



DATE: 31 August 2016

**I.T.L. (PRODUCT TESTING) LTD.
FCC Radio Test Report
for
Haldor Advanced Technologies
Ltd.**

Equipment under test:

**RFID and Barcode Reader
HScanner ORL100.023 (Wired);
HScanner ORL100.024 (Wireless)***

*See customer's declaration on page 5

Tested by:


M. Zohar

Approved by:


D. Shidlow

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 Haldor Advanced Technologies Ltd.

RFID and Barcode Reader

HScanner ORL100.023 (Wired);

FCC ID: X4V-HSCANNER

This report concerns: Original Grant: X
Class I Change:
Class II Change:

Equipment type: DCD - Part 15 Low Power Transmitter Below
1705 kHz

Limits used: 47CFR15 Section 15.225

Measurement procedure used ANSI C.63.10 2013

Application for Certification
prepared by:
R. Pinchuck
ITL (Product Testing) Ltd.
1 Batsheva Street
Lod, 7120101
Israel
e-mail Rpinchuck@itl.co.il

Applicant for this device:
(different from "prepared by")
Morr Avissara
Haldor Advanced Technologies Ltd.
2 Habanai St.
Hod Hasharon 45319
Israel
Tel: +972- 9 – 788 - 5867
Fax: +972- 9 - 788 - 5861
e-mail: morr.avissara@haldor-tech.com

TABLE OF CONTENTS

1.	GENERAL INFORMATION	4
1.1	Administrative Information	4
1.2	List of Accreditations	6
1.3	Product Description	7
1.4	Test Methodology	7
1.5	Test Facility	7
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	9
3.	TEST SETUP PHOTOS	10
4.	CONDUCTED EMISSION FROM AC MAINS	13
4.1	Test Specification	13
4.2	Test Procedure	13
4.3	Limit	13
4.4	Test Results for Wired Power	14
4.5	Test Results for Wireless Power	14
4.6	Test Equipment Used; Conducted Emission	23
5.	FIELD STRENGTH OF FUNDAMENTAL	24
5.1	Test Specification	24
5.2	Test Procedure	24
5.3	Limit	24
5.4	Test Results	25
5.5	Test Instrumentation Used; Field Strength of Fundamental	27
6.	RADIATED EMISSION, 9 KHZ – 200 MHZ	28
6.1	Test Specification	28
6.2	Test Procedure	28
6.3	Test Limits	28
6.4	Test Results	29
6.5	Test Instrumentation Used; Radiated Measurements	31
6.6	Field Strength Calculation	31
7.	OCCUPIED BANDWIDTH	32
7.1	Test Specification	32
7.2	Test Procedure	32
7.3	Test Limits	32
7.4	Test Results	32
7.5	Test Equipment Used; Occupied Bandwidth	33
8.	FREQUENCY TOLERANCE	34
8.1	Test Specification	34
8.2	Test Procedure	34
8.3	Test Limits	34
8.4	Test Results	34
8.5	Test Instruments Used; Frequency Tolerance	36
9.	APPENDIX B - CORRECTION FACTORS	37
9.1	Correction factors for CABLE	37
9.2	Correction factors for ACTIVE LOOP ANTENNA	38
9.3	Correction factors for Biconical Antenna	39



1. General Information

1.1 Administrative Information

Manufacturer: Haldor Advanced Technologies Ltd.

Manufacturer's Address: 2 Habanai St.,
Hod Hasharon, 4531902
Israel
Tel: +972-9-788-5858
Fax: +972-9-788-5861

Manufacturer's Representative: Ronen Shtekel

Equipment Under Test (E.U.T): RFID and Barcode Reader

Equipment Model No.: HScanner ORL100.023 (Wired);
HScanner ORL100.024 (Wireless)*

Equipment Part No.: Not designated

Date of Receipt of E.U.T: April 13, 2016

Start of Test: May 02, 2016, August 21, 2016**

End of Test: May 04, 2016, August 21, 2016**

Test Laboratory Location: I.T.L (Product Testing) Ltd.
1 Batsheva St.,
Lod
ISRAEL 7120101

Test Specifications: FCC Part 15, Subpart C

*See customer's Declaration on following page.

**Occupied Bandwidth testing was performed on August 21, 2016.

Date: July 17, 2017

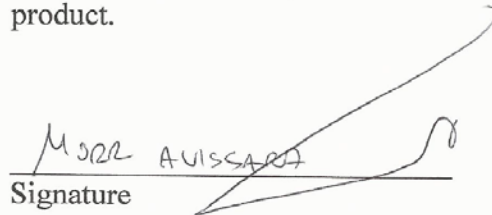
DECLARATION

I HEREBY DECLARE THE FOLLOWING REGARDING THE BELOW MODELS:

- 1) HScanner ORL100.023 (Wired)
- 2) HScanner ORL100.024 (Wireless)

1. The above models contain the identical 13.56 MHz radio transmitter.
2. The only difference between the two models is that the wired model is powered via a USB cable connected to a computer and the wireless model is powered via a rechargeable battery .

Please relate to them (from an RADIO point of view) as the same product.


Signature
Morr Avissara
COO
Haldor Advanced Technologies Ltd.



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 No. IL1005.
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; Sites No. IC 4025A-1, 4025A-2.

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 HScanner™ is a proprietary multi-reader designed and optimized for track and trace of surgical items in the SPD and the ORs.

It detects both barcode and RFID marked items and it has two models:

1. USB device for point of scan where that work is done while being near a table.
2. Wireless version with a dedicated charging base.

The wireless version connects to a PC via a standard Bluetooth protocol.

The wireless version contains a FCC Certified Bluetooth module manufactured by Amp'ed RF Technology Inc., model SPBT2632C2A, FCC ID: X3ZBTMOD5.

The Bluetooth module does not transmit at the same time as the 13.56 transmitter.

Model name	HScanner
Working voltage	1. Wired - 5V via USB connected to computer 2. Wireless - built in rechargeable Li-Ion 3.7V battery
Mode of operation	13.56MHz Transceiver
Modulation	ASK
Assigned Frequency Range	13.110-14.010 MHz
Operation Frequency Range	13.56 MHz
Temperature (°C)/ Humidity (%RH)	24.6°C/41.1%

1.4 **Test Methodology**

Radiated testing was performed according to the procedures in ANSI C63.10: 2013. Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.5 **Test Facility**

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 FCC Designation No. IL1005.

1.6 **Measurement Uncertainty**

Conducted Emission

Conducted Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4)

0.15-30MHz

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):

± 4.98 dB

2. System Test Configuration

2.1 Justification

The E.U.T was transmitting continuously at 13.56MHz with modulation.

Exploratory radiated emission screening was performed in 3 orthogonal orientations to find the “worst case” orientation when comparing the power results in the 2 power modes: USB (wired power) and battery rechargeable mode (wireless power).

The worst case was found in wired power mode and in the Z axis orientation. For more information see table below.

Unit	X			Y			Z		
	Fundamental	2 nd Harmonic	3 th Harmonic	Fundamental	2 nd Harmonic	3 th Harmonic	Fundamental	2 nd Harmonic	3 th Harmonic
	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)
Wired Power	61.2	43.1	48.4	57.6	42.9	48.5	61.5	43.3	49.3
Wireless Power	59.7	36.6	27.5	57.2	36.1	27.8	58.7	36.0	28.4

Figure 1. Screening Results

2.2 EUT Exercise Software

No special exercise software was needed.

2.3 Special Accessories

No accessories were used.

2.4 Equipment Modifications

No modifications were needed in order to achieve compliance.

2.5 Configuration of Tested System

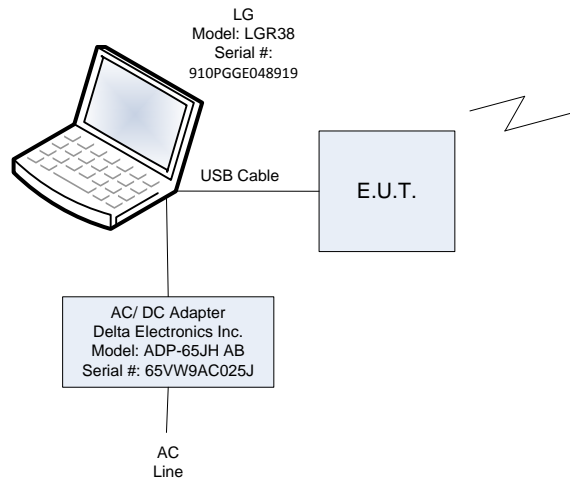


Figure 2. Configuration of Tested System-Wired Power Mode

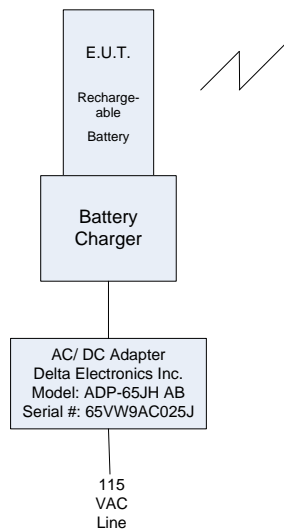


Figure 3. Configuration of Tested System-Wireless Power Mode

3. Test Setup Photos



Figure 4. Conducted Emission from AC Mains Test - Wired



Figure 5. Conducted Emission from AC Mains Test – Wireless



Figure 6. Frequency Stability



Figure 7. Field Strength of Fundamental



Figure 8. Radiated Emission 30MHz-200MHz

4. Conducted Emission From AC Mains

4.1 Test Specification

Part 15, Subpart C, Section 15.207

4.2 Test Procedure

The E.U.T operation mode and test setup are as described in Section 2 of this report. 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. In the case of a floor-standing E.U.T., it was placed on the horizontal ground plane.

The E.U.T was powered from 115 V AC / 60 Hz via 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.'s 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 effect of varying the position of the cables was investigated to find the configuration that produces maximum emission. The configuration tested is shown in the photograph, *Figure 4. Conducted Emission from AC Mains Test - Wired* and *Figure 5. Conducted Emission from AC Mains Test – Wireless*.

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 and are displayed on the receiver's spectrum display.

The E.U.T was evaluated in TX operation mode and in 2 power mode operations: wired and wireless

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

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

4.3 Test Limit

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

4.4 Test Results for Wired Power

JUDGEMENT: Passed by 16.4 dB

The margin between the emission levels and the specification limit is, in the worst case, 16.4 dB for the phase line at 0.474 MHz and 17.4 dB at 0.182 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 9* to *Figure 12*.

4.5 Test Results for Wireless Power

JUDGEMENT: Passed by 18.01 dB

The margin between the emission levels and the specification limit is, in the worst case, 18.01 dB for the phase line at 0.162 MHz and 23.17 dB at 0.198 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 13* to *Figure 16*.

Conducted Emission

E.U.T Description: RFID and Barcode Reader
Type: HScanner ORL100.023 (Wired)
Serial Number: Not designated

Specification: FCC Part 15, Subpart C
Lead: Phase
Detectors: : Peak, Quasi-peak, Average
Power Operation: Wired

EDIT PEAK LIST (Final Measurement Results)				
Trace1:	CE22BQP			
Trace2:	CE22BAP			
Trace3:	---			
TRACE	FREQUENCY	LEVEL dBμV	DELTA	LIMIT dB
1 Quasi Peak	174 kHz	47.44	-17.32	
2 Average	178 kHz	37.85	-16.72	
1 Quasi Peak	234 kHz	41.27	-21.03	
2 Average	238 kHz	32.07	-20.09	
1 Quasi Peak	290 kHz	34.18	-26.33	
2 Average	294 kHz	26.36	-24.04	
1 Quasi Peak	466 kHz	36.23	-20.34	
2 Average	474 kHz	30.02	-16.41	
1 Quasi Peak	534 kHz	34.17	-21.82	
2 Average	542 kHz	25.59	-20.40	
2 Average	770 kHz	23.28	-22.71	
2 Average	1.394 MHz	22.27	-23.72	
1 Quasi Peak	1.454 MHz	34.00	-21.99	
2 Average	1.51 MHz	22.67	-23.32	
1 Quasi Peak	13.398 MHz	27.66	-32.33	
2 Average	13.398 MHz	14.69	-35.30	
1 Quasi Peak	13.406 MHz	25.86	-34.13	
1 Quasi Peak	13.61 MHz	33.67	-26.32	
2 Average	13.614 MHz	15.54	-34.45	
1 Quasi Peak	13.622 MHz	30.07	-29.93	

Date: 2.MAY.2016 13:58:58

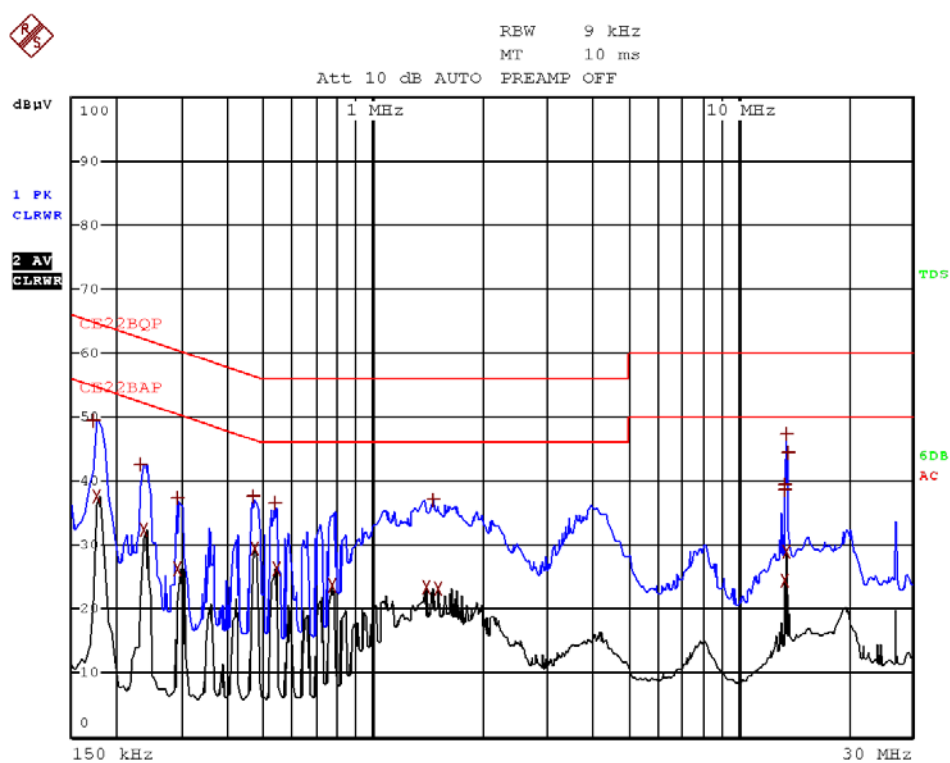
Figure 9. Detectors: Peak, Quasi-peak, Average

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 RFID and Barcode
Reader
Type HScanner ORL100.023
(Wired)
Serial Number: Not designated

Specification: FCC Part 15, Subpart C
Lead: Phase
Detectors: Peak, Quasi-peak, Average
Power Operation Wired



Date: 2.MAY.2016 13:57:18

Figure 10. Detectors: Peak, Quasi-peak, Average

Conducted Emission

E.U.T Description: RFID and Barcode Reader
Type: HScanner ORL100.023 (Wired)
Serial Number: Not designated

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

EDIT PEAK LIST (Final Measurement Results)				
Trace1:	CE22BQP			
Trace2:	CE22BAP			
Trace3:	---			
	TRACE	FREQUENCY	LEVEL dBμV	DELTA LIMIT dB
2	Average	178 kHz	36.17	-18.40
1	Quasi Peak	182 kHz	47.00	-17.39
2	Average	238 kHz	28.42	-23.74
1	Quasi Peak	242 kHz	40.25	-21.77
1	Quasi Peak	294 kHz	34.36	-26.04
2	Average	298 kHz	20.65	-29.64
2	Average	358 kHz	21.89	-26.88
2	Average	418 kHz	19.85	-27.63
2	Average	470 kHz	25.90	-20.61
1	Quasi Peak	530 kHz	35.58	-20.41
2	Average	530 kHz	27.62	-18.37
2	Average	770 kHz	22.21	-23.78
2	Average	1.63 MHz	19.14	-26.85
1	Quasi Peak	13.262 MHz	24.35	-35.64
1	Quasi Peak	13.466 MHz	27.03	-32.96
2	Average	13.47 MHz	14.82	-35.17
1	Quasi Peak	13.478 MHz	30.72	-29.27
1	Quasi Peak	13.682 MHz	25.36	-34.63
1	Quasi Peak	13.694 MHz	25.97	-34.03
1	Quasi Peak	18.126 MHz	27.72	-32.27

Date: 2.MAY.2016 13:47:19

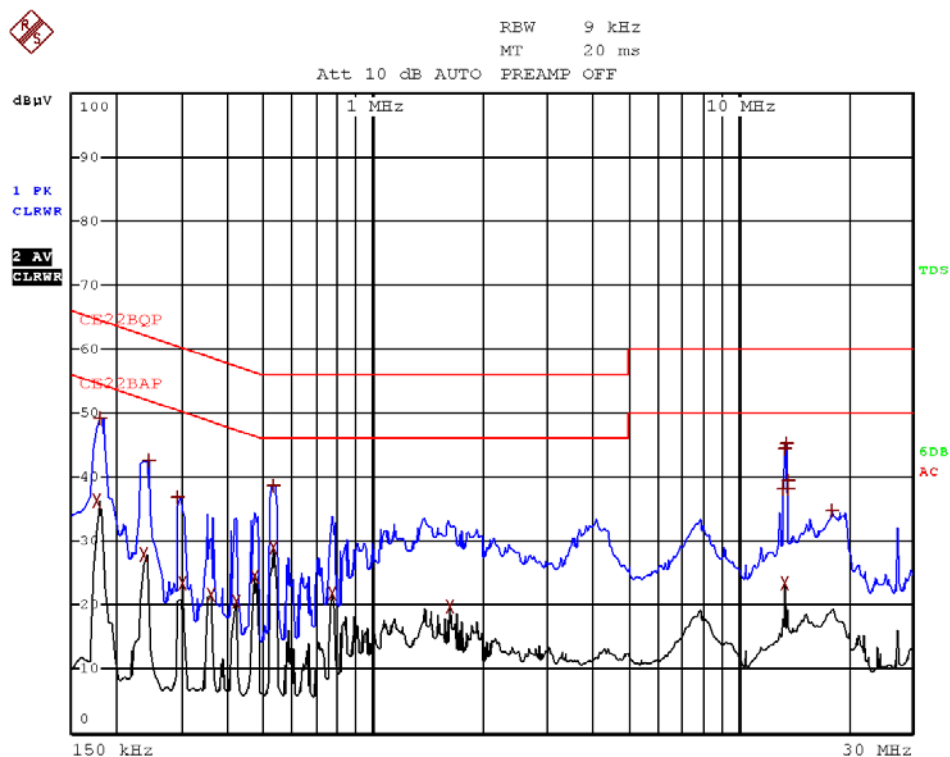
Figure 11. Detectors: Peak, Quasi-peak, Average

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 RFID and Barcode
Reader
Type HScanner
ORL100.023 (Wired)
Serial Number: Not designated

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



Date: 2.MAY.2016 13:45:33

Figure 12 Detectors: Peak, Quasi-peak, Average

Conducted Emission

E.U.T Description RFID and Barcode Reader
Type HScanner ORL100.023 (Wireless)
Serial Number: Not designated

Specification: FCC Part 15, Subpart C
Lead: Phase
Detectors: : Peak, Quasi-peak, Average
Power Operation Wireless

EDIT PEAK LIST (Final Measurement Results)				
Trace1:	CE22BQP			
Trace2:	CE22BAP			
Trace3:	---			
	TRACE	FREQUENCY	LEVEL dBμV	DELTA LIMIT dB
1	Quasi Peak	162 kHz	47.34	-18.01
2	Average	166 kHz	30.20	-24.95
2	Average	198 kHz	28.12	-25.57
2	Average	230 kHz	23.82	-28.62
2	Average	262 kHz	18.67	-32.69
2	Average	434 kHz	9.12	-38.05
1	Quasi Peak	438 kHz	25.97	-31.12
1	Quasi Peak	462 kHz	24.04	-32.61
2	Average	462 kHz	10.72	-35.92
2	Average	506 kHz	11.00	-34.99
2	Average	530 kHz	10.52	-35.47
1	Quasi Peak	1.79 MHz	24.56	-31.43
1	Quasi Peak	2.086 MHz	26.18	-29.81
1	Quasi Peak	2.406 MHz	25.86	-30.13
1	Quasi Peak	2.734 MHz	25.45	-30.54
1	Quasi Peak	3.258 MHz	26.30	-29.69
2	Average	5.59 MHz	25.23	-24.76
1	Quasi Peak	5.814 MHz	33.77	-26.22
1	Quasi Peak	19.118 MHz	29.13	-30.86
2	Average	19.286 MHz	22.54	-27.45

Date: 4.MAY.2016 07:57:17

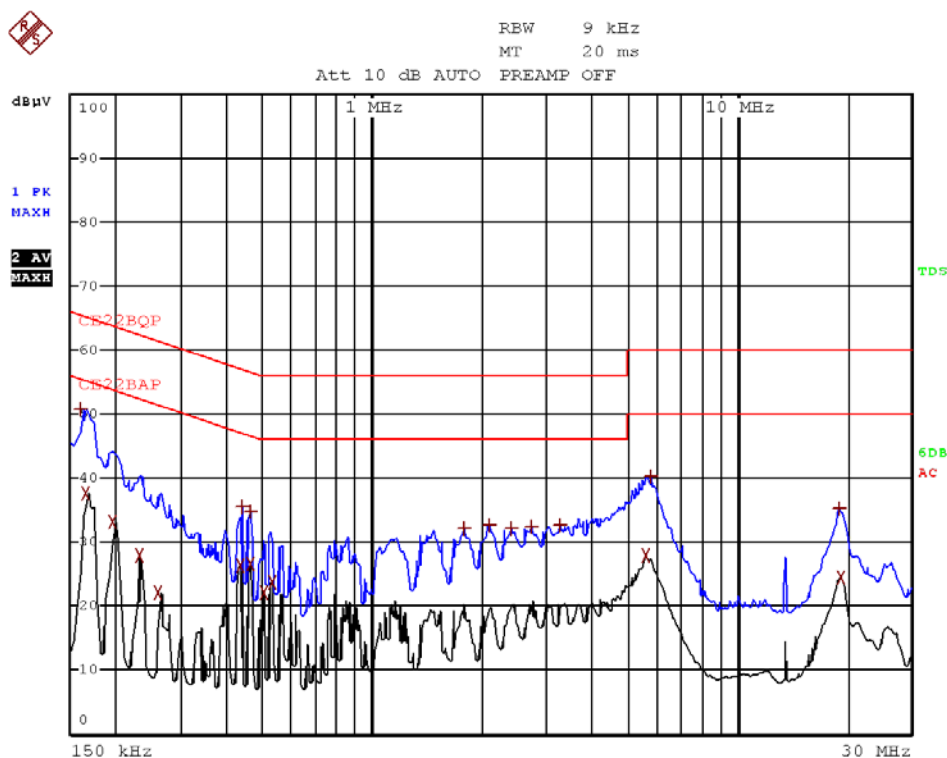
Figure 13. Detectors: Peak, Quasi-peak, Average

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 RFID and Barcode Reader
Type HScanner ORL100.023 (Wireless)
Serial Number: Not designated

Specification: FCC Part 15, Subpart C
Lead: Phase
Detectors: Peak, Quasi-peak, Average
Power Operation Wireless



Date: 4.MAY.2016 07:55:41

Figure 14. Detectors: Peak, Quasi-peak, Average

Conducted Emission

E.U.T Description RFID and Barcode Reader
Type HScanner ORL100.023 (Wireless)
Serial Number: Not designated

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

EDIT PEAK LIST (Final Measurement Results)				
Trace1:	CE22BQP			
Trace2:	CE22BAP			
Trace3:	---			
	TRACE	FREQUENCY	LEVEL dBμV	DELTA LIMIT dB
1	Quasi Peak	162 kHz	32.69	-32.66
2	Average	170 kHz	29.52	-25.43
2	Average	182 kHz	24.85	-29.53
2	Average	198 kHz	30.51	-23.17
2	Average	210 kHz	18.09	-35.10
2	Average	238 kHz	15.83	-36.32
2	Average	390 kHz	17.90	-30.15
1	Quasi Peak	418 kHz	31.52	-25.95
2	Average	422 kHz	23.37	-24.03
2	Average	442 kHz	20.26	-26.76
1	Quasi Peak	446 kHz	29.10	-27.84
1	Quasi Peak	774 kHz	23.71	-32.28
1	Quasi Peak	1.098 MHz	24.41	-31.58
1	Quasi Peak	1.418 MHz	24.04	-31.95
1	Quasi Peak	1.746 MHz	24.02	-31.98
2	Average	5.55 MHz	22.32	-27.67
1	Quasi Peak	5.662 MHz	31.73	-28.26
1	Quasi Peak	13.586 MHz	17.55	-42.45
1	Quasi Peak	18.858 MHz	27.50	-32.49
2	Average	19.074 MHz	20.94	-29.05

Date: 4.MAY.2016 08:07:33

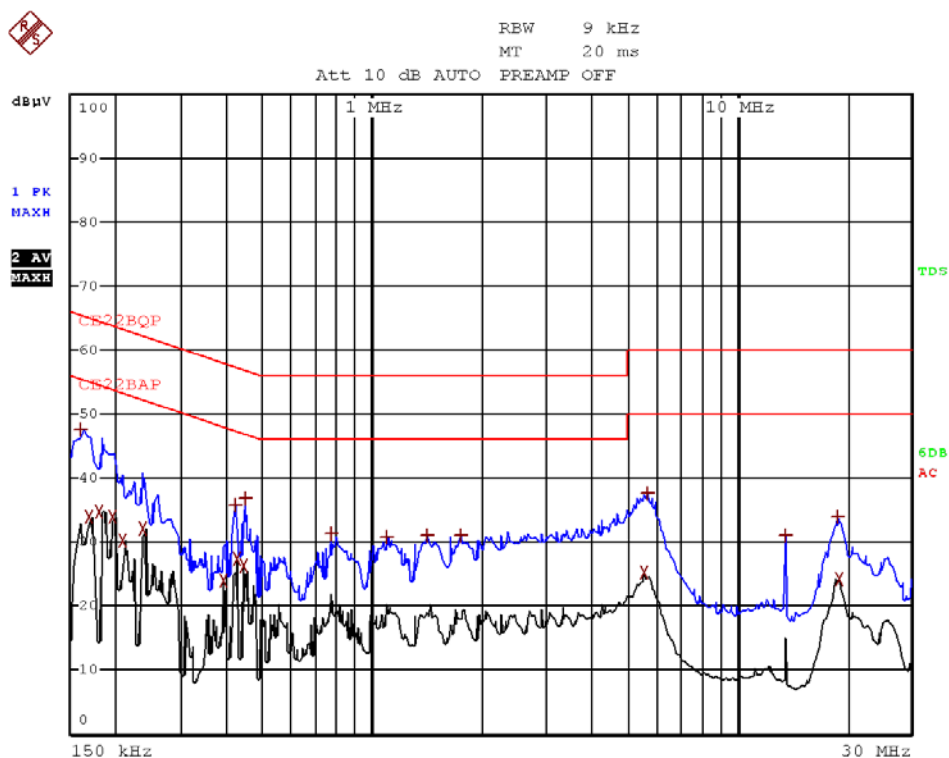
Figure 15. Detectors: Peak, Quasi-peak, Average

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 RFID and Barcode Reader
Type HScanner ORL100.023 (Wireless)
Serial Number: Not designated

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



Date: 4.MAY.2016 08:06:24

Figure 16 Detectors: Peak, Quasi-peak, Average



4.6 Test Equipment Used; Conducted Emission

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
LISN	Fischer	FCC-LISN-25A	127	March 16, 2015	June 30, 2016
Transient Limiter	HP	11947A	3107A03041	May 13, 2015	May 30, 2016
EMI Receiver	Rohde & Schwarz	ESCI7	100724	February 29, 2016	March 1, 2017

Figure 17 Test Equipment Used

5. Field Strength of Fundamental

5.1 Test Specification

Part 15, Subpart C, Section 15.225(a-c)

5.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 2 of this report.

The E.U.T. was placed in the chamber on a non-conductive table, 1.5 meters above the ground.

The EMI receiver was set to the E.U.T. Fundamental Frequency and Peak Detection.

The distance between the E.U.T. and test antenna was 3 meters.

The turntable and antenna were adjusted for maximum level reading on the EMI receiver.

5.3 Test Limit

The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency band	Field strength	Measurement distance	Field strength @30m	Field strength @3m*
(MHz)	(microvolts/meter)	(meters)	(dBμV/m)	(dBμV/m)
13.553-13.567	15,848.0	30.0	84.0	124.0
13.410-13.553	334.0	30.0	50.4	90.4
13.567-13.710				
13.110-13.410	106.0	30.0	40.5	80.5
13.710-14.010				
Up to 13.110	According 15.209			
From 14.010				

* Field strength @3m = $40 \log(30\text{m}/3\text{m}) = 40$

5.4 Test Results

The EUT met the FCC Part 15, Subpart C, 15.225(a-c) requirements.

JUDGEMENT: Passed by 10.64 dB

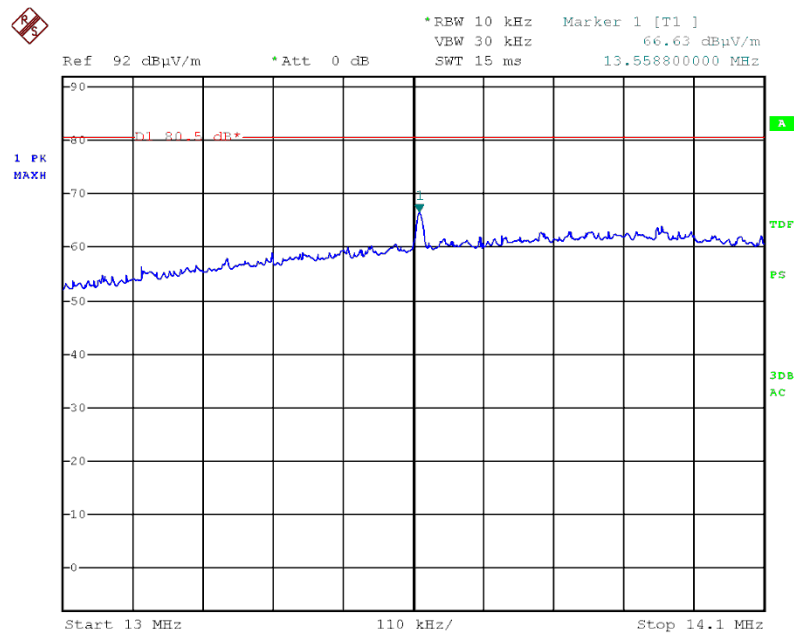
Polarity	Reading (dB μ V/m)	Limit (dB μ V/m)	Margin (dB μ V/m)
Horizontal	66.63	80.5	-13.87
Vertical	69.86	80.5	-10.64

Figure 18 Field Strength of Fundamental

The details of the highest emissions are given in *Figure 19* to *Figure 20*.

Field Strength of Fundamental

E.U.T Description RFID and Barcode Reader
Model Number HScanner ORL100.023 (Wired)
Part Number: Not designated

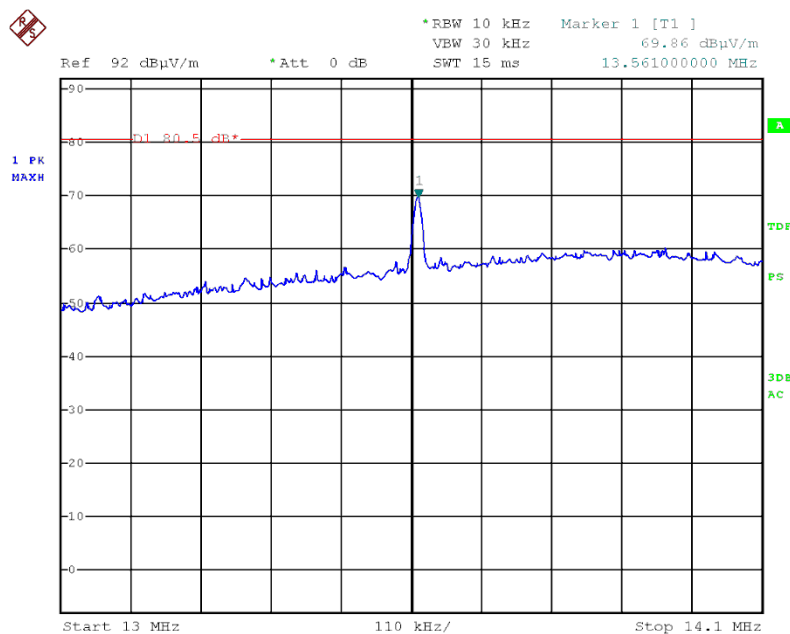


Date: 2.MAY.2016 10:22:15

Figure 19. Field Strength of Fundamental, Horizontal

Field Strength of Fundamental

E.U.T Description RFID and Barcode Reader
Model Number HScanner ORL100.023 (Wired)
Part Number: Not designated



Date: 2.MAY.2016 10:33:33

Figure 20. Field Strength of Fundamental, Vertical

5.5 Test Instrumentation Used; Field Strength of Fundamental

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
EMI Receiver	R&S	ESCI7	100724	February 29, 2016	March 1, 2017
Loop Antenna	EMCO	6502	2950	November 5, 2015	November 30, 2016
Semi Anechoic Chamber	ETS	S81	SL 11643	NCR	NCR

Figure 21. Test Equipment Used

6. Radiated Emission, 9 kHz – 200 MHz

6.1 Test Specification

Part 15, Subpart C, Sections 225(d), 209(a)

6.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 2 of this report.

For measurements between 0.009MHz-30.0MHz:

The E.U.T was tested inside the shielded room at a distance of 3 meters and the E.U.T was placed on a non-metallic table, 1.5 meters above the ground. The frequency range 0.009MHz-30.0MHz was scanned. The readings were maximized by the turntable azimuth between 0-360°, and the antenna polarization.

The emissions were measured at a distance of 3 meters.

For measurements between 30.0MHz-200.0MHz:

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, 1.0 meters above the ground. The frequency range 30.0MHz-200.0MHz was scanned. The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.

The emissions were measured at a distance of 3 meters.

6.3 Test Limits

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)	Field strength* (dBμV/m)	Field strength* (dBμV/m)@3m
0.009-0.490	2400/F(kHz)	300	48.5-13.8	128.5-73.8
0.490-1.705	24000/F(kHz)	30	33.8-23.0	73.8-63.0
1.705-30.0	30	30	29.5	69.5
30-88	100	3	40.0	40.0
88-216	150	3	43.5	43.5
216-960	200	3	46.0	46.0
Above 960	500	3	54.0	54.0

*The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector. For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.



6.4 Test Results

JUDGEMENT: Passed by 0.9 dB

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

See additional information in *Figure 22*.

Radiated Emission 9 kHz – 200 MHz

E.U.T Description RFID and Barcode Reader
Model Number HScanner ORL100.023 (Wired)
Part Number: Not designated

Specification: FCC, Part 15, Subpart C;

Antenna Polarization: Horizontal/Vertical Frequency range: 9 kHz to 200.0 MHz
Test Distance: 3 meters Detector: Peak, Q.peak
Operation Frequencies: 13.56MHz

Frequency	Polarity	Peak	Q.peak	Specification	Margin
(MHz)	(V/H)	(dB μ V/m)	(dB μ V/m)	(dB μ V/m)	(dB)
27.12	V	42.6	-	69.5	-26.9
	H	44.3	-	69.5	-25.2
40.68	V	42.0	39.1	40.0	-0.9
	H	32.4	31.6	40.0	-8.4
122.04	V	47.4	32.1	43.5	-11.4
	H	44.2	40.6	43.5	-2.9

Figure 22. 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.

6.5 Test Instrumentation Used; Radiated Measurements

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
EMI Receiver	R&S	ESCI7	100724	February 29, 2016	March 1, 2017
EMI Receiver	HP	8542E	3906A00276	March 3, 2016	March 3, 2017
RF Filter Section	HP	85420E	3705A00248	March 3, 2016	March 3, 2017
Active Loop Antenna	EMCO	6502	9506-2950	November 5, 2015	November 30, 2016
Biconical Antenna	EMCO	3110B	9912-3337	March 24, 2016	March 24, 2018

Figure 23. Test Equipment Used

6.6 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. Occupied Bandwidth

7.1 Test Specification

FCC, Part 2, Section 2.1049

7.2 Test Procedure

The transmitter unit was operated with normal modulation. The spectrum analyzer was set to 1 kHz resolution BW and center frequency of the transmitter fundamental. The spectrum bandwidth of the transmitter unit was measured and recorded. The BW was measured at 26dBc points.

The EUT was set up as shown in *Figure 2*, and its proper operation was checked. The transmitter occupied bandwidth was measured with the EMI receiver as frequency delta between reference points on the modulation envelope.

7.3 Test Limits

N/A

7.4 Test Results

FREQUENCY (MHz)	READING (kHz)
13.56	33.1

Figure 24. Bandwidth Test Results

JUDGEMENT: Passed

See additional information in *Figure 25*.

Occupied Bandwidth

E.U.T Description RFID and Barcode Reader
Model Number HScanner ORL100.023 (Wired)
Part Number: Not designated

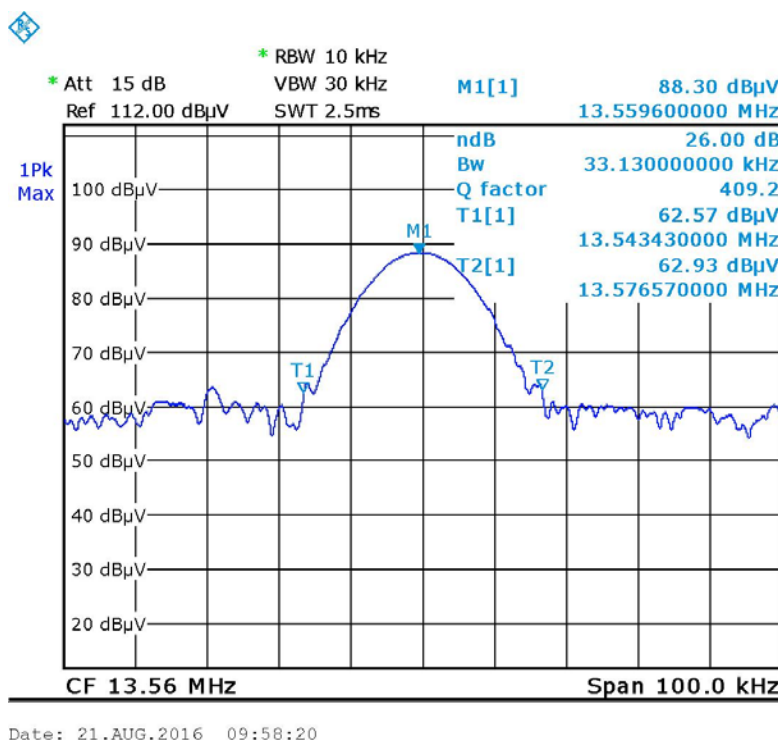


Figure 25 26dB Bandwidth

7.5 Test Equipment Used; Occupied Bandwidth

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
Spectrum Analyzer	R&S	FSL6	100194	February 29, 2016	March 1, 2017
Loop Antenna	EMCO	6502	2950	November 5, 2015	November 30, 2016
Semi Anechoic Chamber	ETS	S81	SL 11643	NCR	NCR

Figure 26 Test Equipment Used

8. Frequency Tolerance

8.1 Test Specification

Part 15, Subpart C, Sections 225(e)

8.2 Test Procedure

The E.U.T operation mode and test setup are as described in Section 2.

The E.U.T. was placed inside a temperature chamber. The power to the laptop was supplied by a variac. The E.U.T. was operated from 132.2VAC, 115VAC and 97.7VAC at normal temperature and the chamber temperature was set to +25°C.

The spectrum analyzer was set to 10.0 kHz span and 1.0 kHz RBW, and 1.0 kHz VBW, counter function was set on.

The carrier frequency was measured and recorded (reference frequency reading).

The carrier frequency measurement was repeated for:

- (a). -20°C and 115 VAC
- (b). -10°C and 115 VAC
- (c). 0°C and 115 VAC
- (d). +10°C and 115 VAC
- (e). +20°C and 115 VAC
- (f). +40°C and 115 VAC
- (g). +50°C and 115 VAC

The carrier frequency was measured and recorded after at least 20 minutes of exposing the E.U.T. to the temperature.

8.3 Test Limits

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency: $0.01 \times (13.56\text{M}/100) = \pm 1356\text{Hz}$.

8.4 Test Results

JUDGEMENT: Passed

The E.U.T met the requirements of Part 15, Subpart C, Section 225(e) specification.

The details of the results are given in *Figure 27*.

Frequency Tolerance

E.U.T Description RFID and Barcode Reader
Type HScanner ORL100.023 (Wired)
Part Number: Not designated

Specification: FCC Part 15, Sub-part C, Section 225(e)

Temperature	Voltage	Frequency	Drift
(°C)	(VAC)	(kHz)	(Hz)
+25.0	97.7	13,559.6994	0.0
	115.0	13,559.6994	-
	132.2	13,559.6994	0.0
-20.0	115.0	13,559.8997	+200.3
-10.0	115.0	13,559.8994	+200.0
0.0	115.0	13,599.8994	+200.0
+10.0	115.0	13,559.6994	0.0
+20.0	115.0	13,559.6994	0.0
+40.0	115.0	13,559.6994	0.0
+50.0	115.0	13,559.6994	0.0

Figure 27. Frequency Tolerance Test Results Table



8.5 Test Instruments Used; Frequency Tolerance

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration Date	Next Calibration Due
Spectrum Analyzer	Rodhe & Schwarz	ESIB7	100120	February 29, 2016	March 1, 2017
Environmental Chamber	THERMOTRON CORP	SM 32C Mini Max	25-1030	N/A	N/A
Variable Voltage Transformer	Variac Voltage Co.	-	-	N/A	N/A

Figure 28. Test Equipment Used

9. APPENDIX B - CORRECTION FACTORS

9.1 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	2.1
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

9.2 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



9.3 Correction factors for

**Biconical Antenna
EMCO model 3110B
Serial #: 9912-3337**

Frequency [MHz]	AF [dB/m]
30.0	14.18
35.0	13.95
40.0	12.84
45.0	11.23
50.0	11.10
60.0	10.39
70.0	9.34
80.0	9.02
90.0	9.31
100.0	8.95
120.0	11.53
140.0	12.20
160.0	12.56
180.0	13.49
200.0	15.27