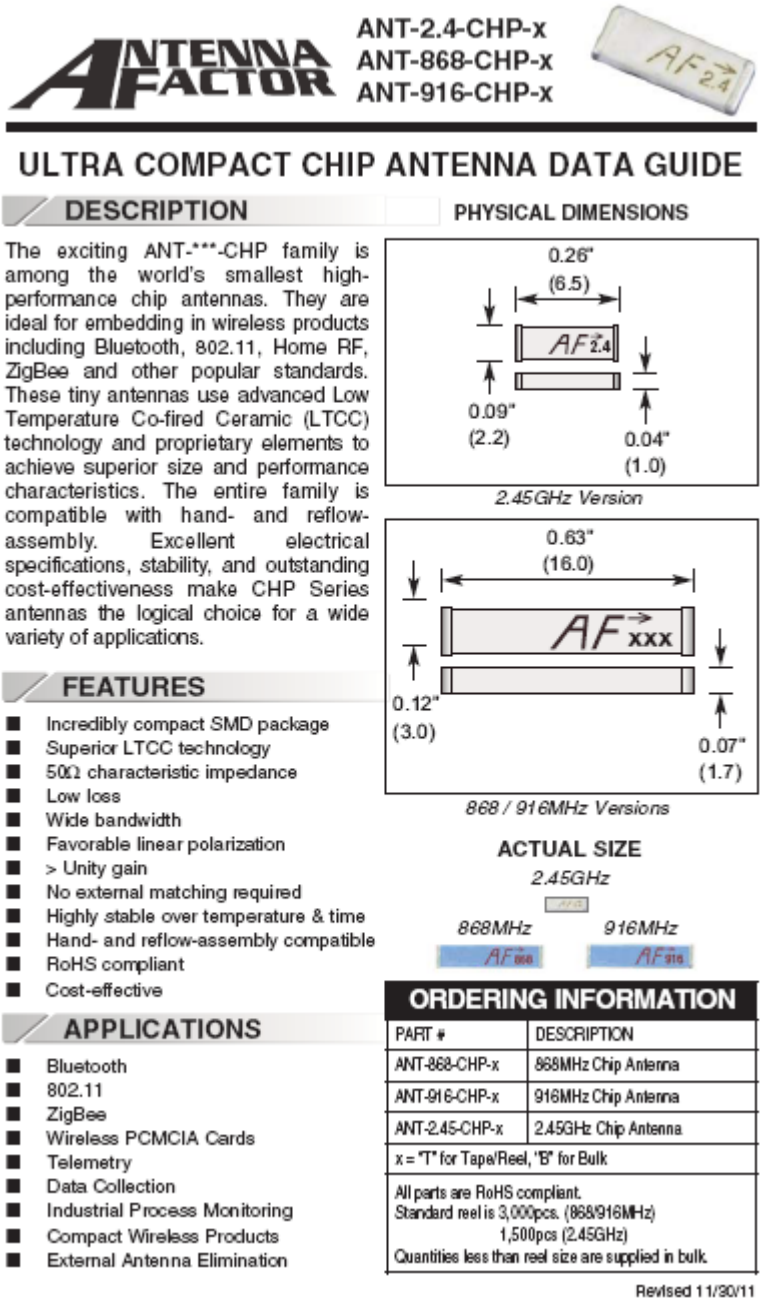
The field strength is calculated directly by the EMI Receiver software, and a "Correction Factors" data disk, using the following equation:

$$[dB\mu v/m]\ FS = RA + AF + CF$$

FS: Field Strength [dBμv/m]
RA: Receiver Amplitude [dBμv]
AF: Receiving Antenna Correction Factor [dB/m]
CF: Cable Attenuation Factor [dB]

8. Antenna Gain/Information

The antenna gain is 0.5 dBi



ANTENNA FACTOR

ANT-2.4-CHP-x
ANT-868-CHP-x
ANT-916-CHP-x

ULTRA COMPACT CHIP ANTENNA DATA GUIDE

DESCRIPTION

The exciting ANT-***-CHP family is among the world's smallest high-performance chip antennas. They are ideal for embedding in wireless products including Bluetooth, 802.11, Home RF, ZigBee and other popular standards. These tiny antennas use advanced Low Temperature Co-fired Ceramic (LTCC) technology and proprietary elements to achieve superior size and performance characteristics. The entire family is compatible with hand- and reflow-assembly. Excellent electrical specifications, stability, and outstanding cost-effectiveness make CHP Series antennas the logical choice for a wide variety of applications.

FEATURES

- Incredibly compact SMD package
- Superior LTCC technology
- 50Ω characteristic impedance
- Low loss
- Wide bandwidth
- Favorable linear polarization
- > Unity gain
- No external matching required
- Highly stable over temperature & time
- Hand- and reflow-assembly compatible
- RoHS compliant
- Cost-effective

APPLICATIONS

- Bluetooth
- 802.11
- ZigBee
- Wireless PCMCIA Cards
- Telemetry
- Data Collection
- Industrial Process Monitoring
- Compact Wireless Products
- External Antenna Elimination

PHYSICAL DIMENSIONS

2.45GHz Version

868 / 916MHz Versions

ACTUAL SIZE

2.45GHz

868MHz *916MHz*

ORDERING INFORMATION

PART #	DESCRIPTION
ANT-868-CHP-x	868MHz Chip Antenna
ANT-916-CHP-x	916MHz Chip Antenna
ANT-2.45-CHP-x	2.45GHz Chip Antenna
x = "T" for Tape/Reel, "B" for Bulk	

All parts are RoHS compliant.
Standard reel is 3,000pcs. (868/916MHz)
1,500pcs (2.45GHz)
Quantities less than reel size are supplied in bulk.

Revised 11/30/11

9. R.F Exposure/Safety

Typical use of the E.U.T. is in a ReWalk P Communicator.
The typical distance between the E.U.T. and the user in the worst case application, is 1 cm.

Calculation of Maximum Permissible Exposure (MPE)
Based on Section 1.1310 Requirements

(a) FCC limits at 2437 MHz is: $1\frac{mW}{cm^2}$

Using table 1 of Section 1.1310 limit for general population/uncontrolled exposures, the above level is an average over 30 minutes.

(b) The power density produced by the E.U.T. is

$$S = \frac{P_t G_t}{4\pi R^2}$$

P_t- Transmitted Power 84.4 dBuV/m (Peak) = 0.083 mW

G_T- Antenna Gain, 0.5dBi = 1.12 numeric

R- Distance from Transmitter using 1cm worst case

(c) The peak power density is:

$$S_p = \frac{0.083 \times 1.12}{4\pi (1)^2} = 0.007 \frac{mW}{cm^2}$$

(e) This is below the FCC limit.

10. APPENDIX A - CORRECTION FACTORS

10.1 Correction factors for CABLE

from EMI receiver to test antenna at 3 meter range.

FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.3
20.0	0.6
30.0	0.8
40.0	0.9
50.0	1.1
60.0	1.2
70.0	1.3
80.0	1.4
90.0	1.6
100.0	1.7
150.0	2.0
200.0	2.3
250.0	2.7
300.0	3.1
350.0	3.4
400.0	3.7
450.0	4.0
500.0	4.3
600.0	4.7
700.0	5.3
800.0	5.9
900.0	6.3
1000.0	6.7

FREQUENCY (MHz)	CORRECTION FACTOR (dB)
1200.0	7.3
1400.0	7.8
1600.0	8.4
1800.0	9.1
2000.0	9.9
2300.0	11.2
2600.0	12.2
2900.0	13.0

NOTES:

1. *The cable type is RG-214.*
2. *The overall length of the cable is 27 meters.*
3. *The above data is located in file 27MO3MO.CBL on the disk marked "Radiated Emission Tests EMI Receiver".*

10.2 Correction factors for CABLE

from EMI receiver to test antenna at 3 meter range.

FREQUENCY (GHz)	CORRECTION FACTOR (dB)
1.0	1.2
2.0	1.6
3.0	2.0
4.0	2.4
5.0	3.0
6.0	3.4
7.0	3.8
8.0	4.2
9.0	4.6
10.0	5.0
12.0	5.8

NOTES:

1. The cable type is RG-8.

2. The overall length of the cable is 10 meters.

10.3 Correction factors for CABLE

from spectrum analyzer to test antenna above 2.9 GHz

FREQUENCY (GHz)	CORRECTION FACTOR (dB)	FREQUENCY (GHz)	CORRECTION FACTOR (dB)
1.0	1.9	14.0	9.1
2.0	2.7	15.0	9.5
3.0	3.5	16.0	9.9
4.0	4.2	17.0	10.2
5.0	4.9	18.0	10.4
6.0	5.5	19.0	10.7
7.0	6.0	20.0	10.9
8.0	6.5	21.0	11.2
9.0	7.0	22.0	11.6
10.0	7.5	23.0	11.9
11.0	7.9	24.0	12.3
12.0	8.3	25.0	12.6
13.0	8.7	26.0	13.0

NOTES:

1. The cable type is SUCOFLEX 104 E manufactured by SUHNER.

2. The cable is used for measurements above 2.9 GHz.

3. The overall length of the cable is 10 meters.

8.4 Correction factors for LOG PERIODIC ANTENNA

Type LPD 2010/A
at 3 and 10 meter ranges.

Distance of 3 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.1
250.0	10.2
300.0	12.5
400.0	15.4
500.0	16.1
600.0	19.2
700.0	19.4
800.0	19.9
900.0	21.2
1000.0	23.5

Distance of 10 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.0
250.0	10.1
300.0	11.8
400.0	15.3
500.0	15.6
600.0	18.7
700.0	19.1
800.0	20.2
900.0	21.1
1000.0	23.2

NOTES:

1. *Antenna serial number is 1038.*
2. *The above lists are located in file number 38M3O.ANT for a 3 meter range, and file number 38M100.ANT for a 10 meter range.*
3. *The files mentioned above are located on the disk marked "Radiated Emission Test EMI Receiver".*

10.5 Correction factors for LOG PERIODIC ANTENNA

Type SAS-200/511
at 3 meter range.

FREQUENCY (GHz)	ANTENNA FACTOR (dB)
1.0	24.9
1.5	27.8
2.0	29.9
2.5	31.2
3.0	32.8
3.5	33.6
4.0	34.3
4.5	35.2
5.0	36.2
5.5	36.7
6.0	37.2
6.5	38.1

FREQUENCY (GHz)	ANTENNA FACTOR (dB)
7.0	38.6
7.5	39.2
8.0	39.9
8.5	40.4
9.0	40.8
9.5	41.1
10.0	41.7
10.5	42.4
11.0	42.5
11.5	43.1
12.0	43.4
12.5	44.4
13.0	44.6

NOTES:

1. Antenna serial number is 253.

2. The above lists are located in file number SAS3M0.ANT for a 3 meter range.

3. The files mentioned above are located on the disk marked "Antenna Factors".

10.6 Correction factors for BICONICAL ANTENNA

Type BCD-235/B, at 3 meter range

FREQUENCY (MHz)	AFE (dB/m)
20.0	19.4
30.0	14.8
40.0	11.9
50.0	10.2
60.0	9.1
70.0	8.5
80.0	8.9
90.0	9.6
100.0	10.3
110.0	11.0
120.0	11.5
130.0	11.7
140.0	12.1
150.0	12.6
160.0	12.8
170.0	13.0
180.0	13.5
190.0	14.0
200.0	14.8
210.0	15.3
220.0	15.8
230.0	16.2
240.0	16.6
250.0	17.6
260.0	18.2
270.0	18.4
280.0	18.7
290.0	19.2
300.0	19.9
310	20.7
320	21.9
330	23.4
340	25.1
350	27.0

NOTES:

1. Antenna serial number is 1041.

2. The above list is located in file 19BC10M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver".

10.7 Correction factors for Double-Ridged Waveguide Horn

Model: 3115, S/N 29845
at 3 meter range.

FREQUENCY (GHz)	ANTENNA FACTOR (dB 1/m)	ANTENNA Gain (dBi)	FREQUENCY (GHz)	ANTENNA FACTOR (dB 1/m)	ANTENNA Gain (dBi)
1.0	24.8	5.4	10.0	38.8	11.4
1.5	26.1	7.6	10.5	38.9	11.8
2.0	28.6	7.7	11.0	39.0	12.1
2.5	29.8	8.4	11.5	39.6	11.8
3.0	31.4	8.4	12.0	39.8	12.0
3.5	32.4	8.7	12.5	39.6	12.5
4.0	33.7	8.6	13.0	40.0	12.5
4.5	33.4	9.9	13.5	39.8	13.0
5.0	34.5	9.7	14.0	40.2	13.0
5.5	35.1	9.9	14.5	40.6	12.9
6.0	35.4	10.4	15.0	41.3	12.4
6.5	35.6	10.8	15.5	39.5	14.6
7.0	36.2	10.9	16.0	38.8	15.5
7.5	37.3	10.4	16.5	40.0	14.6
8.0	37.7	10.6	17.0	41.4	13.4
8.5	38.3	10.5	17.5	44.8	10.3
9.0	38.5	10.8	18.0	47.2	8.1
9.5	38.7	11.1			

10.8 Correction factors for Horn Antenna

Model: SWH-28
at 1 meter range.

FREQUENCY (GHz)	AFE (dB /m)	Gain (dB1)
18.0	40.3	16.1
19.0	40.3	16.3
20.0	40.3	16.1
21.0	40.3	16.3
22.0	40.4	16.8
23.0	40.5	16.4
24.0	40.5	16.6
25.0	40.5	16.7
26.0	40.6	16.4

10.9 Correction factors for ACTIVE LOOP ANTENNA

Model 6502
S/N 9506-2950

FREQUENCY (MHz)	Magnetic Antenna Factor (dB)	Electric Antenna Factor (dB)
.009	-35.1	16.4
.010	-35.7	15.8
.020	-38.5	13.0
.050	-39.6	11.9
.075	-39.8	11.8
.100	-40.0	11.6
.150	-40.0	11.5
.250	-40.0	11.6
.500	-40.0	11.5
.750	-40.1	11.5
1.000	-39.9	11.7
2.000	-39.5	12.0
3.000	-39.4	12.1
4.000	-39.7	11.9
5.000	-39.7	11.8
10.000	40.2	11.3
15.000	-40.7	10.8
20.000	-40.5	11.0
25.000	-41.3	10.2
30.000	42.3	9.2