



DATE: 5 November 2014

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

FCC Radio Test Report

for

Activocal LTD

Equipment under test:

**Around - Voice Activated
Speakerphone**

Base Unit

Written by:




R. Pinchuck, Documentation

Approved by:



M. Zohar, Test Engineer

Approved by:



I. Raz, EMC Laboratory Manager

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This report relates only to items tested.



Measurement/Technical Report for Activocal LTD

Equipment under test:

Around - Voice Activated Speakerphone Base Unit

FCC ID: 2ADI5-AROUND

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 v03r02 and
ANSI C63.4-2003.

Application for Certification
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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	7
2.	SYSTEM TEST CONFIGURATION -----	8
2.1	Justification	8
2.2	EUT Exercise Software	8
2.3	Special Accessories	8
2.4	Equipment Modifications	8
2.5	Configuration of Tested System	8
3.	CONDUCTED AND RADIATED MEASUREMENT TEST SET-UP PHOTO -----	10
4.	FIELD STRENGTH OF FUNDAMENTAL -----	12
4.1	Test Specification	12
4.2	Test Procedure	12
4.3	Measured Data	12
4.4	Test Instrumentation Used, Field Strength of Fundamental	17
5.	CONDUCTED EMISSION -----	18
5.1	Test Specification	18
5.2	Test Procedure	18
5.3	Measured Data	18
5.4	Test Instrumentation Used, Conducted Measurement	23
6.	RADIATED EMISSION, 9 KHZ – 30 MHZ -----	24
6.1	Test Specification	24
6.2	Test Procedure	24
6.3	Measured Data	24
6.4	Test Instrumentation Used; Radiated Measurements 9kHz-30MHz.....	25
6.5	Field Strength Calculation	26
7.	SPURIOUS RADIATED EMISSION 30 MHZ – 25 GHZ -----	27
7.1	Test Specification	27
7.2	Measured Data	28
7.3	Test Instrumentation Used; Spurious Radiated Emission.....	33
7.4	Field Strength Calculation	34
8.	ANTENNA GAIN/INFORMATION -----	35
9.	R.F EXPOSURE/SAFETY -----	36
10.	APPENDIX A - CORRECTION FACTORS -----	37
10.1	Correction factors for CABLE	37
10.2	Correction factors for CABLE	38
10.3	Correction factors for CABLE	39
10.4	Correction factors for Bilog ANTENNA	40
10.5	Correction factors for Horn ANTENNA.....	41
10.6	Correction factors for LOG PERIODIC ANTENNA	42
10.7	Correction factors for Double-Ridged Waveguide Horn.....	43
10.8	Correction factors for Horn Antenna	44
10.9	Correction factors for ACTIVE LOOP ANTENNA	45



1. General Information

1.1 Administrative Information

Manufacturer:	Activocal LTD
Manufacturer's Address:	PO Box 102 Rehovot, 761002 Israel
Manufacturer's Representative:	Nir Dvash
Equipment Under Test (E.U.T):	Around - Voice Activated Speakerphone
Equipment Model No.:	Base Unit
Equipment Serial No.:	Not designated
Date of Receipt of E.U.T:	13.07.14
Start of Test:	13.07.14
End of Test:	26.10.14
Test Laboratory Location:	I.T.L (Product Testing) Ltd. 1 Batsheva St., Lod ISRAEL 7120101
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.), FCC Designation Number US1004.
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-3006, R-2729, T-1877, G-245.
5. Industry Canada (Canada), IC File No.: 46405-4025; Site No. IC 4025A-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**

Around – Voice Activated Environmental Phone



- Total voice activation – answering and placing calls, menus etc. – no buttons needed.
- Speakerphone mode, wireless Handset and wired Headset.
- Remote dialing from any PC. No hardware is needed on the PC side. Can enable any existing PC software (i.e. mouse eye tracking) to dial the phone
- Can be used to remotely activate other appliances in the house.
- Has a big button, backlighted keyboard.
- Includes a talking clock and alarm clock
- Talking Caller ID with name and/or number announcement.
- USB connection to the PC for backup and code upgrades.
- Extremely bright LED stripe for visual notifications
- Can be easily configured for any one or more disability including low vision, blindness, hard of hearing, dexterity, physically challenged and old age.

1.4 **Test Methodology**

Both conducted and radiated testing were performed according to the procedures in KDB 558074 D01v03r02 and ANSI C63.4: 2003. Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.5 **Test Facility**

Both conducted and radiated emissions tests were performed at I.T.L.'s testing facility in Lod, Israel. I.T.L.'s EMC Laboratory is accredited by A2LA, certificate No. 1152.01 and its FC Designation Number is US1004.



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*

Unit was tested in 3 positions; the worst case position was evaluated for compliance. The base unit and the cordless handset contain the identical radio. See customer's Declaration on following page.

2.2 *EUT Exercise Software*

No special exercise software was needed to achieve compliance.

2.3 *Special Accessories*

No special exercise software was needed to achieve compliance

2.4 *Equipment Modifications*

No equipment modifications were needed to achieve compliance.

2.5 *Configuration of Tested System*

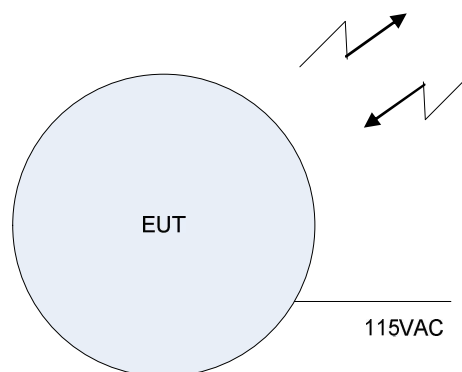


Figure 1. Configuration of Tested System



ActiVo))cal

Tel: +972-3-3746618
4 Ha-Yarden st.,
Yavne P.O. Box 102,
Rehovot 76100 Israel

Date December 4, 2014

DECLARATION

I HEREBY DECLARE THAT THE RADIO PARTS IN THE
AROUND – VOICE ACTIVATED SPEAKERPHONE, BASE
UNIT AND CORDLESS HANDSET ARE IDENTICAL.

Thank you,

Signature: _____

Printed Name: Nir Dvash

R&D Manager Activocal LTD

www.activocal.com

3. Conducted and Radiated Measurement Test Set-up Photo



Figure 2. Conducted Emission Test



Figure 3. Radiated Emission Test



Figure 4. Radiated Emission Test



Figure 5. Radiated Emission Test



4. Field Strength of Fundamental

4.1 Test Specification

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

4.2 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.


4.3 Measured Data

JUDGEMENT: Passed by 2.3 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 6*.

TEST PERSONNEL:

Tester Signature:  _____

Date: 11.11.14

Typed/Printed Name: M. Zohar



Field Strength of Fundamental

E.U.T Description Around - Voice Activated
Speakerphone

Model Number Base Unit

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	Peak Specification	Avg. Factor	Avg. Result	Avg Specification	Margin
(MHz)	V/H	(dBμV/m)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
2406	H	102.8	114.0	11.1	91.7	94.0	-2.3
2406	V	100.0	114.0	11.1	88.9	94.0	-5.1
2442	H	102.8	114.0	11.1	91.7	94.0	-2.3
2442	V	99.0	114.0	11.1	87.9	94.0	-6.1
2478	H	102.6	114.0	11.1	91.5	94.0	-2.5
2478	V	97.8	114.0	11.1	86.7	94.0	-7.3

**Figure 6. 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.

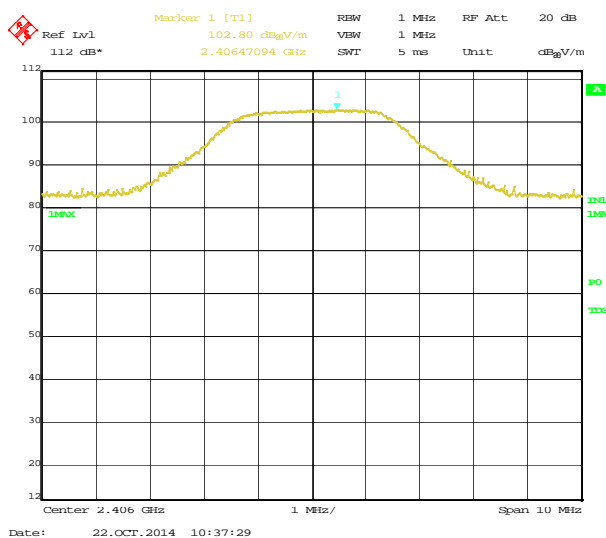
Field Strength of Fundamental

E.U.T Description Around - Voice Activated Speakerphone
Model Number Base Unit
Serial Number: Not designated

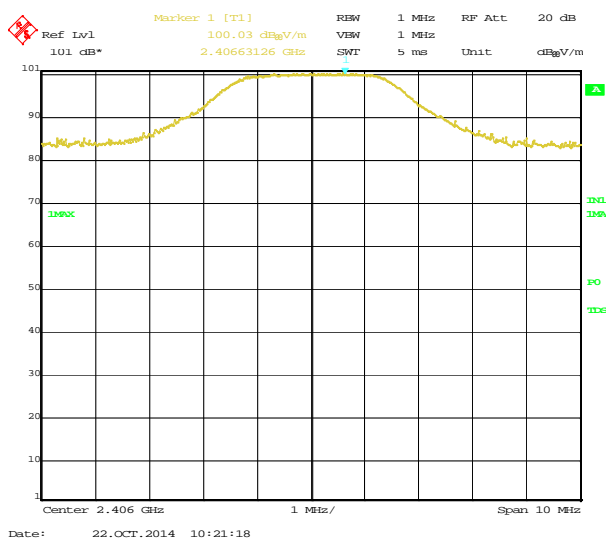
Specification: F.C.C., Part 15, Subpart C 15.249(a)

Antenna Polarization: Horizontal/Vertical
Test Distance: 3 meters

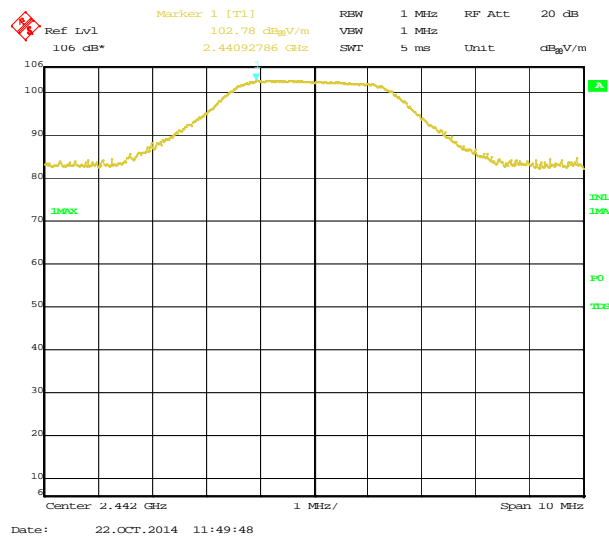
Operation Frequency: Low/Mid/High
Detector: Peak



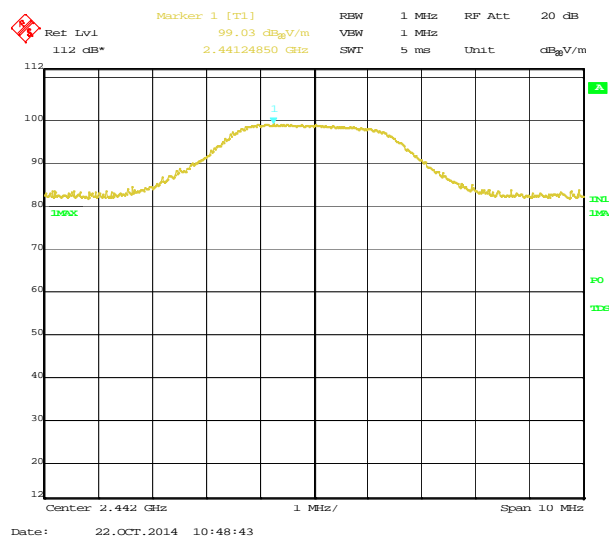
**Figure 7. Field Strength of Fundamental. Antenna Polarization: HORIZONTAL
FREQ: LOW**



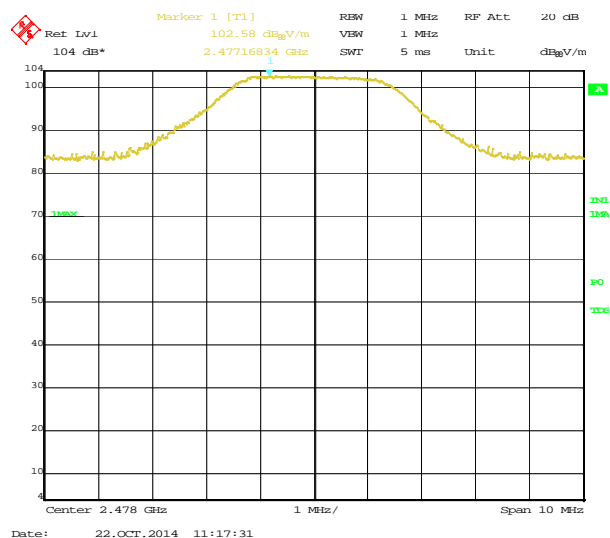
**Figure 8. Field Strength of Fundamental. Antenna Polarization: VERTICAL
FREQ: LOW**



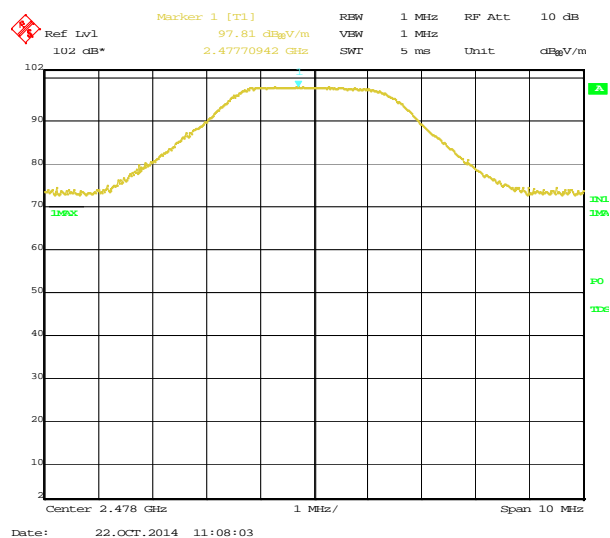
**Figure 9. Field Strength of Fundamental. Antenna Polarization: HORIZONTAL
FREQ: MID**



**Figure 10. Field Strength of Fundamental. Antenna Polarization: VERTICAL
FREQ: MID**



**Figure 11. Field Strength of Fundamental. Antenna Polarization: HORIZONTAL
FREQ: HIGH**



**Figure 12. Field Strength of Fundamental. Antenna Polarization: VERTICAL
FREQ: HIGH**



4.4 Test Instrumentation Used, Field Strength of Fundamental

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	Rohde & Schwarz	ESIB7	100120	December 19, 2013	1 Year
EMI Receiver	Rohde & Schwarz	ESCI7	100724	December 17, 2013	1 Year
Horn Antenna	ETS	3115	6142	March 14, 2012	3 Years
Antenna Mast	ETS	2070-2	9608-1497	N/A	N/A
Turntable	ETS	2087	-	N/A	N/A
Mast & Table Controller	ETS/EMCO	2090	9608-1456	N/A	N/A

Figure 13 Test Equipment Used

5. Conducted Emission

5.1 Test Specification

F.C.C., Part 15, Subpart C, Section 15.249

5.2 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 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.

5.3 Measured Data

JUDGEMENT: Passed by 9.62 dB

The margin between the emission levels and the specification limit is, in the worst case, 9.62 dB for the phase line at 0.462 MHz and 12.58 dB at 0.474 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 14* to *Figure 17*.

TEST PERSONNEL:

Tester Signature: 

Date: 11.11.14

Typed/Printed Name: M. Zohar



Conducted Emission

E.U.T Description: Around - Voice Activated
Speakerphone

Type: Base Unit

Serial Number: Not designated

Specification: F.C.C., Part 15, Subpart C, Class B

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	150 kHz	51.05	-14.95
2	Average	210 kHz	34.60	-18.60
1	Quasi Peak	258 kHz	38.64	-22.85
2	Average	366 kHz	28.27	-20.31
1	Quasi Peak	458 kHz	44.39	-12.33
2	Average	462 kHz	37.02	-9.62
1	Quasi Peak	738 kHz	28.72	-27.27
2	Average	738 kHz	22.92	-23.07
2	Average	1.722 MHz	19.11	-26.88
1	Quasi Peak	1.79 MHz	23.60	-32.39
2	Average	3.238 MHz	16.53	-29.46
1	Quasi Peak	3.478 MHz	22.96	-33.03
2	Average	3.606 MHz	14.50	-31.50
1	Quasi Peak	3.626 MHz	20.40	-35.59
1	Quasi Peak	7.522 MHz	25.68	-34.31
2	Average	8.194 MHz	21.74	-28.25
1	Quasi Peak	11.214 MHz	19.12	-40.87
2	Average	11.334 MHz	13.91	-36.08
2	Average	24.574 MHz	23.94	-26.05
1	Quasi Peak	24.578 MHz	26.23	-33.76

Date: 13.JUL.2014 12:38:13

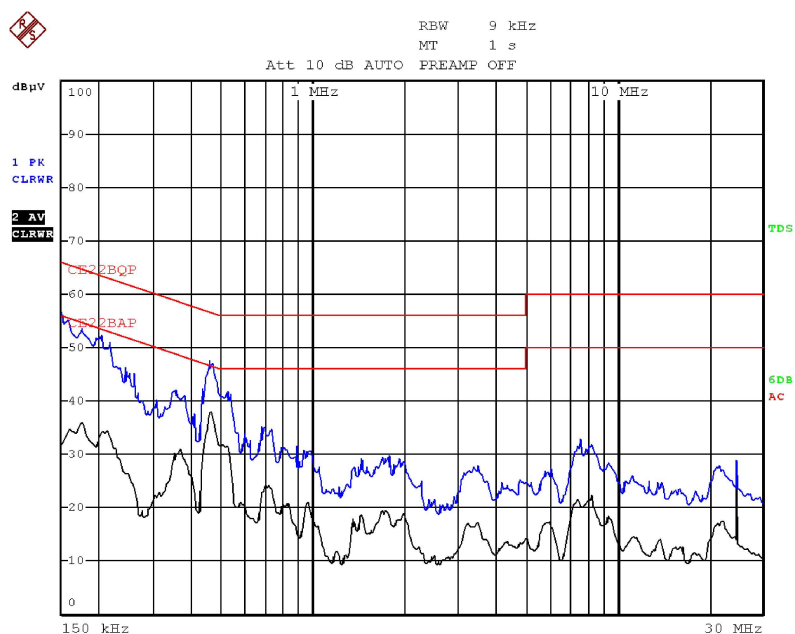
Figure 14. Detectors: Quasi-peak, Average

Note: DELTA LIMIT 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 Around - Voice Activated Speakerphone
Type Base Unit
Serial Number: Not designated

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



Date: 13.JUL.2014 12:36:13

Figure 15 Detectors: Quasi-peak, Average

Conducted Emission

E.U.T Description: Around - Voice Activated Speakerphone
Type: Base Unit
Serial Number: Not designated

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

EDIT PEAK LIST (Final Measurement Results)				
Trace1:	CE22BQF			
Trace2:	CE22BAP			
Trace3:	---			
TRACE	FREQUENCY	LEVEL dBμV	DELTA LIMIT dB	
1 Quasi Peak	162 kHz	49.91	-15.44	
2 Average	166 kHz	35.53	-19.62	
1 Quasi Peak	350 kHz	35.11	-23.84	
2 Average	370 kHz	28.56	-19.94	
1 Quasi Peak	462 kHz	43.19	-13.46	
2 Average	474 kHz	33.85	-12.58	
1 Quasi Peak	1.026 MHz	28.88	-27.11	
2 Average	1.078 MHz	23.01	-22.98	
1 Quasi Peak	1.274 MHz	28.13	-27.86	
2 Average	1.346 MHz	24.15	-21.84	
1 Quasi Peak	2.446 MHz	23.54	-32.45	
2 Average	2.558 MHz	19.62	-26.37	
2 Average	4.114 MHz	16.39	-29.60	
1 Quasi Peak	4.13 MHz	21.51	-34.48	
1 Quasi Peak	7.086 MHz	20.06	-39.93	
2 Average	8.19 MHz	17.70	-32.29	
2 Average	11.222 MHz	13.53	-36.46	
1 Quasi Peak	11.454 MHz	18.81	-41.18	
2 Average	24.574 MHz	23.49	-26.50	
1 Quasi Peak	24.578 MHz	25.60	-34.39	

Date: 13.JUL.2014 12:45:11

Figure 16. Detectors: Quasi-peak, Average

Note: DELTA LIMIT 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 Around - Voice Activated Speakerphone

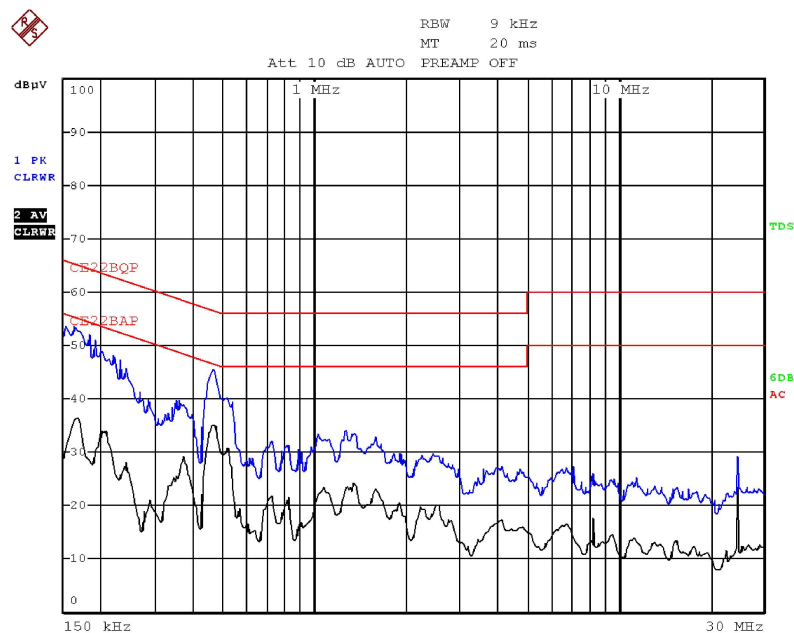
Type Base Unit

Serial Number: Not designated

Specification: FCC Part 15, Subpart B, Class B

Lead: Neutral

Detectors: Quasi-peak, Average



Date: 13.JUL.2014 12:42:57

Figure 17 Detectors: Quasi-peak, Average



5.4 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
Transient Limiter	HP	11947A	3107A03041	May 13, 2014	1 Year
EMI Receiver	Rohde & Schwarz	ESCI7	100724	December 17, 2013	1 Year

Figure 18 Test Equipment Used



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 LOW (2406 MHz), MID (2442 MHz) and HIGH (2478 MHz).

6.3 Measured Data

JUDGEMENT: Passed

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

No results were detected in the range of 9 kHz-30 MHz.

TEST PERSONNEL:

Tester Signature: 

Date: 11.11.14

Typed/Printed Name: M. Zohar



6.4 Test Instrumentation Used; Radiated Measurements 9kHz-30MHz

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	Rohde & Schwarz	ESIB7	100120	December 19, 2013	1 Year
Active Loop Antenna	EMCO	6502	9506-2950	November 4, 2013	1 year
Antenna Mast	ETS	2070-2	9608-1497	N/A	N/A
Turntable	ETS	2087	-	N/A	N/A
Mast & Table Controller	ETS/EMCO	2090	9608-1456	N/A	N/A

Figure 19 Test Equipment 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: $FS = 30.7 \text{ dB}\mu\text{V (RA)} + 14.0 \text{ dB (AF)} + 0.9 \text{ dB (CF)} = 45.6 \text{ dB}\mu\text{V}$

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 – 7 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 7 - 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 1.4 dB in the worst case at the frequency of 2390.0 MHz, 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: 11.11.14

Typed/Printed Name: M. Zohar

Spurious Radiated Emission 30 MHz - 25GHz

E.U.T Description Around - Voice Activated Speakerphone
Type Base Unit
Serial Number: Not designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical Frequency range: 30 MHz 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	62.3	74.0	-11.7
2390.0	V	63.7	74.0	-10.3
2483.5	H	57.0	74.0	-17.0
2483.5	V	62.1	74.0	-11.9
4812.0	H	59.3	74.0	-14.7
4812.0	V	60.7	74.0	-13.3
4884.0	H	61.1	74.0	-12.9
4884.0	V	62.3	74.0	-11.7
4956.0	H	62.4	74.0	-11.6
4956.0	V	61.9	74.0	-12.1

**Figure 20. 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

Spurious Radiated Emission 30 MHz-25 GHz

E.U.T Description Around - Voice Activated Speakerphone
Type Base Unit
Serial Number: Not designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical Frequency range: 30 MHz to 25.0 GHz
Test Distance: 3 meters Detector: peak
Operation Frequency: Low/Mid/High

Freq.	Polarity	Avg Factor	Average Amp	Average Specification	AVg. Margin
(MHz)	(H/V)	(dB)	(dBμV/m)	(dB μV/m)	(dB)
2390.0	H	11.1	51.2	54.0	-2.8
2390.0	V	11.1	52.6	54.0	-1.4
2483.5	H	11.1	45.9	54.0	-8.1
2483.5	V	11.1	51.0	54.0	-3.0
4812.0	H	11.1	48.2	54.0	-5.8
4812.0	V	11.1	49.6	54.0	-4.4
4884.0	H	11.1	50.0	54.0	-4.0
4884.0	V	11.1	51.2	54.0	-2.8
4956.0	H	11.1	51.3	54.0	-2.7
4956.0	V	11.1	50.8	54.0	-3.2

**Figure 21. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL.
Detector: peak**

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 = 0.6msec
4. Time between bursts = 18.6msec
5. Average Factor = $20 \log \left[\frac{\text{Pulse duration}}{\text{Pulse period}} \times \frac{\text{burst duration}}{100\text{msec}} \times \text{Num of burst within 100msec} \right]$

$$\text{Average Factor} = 20 \log \left[1 * \frac{0.6}{100} * 6 \right] = 11.1dB$$

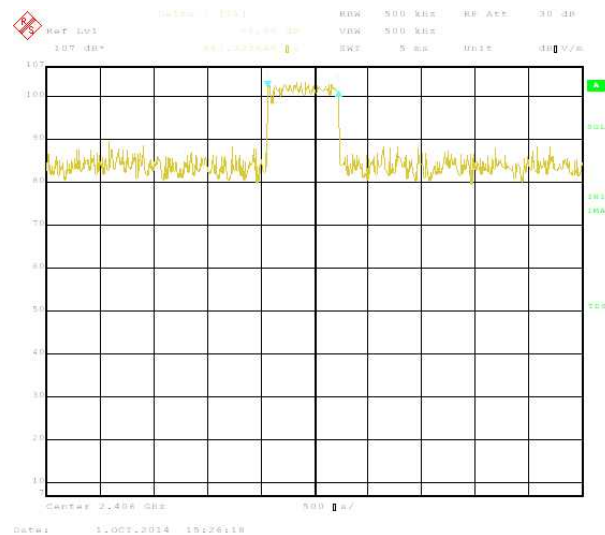
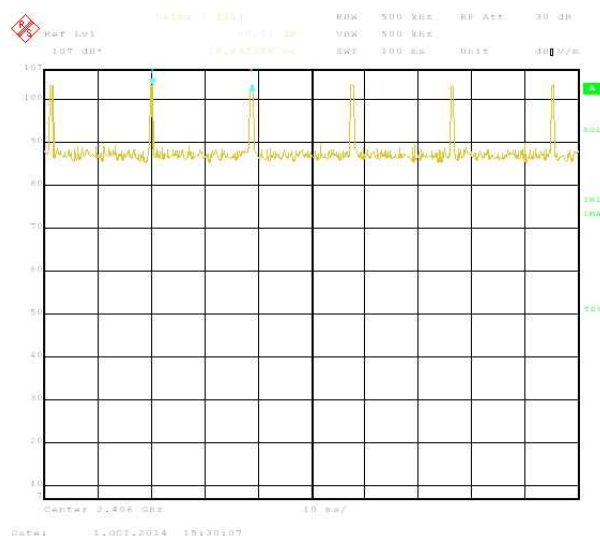


Figure 22. Transmission Burst Duration = 0.6 msec



**Figure 23. Time Between Transmissions 18.6 msec
6 bursts in 100msec**

7.3 Test Instrumentation Used; Spurious Radiated Emission

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
EMI Receiver	Rohde & Schwarz	ESIB7	100120	December 19, 2013	1 year
EMC Analyzer	HP	HP8593	3536A00120	March 6, 2014	1 year
Biconilog Antenna	EMCO	3142B	1250	May 22, 2014	2 years
Horn Antenna	ETS	3115	6142	March 14, 2012	3 years
Horn Antenna	ARA	SWH-28	1007	March 30, 2014	3 years
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	August 22, 2014	1 year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	August 29, 2014	1 year
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2014	1 year
Spectrum Analyzer	HP	8564E	3442A00275	March 2, 2014	1 year
Antenna Mast	ETS	2070-2	9608-1497	N/A	N/A
Turntable	ETS	2087	-	N/A	N/A
Mast & Table Controller	ETS/EMCO	2090	9608-1456	N/A	N/A

Figure 24 Test Equipment Used

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:

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

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. Antenna Gain/Information

3.3 dBi

2.4 GHz Inverted F Antenna - Texas Instruments Design Note DN0007

9. R.F Exposure/Safety

Typical use of the E.U.T. is as a base unit for a voice activated phone.

The typical placement of the E.U.T. is on a flat surface. 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 2442 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

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

P_t- Transmitted Power 102.8 dBuV/m (Peak) = 5.75 mW

*G_T- Antenna Gain,

*Note – because antenna is integral and tests were performed radiated, the transmitted power, P_t, takes the antenna gain into account

R- Distance from Transmitter using 1cm worst case

(c) The peak power density is:

$$S_p = \frac{5.75}{4f(1)^2} = 0.457 \frac{mW}{cm^2}$$

(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)	Cable Loss (dB)
0.010	0.4
0.015	0.2
0.020	0.2
0.030	0.3
0.050	0.3
0.075	0.3
0.100	0.2
0.150	0.2
0.200	0.3
0.500	0.4
1.00	0.4
1.50	0.5
2.00	0.5
5.00	0.6
10.00	0.8
15.00	0.9
20.00	0.8

Frequency (MHz)	Cable Loss (dB)
50.00	1.2
100.00	0.7
150.00	20.1
200.00	2.3
300.00	2.9
500.00	3.8
750.00	4.8
1000.00	5.4
1500.00	6.7
2000.00	9.0
2500.00	9.4
3000.00	9.9
3500.00	10.2
4000.00	11.2
4500.00	12.1
5000.00	13.1
5500.00	13.5
6000.00	14.5

NOTES:

1. The cable type is SPUMA400 RF-11N(X2) and 39m long
2. The cable is manufactured by Huber + Suhner

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 Bilog ANTENNA

Model: 3142

Antenna serial number: 1250

3 meter range

FREQUENCY	AFE	FREQUENCY	AFE
(MHz)	(dB/m)	(MHz)	(dB/m)
30	18.4	1100	25
40	13.7	1200	24.9
50	9.9	1300	26
60	8.1	1400	26.1
70	7.4	1500	27.1
80	7.2	1600	27.2
90	7.5	1700	28.3
100	8.5	1800	28.1
120	7.8	1900	28.5
140	8.5	2000	28.9
160	10.8		
180	10.4		
200	10.5		
250	12.7		
300	14.3		
400	17		
500	18.6		
600	19.6		
700	21.1		
800	21.4		
900	23.5		
1000	24.3		



10.5 Correction factors for Horn ANTENNA.

Model: 3115

Antenna serial number: 6142

3 meter range

FREQUENCY	Antenna Factor	FREQUENCY	Antenna Factor
(MHz)	(dB/m)	(MHz)	(dB/m)
1000	23.9	10500	38.4
1500	25.4	11000	38.5
2000	27.3	11500	39.4
2500	28.5	12000	39.2
3000	30.4	12500	39.4
3500	31.6	13000	40.7
4000	33	14000	42.1
4500	32.7	15000	40.1
5000	34.1	16000	38.2
5500	34.5	17000	41.7
6000	34.9	17500	45.7
6500	35.1	18000	47.7
7000	35.9		
7500	37.5		
8000	37.6		
8500	38.3		
9000	38.5		
9500	38.1		
10000	38.6		

10.6 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".



10.7 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
	(dB 1/m)	(dBi)		(dB 1/m)	(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	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