



DATE: 26 March 2014

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

FCC Radio Test Report

for

Panoramic Power Ltd.

Equipment under test:

Wireless Power Sensor

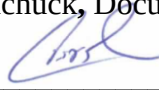
PAN-42-US

Written by:



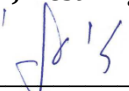
R. Pinchuck, Documentation

Approved by:



A. Sharabi, Test Engineer

Approved by:



I. Raz, EMC Laboratory Manager

This report must not be reproduced, except in full, without the written permission of I.T.L. (Product Testing) Ltd.

This report relates only to items tested.



Measurement/Technical Report for Panoramic Power Ltd.

Equipment under test:

Wireless Power Sensor

PAN-42-US

FCC ID: Z9M-PAN-4-2

This report concerns: Original Grant: x
Class I change:
Class II change:

Equipment Type: Digital Transmission System

Limits used: 47CFR15 Section 15.249

Measurement procedure used is KDB 558074 D01 09 April 2013 and
ANSI C63.4-2003.

Application for Certification
prepared by:
R. Pinchuck
ITL (Product Testing) Ltd.
Kfar Bin Nun
D.N. Shimshon 99780
Israel
Tel: +972-8-918-6117
Fax: +972-8-915-3101
Email: rpinchuck@itl.co.il

Applicant for this device:
(different from "prepared by")
Adi Shamir
Panoramic Power Ltd.
20 Atir Yeda St.
Kfar Saba, 44643
Israel
Tel: 972-9-766-7600
Fax: 972-9-766-7610
Email: adi@panpwr.com



TABLE OF CONTENTS

1.	GENERAL INFORMATION -----	4
1.1	Administrative Information	4
1.2	List of Accreditations	5
1.3	Product Description	6
1.4	Test Methodology	6
1.5	Test Facility	6
1.6	Measurement Uncertainty	6
2.	SYSTEM TEST CONFIGURATION -----	7
2.1	Justification	7
2.2	Special Accessories	7
2.3	Equipment Modifications	7
2.4	Configuration of Tested System	7
3.	CONDUCTED AND RADIATED MEASUREMENTS TEST SETUP PHOTOS -----	8
4.	CONDUCTED EMISSION FROM AC MAINS -----	11
4.1	Test Specification	11
4.2	Test Procedure	11
4.3	Measured Data	11
4.4	Test Instrumentation Used, Conducted Measurement	15
5.	FIELD STRENGTH OF FUNDAMENTAL -----	16
5.1	Test Specification	16
5.2	Test Procedure	16
5.3	Test Results	16
5.4	Test Instrumentation Used, Field Strength of Fundamental	20
6.	SPURIOUS RADIATED EMISSION 9 KHZ - 30 MHZ -----	21
6.1	Test Specification	21
6.2	Test Procedure	21
6.3	Test results	21
6.4	Test Instrumentation Used, Radiated Measurements 9 kHz – 30 MHz	22
6.5	Field Strength Calculation	22
7.	SPURIOUS RADIATED EMISSION 30 MHZ- 10 GHZ -----	23
7.1	Test Specification	23
7.2	Test Procedure	23
7.3	Test Results	23
7.4	Test Instrumentation Used, Radiated Measurements 30 MHz – 10 GHz	26
7.5	Field Strength Calculation	26
8.	BAND EDGE ATTENUATION -----	27
8.1	Test Specification	27
8.2	Test Procedure	27
8.3	Test Results	27
8.4	Test Instrumentation Used, Band Edge Attenuation	30
9.	AVERAGE FACTOR CALCULATION -----	31
9.1	Test Equipment Used, Average Factor Calculation	33
10.	APPENDIX A - CORRECTION FACTORS -----	34
10.1	Correction factors for CABLE	34
10.2	Correction factors for CABLE	35
10.3	Correction factors for CABLE	36
10.4	Correction factors for LOG PERIODIC ANTENNA	37
10.5	Correction factors for LOG PERIODIC ANTENNA	38
10.6	Correction factors for BICONICAL ANTENNA	39
10.7	Correction factors for ACTIVE LOOP ANTENNA	40
10.8	Correction factors for Double-Ridged Waveguide Horn	41



1. General Information

1.1 Administrative Information

Manufacturer:	Panoramic Power Ltd.
Manufacturer's Address:	20 Atir Yeda St., Kfar Saba 44643, Israel Tel: +972-9-766-7600 Fax: +972-9-766-7610
Manufacturer's Representative:	Yael Alali
Equipment Under Test (E.U.T):	Wireless Power Sensor
Equipment Model No.:	PAN-42-US
Equipment Serial No.:	Not Designated
Date of Receipt of E.U.T:	18.03.14
Start of Test:	18.03.14
End of Test:	23.03.14
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 PAN-42 wireless power sensor provides high accuracy real time power measurements and advanced power quality measurements for main power monitoring, sub-metering and for the metering of large devices. Designed for demanding electrical applications, supporting industry accuracy standards, PAN-42 enables the metering of power, voltage, current, power factor and power quality measurement data. Information is sent wirelessly, through Panoramic's Bridge unit, to Panoramic's advanced cloud-based analytics platform. The data is then used to provide customers with actionable analytics and real-time dashboards and alerts. PAN-42 complements the Panoramic Power sensor family (PAN-10, PAN-12 and PAN -14) that is used for more granular monitoring of individual circuits and devices. Together they deliver a comprehensive range of metering and monitoring tools to reduce energy costs and maximize energy efficiency.

1.4 Test Methodology

Conducted and radiated testing was performed according to the procedures in KDB 558074 D01 09 April 2013 and 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):

± 3.6 dB

Note: See ITL Procedure No. PM 198.

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

Note: See ITL Procedure No. PM 198.

2. System Test Configuration

2.1 *Justification*

The E.U.T. was tested in normal operation mode set to transmit in 915MHz within the 902 – 928 MHz frequency band.

Since unit can be installed in different orientations, unit was scanned in 3 different orientations to determine worst-case radiation.

2.2 *Special Accessories*

No special accessories were needed to achieve compliance.

2.3 *Equipment Modifications*

No special modifications were needed to achieve compliance.

2.4 *Configuration of Tested System*

The configuration of the tested system is described below.

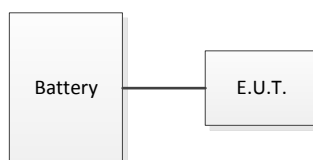


Figure 1. Configuration of Tested System – Radiated Emission

3. Conducted and Radiated Measurements Test Setup 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 from AC Mains

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 a 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 via a 50 Ohm / 50 μ Hn 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 14.45dB

The margin between the emission levels and the specification limit is, in the worst case, 17.86dB for the phase line at 1.27MHz and 14.45dB at 0.346MHz 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: 21.05.14

Typed/Printed Name: D. Yadidi



Conducted Emission

E.U.T Description: Wireless Power Sensor
Type: PAN-42-US
Serial Number: Not Designated

Specification: FCC Part 15, Subpart C
Lead: Phase
Detectors: Quasi-peak, Average

EDIT PEAK LIST (Final Measurement Results)			
Trace1:	CE22BQP		
Trace2:	CE22BAP		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV	DELTA LIMIT dB
1 Quasi Peak	154 kHz	36.55	-29.22
1 Quasi Peak	190 kHz	36.89	-27.14
1 Quasi Peak	234 kHz	40.91	-21.39
2 Average	234 kHz	23.63	-28.67
1 Quasi Peak	314 kHz	34.66	-25.20
1 Quasi Peak	338 kHz	37.21	-22.03
2 Average	346 kHz	25.54	-23.51
2 Average	462 kHz	25.23	-21.41
1 Quasi Peak	466 kHz	38.52	-18.06
1 Quasi Peak	570 kHz	36.40	-19.59
2 Average	578 kHz	24.88	-21.11
2 Average	694 kHz	25.19	-20.80
2 Average	926 kHz	24.86	-21.14
1 Quasi Peak	1.038 MHz	37.94	-18.05
2 Average	1.042 MHz	24.52	-21.47
1 Quasi Peak	1.158 MHz	37.72	-18.27
1 Quasi Peak	1.27 MHz	38.13	-17.86
2 Average	1.27 MHz	23.24	-22.75
2 Average	1.502 MHz	21.64	-24.35
2 Average	2.082 MHz	21.62	-24.37

Date: 23.MAR.2014 10:10:36

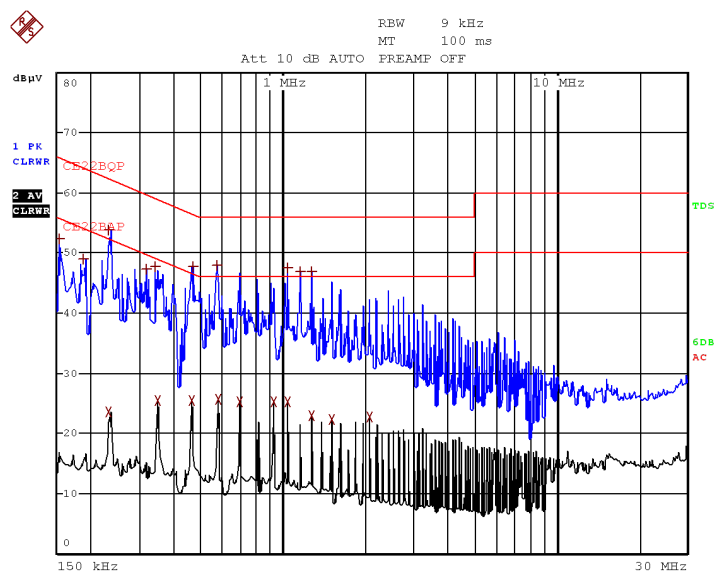
Figure 7. Detectors: Quasi-Peak, AVERAGE

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 Wireless Power Sensor
Type PAN-42-US
Serial Number: Not Designated

Specification: FCC Part 15, Subpart C
Lead: Phase
Detectors: Quasi-peak, Average



Date: 23.MAR.2014 10:09:38

Figure 8. Detectors: Quasi-peak, Average

Note: Fail indication on the spectral plot results from peak detector level reading above the limit. This indication is for information only and it should not be interpreted as a test failure.

Conducted Emission

E.U.T Description Wireless Power Sensor
Type PAN-42-US
Serial Number: Not Designated

Specification: FCC Part 15, Subpart C
Lead: Neutral
Detectors: Quasi-peak, Average

EDIT PEAK LIST (Final Measurement Results)				
Trace1:	CE22BQP			
Trace2:	CE22BAP			
Trace3:	---			
TRACE	FREQUENCY	LEVEL dBμV	DELTA	LIMIT dB
1 Quasi Peak	158 kHz	36.77	-28.79	
1 Quasi Peak	178 kHz	37.38	-27.19	
1 Quasi Peak	190 kHz	36.64	-27.39	
1 Quasi Peak	210 kHz	37.58	-26.61	
1 Quasi Peak	230 kHz	43.11	-19.33	
2 Average	230 kHz	26.11	-26.33	
1 Quasi Peak	290 kHz	36.94	-23.57	
1 Quasi Peak	346 kHz	44.60	-14.45	
2 Average	346 kHz	26.53	-22.52	
1 Quasi Peak	398 kHz	33.95	-23.94	
2 Average	462 kHz	26.53	-20.11	
1 Quasi Peak	466 kHz	38.50	-18.07	
1 Quasi Peak	574 kHz	38.73	-17.26	
2 Average	578 kHz	26.46	-19.53	
1 Quasi Peak	694 kHz	40.05	-15.94	
2 Average	694 kHz	26.44	-19.55	
2 Average	810 kHz	26.21	-19.78	
2 Average	926 kHz	25.81	-20.18	
2 Average	1.042 MHz	25.10	-20.89	
1 Quasi Peak	1.154 MHz	38.22	-17.77	

Date: 23.MAR.2014 10:17:19

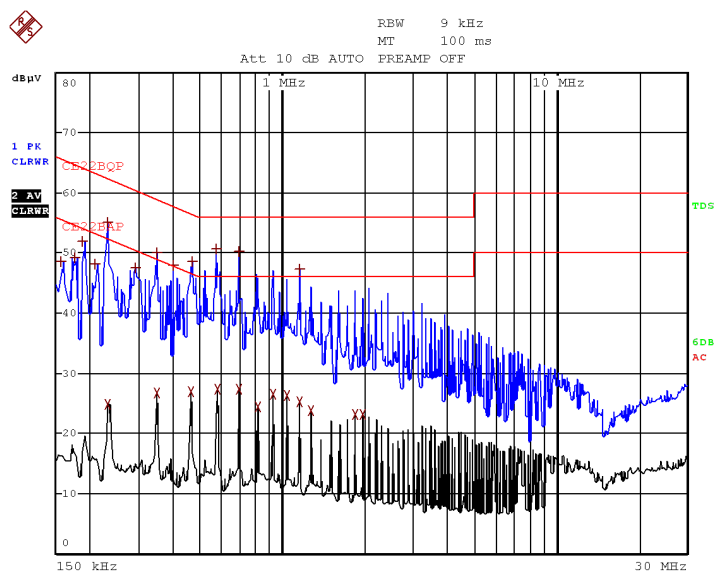
Figure 9. Detectors: Peak, AVERAGE

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: Wireless Power Sensor
Type: PAN-42-US
Serial Number: Not Designated

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



Date: 23.MAR.2014 10:16:01

Figure 10 Detectors: Quasi-peak, Average

Note: Fail indication on the spectral plot results from peak detector level reading above the limit. This indication is for information only and it should not be interpreted as a test failure.

4.4 Test Instrumentation Used, Conducted Measurement

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
Transient Limiter	HP	11947A	3107A01578	February 25, 2013	2 Years
EMI Receiver	Rohde & Schwarz	ESCI7	100724	December 17, 2013	1 Year
LISN	Fischer	FCC-LISN-2A	127	January 1, 2014	1 Year



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 (915 MHz) Peak and Quasi-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 Test Results

JUDGEMENT: Passed by 6.32dB

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

See additional details in *Figure 11* to *Figure 13*.

TEST PERSONNEL:

Tester Signature: _____

Date: 30.03.14

Typed/Printed Name: A. Sharabi



Field Strength of Fundamental

E.U.T Description Wireless Power Sensor
Model Number PAN-42-US
Serial Number: Not Designated

Specification: FCC, Part 15, Subpart C 15.249(a)

Antenna Polarization: Horizontal/Vertical

Test Distance: 3 meters

Detectors: Peak, Quasi-peak

Freq. (MHz)	Pol. V/H	Peak Reading (dB μ V/m)	Peak Specification (dB μ V/m)	QP Reading (dB μ V/m)	QP Specification (dB μ V/m)	Margin (dB)
915.0	H	81.11	113.0	81.11	93.98	-12.87
915.0	V	87.66	113.0	87.66	93.98	-6.32

**Figure 11. Field Strength of Fundamental. Antenna Polarization: HORIZONTAL/VERTICAL.
Detectors: Peak, Quasi-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 Reading” includes “Correction Factors.

“Correction Factors” = Antenna Correction Factor + Cable Loss.

“Quasi-peak Reading” includes “Correction Factors.

“Correction Factors” = Antenna Correction Factor + Cable Loss.

Field Strength of Fundamental

E.U.T Description Wireless Power Sensor
Model Number PAN-42-US
Serial Number: Not Designated

Specification: FCC, Part 15, Subpart C 15.249(a)

Antenna Polarization: Horizontal/Vertical

Test Distance: 3 meters

Detector: Peak, Quasi-peak

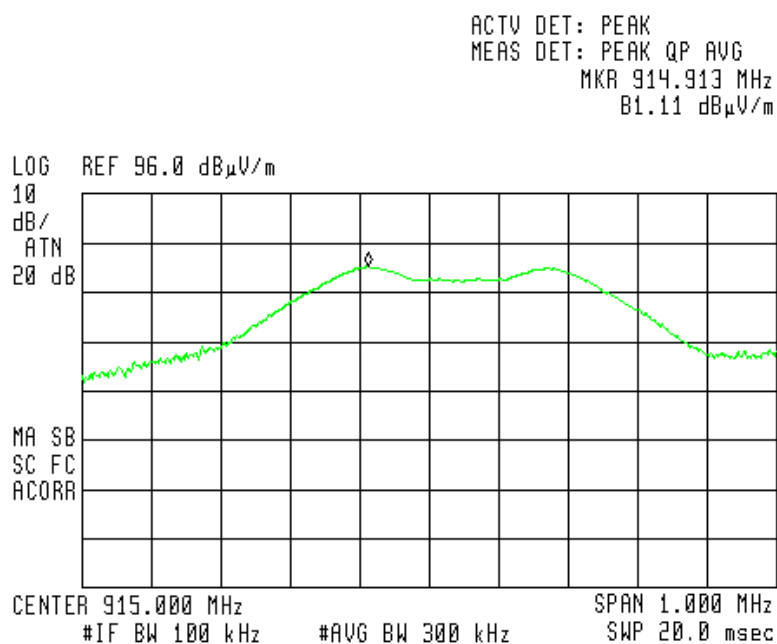


Figure 12. 915.00 MHz Antenna Polarization Horizontal



ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 914.913 MHz
87.66 dB μ V/m

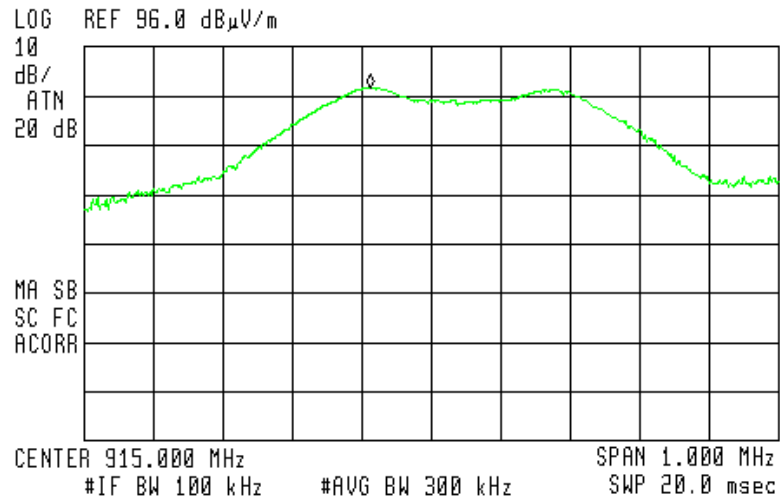


Figure 13. 915.00 MHz Antenna Polarization Vertical



5.4 Test Instrumentation Used, Field Strength of Fundamental

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	January 15, 2014	1 year
RF Section	HP	85420E	3705A00248	January 15, 2014	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	April 2, 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

Figure 14 - Test Instrumentation Used



6. Spurious Radiated Emission 9 kHz - 30 MHz

6.1 Test Specification

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

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 1.

The frequency range 9 kHz-1000 MHz was scanned and the list of the highest emissions was verified and updated accordingly.

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-30 MHz, the loop antenna was rotated on its vertical axis. The antenna height (center of loop) was 1 meter.

The E.U.T. was operated in continuous transmission to enable better detection of signals.

6.3 Test results

JUDGEMENT: Passed

No signals were detected in the frequency range of 9 kHz – 30 MHz.

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

TEST PERSONNEL:

Tester Signature: 

Date: 30.03.14

Typed/Printed Name: A. Sharabi

6.4 Test Instrumentation Used, Radiated Measurements 9 kHz – 30 MHz

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	January 15, 2014	1 year
RF Section	HP	85420E	3705A00248	January 15, 2014	1 year
Active Loop Antenna	EMCO	6502	9506-2950	November 4, 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	JPKG19982	N/A	N/A

Figure 15 - Test Instrumentation Used

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 [dB μ V/m]
 RA: Receiver Amplitude [dB μ V]
 AF: Receiving Antenna Correction Factor [dB/m]
 CF: Cable Attenuation Factor [dB]

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

No external pre-amplifiers were used.



7. Spurious Radiated Emission 30 MHz- 10 GHz

7.1 Test Specification

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

7.2 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, 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 emission levels were compared to the requirement of Section 15.249.

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

In the frequency range 2.9 - 10 GHz, a spectrum analyzer including a low noise amplifier was used. During peak measurements, the I.F. bandwidth was 1 MHz, and video bandwidth 3 MHz. During average measurements, the I.F. bandwidth was 1 MHz and video bandwidth was 100 Hz.

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.).

The test distance was 3 meters.

7.3 Test Results

JUDGEMENT: Passed by 17.7dB

The margin between the emission level and the specification limit is 17.7dB in the worst case at the frequency of 2744MHz, vertical polarization.

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

TEST PERSONNEL:

Tester Signature: 

Date: 30.03.14

Typed/Printed Name: A. Sharabi



Spurious Radiated Emission 30 MHz- 10 GHz

E.U.T Description Wireless Power Sensor
Type PAN-42-US
Serial Number: Not Designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical Frequency range: 30 MHz to 10.0 GHz
Test Distance: 3 meters Detector: Peak

Operation Frequency (MHz)	Freq. (MHz)	Pol. V/H	Peak Reading (dB μ V/m)	Peak Specification (dB μ V/m)	Margin (dB)
915.00	1830.00	H	53.0	74.0	-21.0
915.00	1830.00	V	52.4	74.0	-21.6
915.00	2744.0	H	55.7	74.0	-18.3
915.00	2744.0	V	56.3	74.0	-17.7

Figure 16. Spurious Radiated Emission

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 Reading” includes correction factor.

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



Spurious Radiated Emission 30 MHz- 10 GHz

E.U.T Description Wireless Power Sensor
Type PAN-42-US
Serial Number: Not Designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical Frequency range: 30 MHz to 10.0 GHz
Test Distance: 3 meters Detector: Peak

Operation Frequency (MHz)	Freq. (MHz)	Pol. V/H	Average Reading (dB μ V/m)	Average Specification (dB μ V/m)	Margin (dB)
915.00	1830.00	H	12.0	54.0	-42.0
915.00	1830.00	V	11.4	54.0	-42.6
915.00	2745.0	H	14.7	54.0	-39.3
915.00	2745.0	V	15.3	54.0	-38.7

Figure 17. Spurious Radiated Emission

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 Reading” includes correction factor.

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

7.4 Test Instrumentation Used, Radiated Measurements 30 MHz – 10 GHz

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
EMI Receiver	HP	85422E	3906A00276	January 15, 2014	1 Year
RF Filter Section	HP	85420E	3705A00248	January 15, 2014	1 Year
Antenna Biconical	EMCO	3104	2606	August 30, 2013	1 Year
Antenna Log Periodic	ARA	LPD-2010/A	1038	April 2, 2013	1 Year
Horn Antenna	ETS	3115	29845	March 14, 2012	3 Years
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	August 21, 2013	1 Year
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2014	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	JPKG19982	N/A	N/A

Figure 18 - Test Instrumentation Used

7.5 Field Strength Calculation

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

$$[\text{dB}\mu\text{V/m}] \text{ FS} = \text{RA} + \text{AF} + \text{CF}$$

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



8. Band Edge Attenuation

8.1 Test Specification

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

8.2 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 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.

8.3 Test Results

JUDGEMENT: Passed by 3.4 dB

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

TEST PERSONNEL:

Tester Signature: _____

Date: 30.03.14

Typed/Printed Name: A. Sharabi



Band Edge Attenuation

E.U.T Description Wireless Power Sensor
Model Number PAN-42-US
Serial Number: Not Designated

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

Freq. (MHz)	Reading (dBc)	Specification (dBc)	Margin (dB)
902.0	-55.2	-50	-5.2
928.0	-53.4	-50	-3.4

Figure 19. Band Edge Attenuation

Band Edge Attenuation

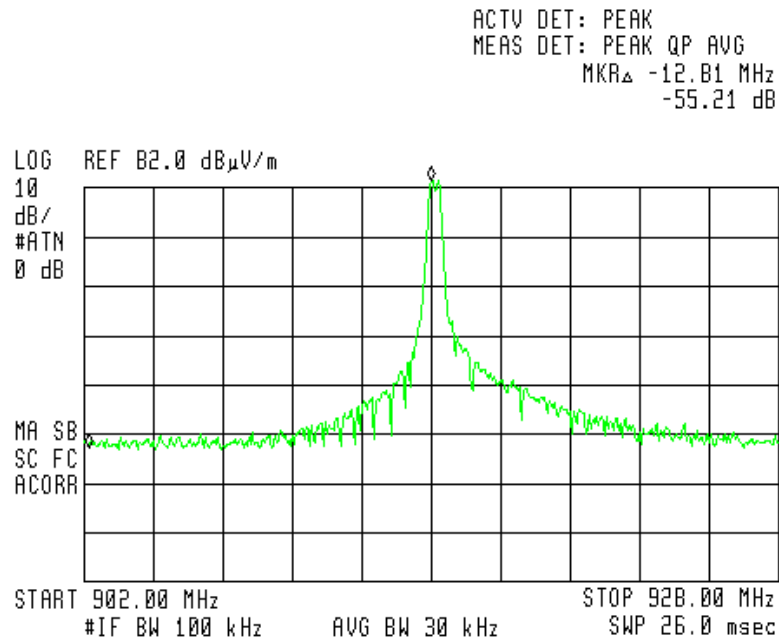


Figure 20. Band Edge Attenuation

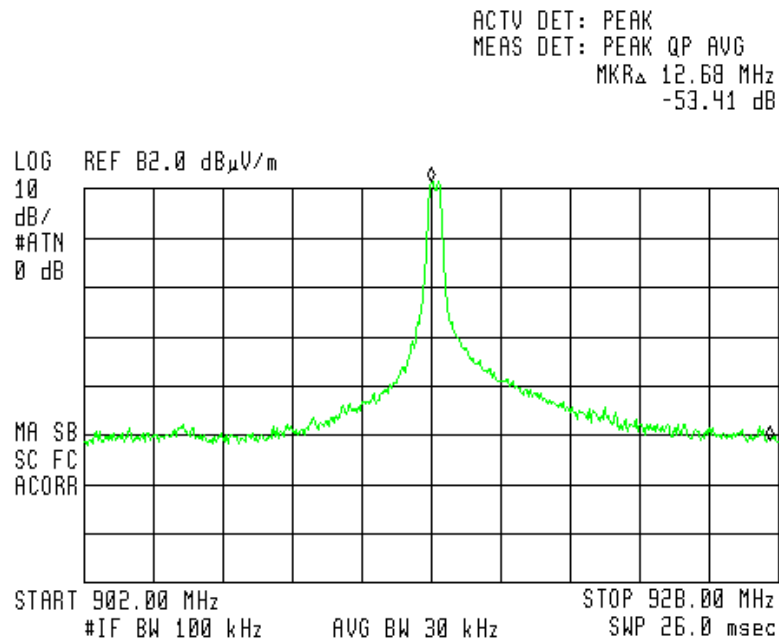


Figure 21. Band Edge Attenuation



8.4 Test Instrumentation Used, Band Edge Attenuation

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
EMI Receiver	HP	85422E	3906A00276	January 15, 2014	1 Year
RF Filter Section	HP	85420E	3705A00248	January 15, 2014	1 Year
Antenna Log Periodic	ARA	LPD-2010/A	1038	April 2, 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

Figure 22 -Test Instrumentation Used

9. Average Factor Calculation

1. Burst duration = 0.825msec
2. Time between bursts >100msec

$$3. \text{ Average Factor} = 20 \log \left[\frac{\text{Pulse duration}}{\text{Pulse period}} \times \frac{\text{burst duration}}{100\text{msec}} \times \text{Num of burst within 100msec} \right]$$

$$\text{Average Factor} = 20 \log \left[\frac{0.825}{100} \right] = -41.0\text{dB}$$

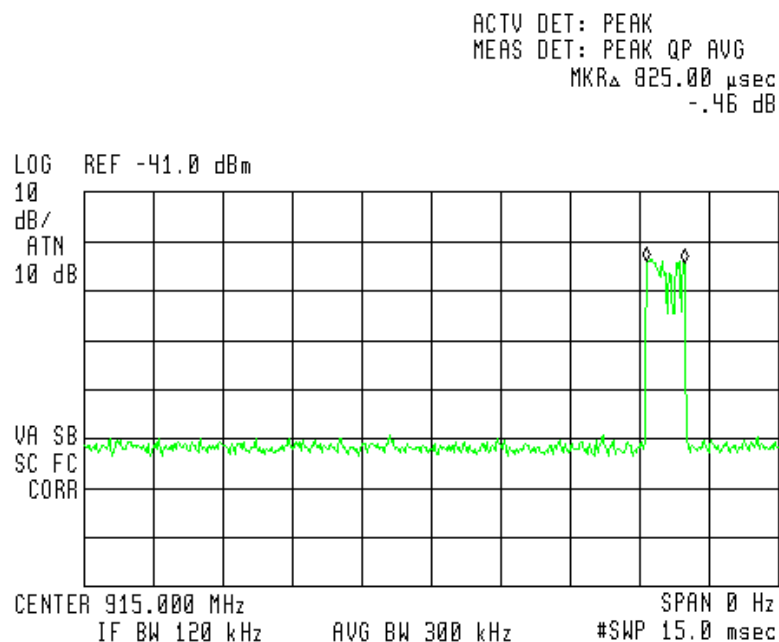


Figure 23 Avg. Factor Pulse Duration = 0.825msec



ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR Δ -5.1000 sec
27.25 dB

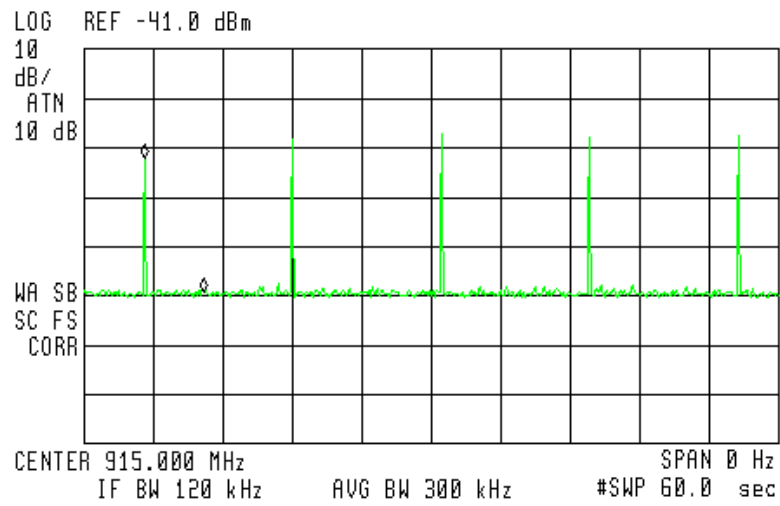


Figure 24 Avg. Factor -Time between transmissions >100msec



9.1 Test Equipment Used, Average Factor Calculation

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
EMI Receiver	HP	85422E	3906A00276	January 15, 2014	1 Year
RF Filter Section	HP	85420E	3705A00248	January 15, 2014	1 Year
Antenna Biconical	EMCO	3104	2606	August 30, 2013	1 Year
Antenna Log Periodic	ARA	LPD-2010/A	1038	April 2, 2013	1 Year
Horn Antenna	ETS	3115	29845	March 14, 2012	3 Years
Horn Antenna	ARA	SWH-28	1007	March 30, 2014	3 Years
Low Noise Amplifier	Narda	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, 2014	1 Year
Spectrum Analyzer	HP	8564E	3442A00275	March 2, 2014	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	JPKG19982	N/A	N/A

Figure 25 Test Equipment Used

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)	FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.3	1200.0	7.3
20.0	0.6	1400.0	7.8
30.0	0.8	1600.0	8.4
40.0	0.9	1800.0	9.1
50.0	1.1	2000.0	9.9
60.0	1.2	2300.0	11.2
70.0	1.3	2600.0	12.2
80.0	1.4	2900.0	13.0
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		

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.



10.4 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 38M30.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 ACTIVE LOOP ANTENNA

Model 6502

S/N 9506-2950

FREQUENCY	Magnetic Antenna Factor	Electric Antenna Factor
(MHz)	(dB)	(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



10.8 Correction factors for Double-Ridged Waveguide Horn

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

FREQUENCY	ANTENNA	ANTENNA	FREQUENCY	ANTENNA	ANTENNA
(GHz)	FACTOR	Gain	(GHz)	FACTOR	Gain
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			