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DATE: 30 November 2014

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

FCC Radio Test Report

for

AeroScout Ltd.

Equipment under test:

Hand Hygiene Integrated Exciter

EX-3300

Tested by:

M. Zohar

Approved by:

D. Shidlowsky

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This report relates only to items tested.



Measurement/Technical Report for

AeroScout Ltd.

Hand Hygiene Integrated Exciter

EX-3300

FCC ID: Q3HEX3300

IC: 5115A-EX3300

This report concerns:

Original Grant:

Class I change:

Class II change: X

Equipment type:

Part 15 Low Power Transmitter
Below 1705 kHz

Limits used:

47CFR15 Section 15.205; 15.209

Application for Certification
prepared by:

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1. General Information

1.1 Administrative Information

Manufacturer:	AeroScout Ltd.
Manufacturer's Address:	Ilan Ramon 2 Ness Ziyona Israel Tel: +972-8-9369393 Fax: +972-8-9365977
Manufacturer's Representative:	Leonid Genusin
Equipment Under Test (E.U.T):	Hand Hygiene Integrated Exciter
Equipment Model No.:	EX-3300
Equipment Serial No.:	Not Designated
Date of Receipt of E.U.T:	21.08.2014
Start of Test:	21.08.2014
End of Test:	21.08.2014
Test Laboratory Location:	I.T.L (Product Testing) Ltd. Kfar Bin Nun, ISRAEL 99780
Test Specifications:	FCC Part 15 Subpart C RSS 210, Issue 8, 2010



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 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 Hand Hygiene Integrated Exciter (EX-3300) is a component of AeroScout location system. This device acts as a beaconing device that triggers AeroScout Tags to transmit a message to the AeroScout location system and modify the tag behavior.

The integrated unit is embedded into Hand Hygiene dispenser and will act as a single device for Healthcare solutions.

1.4 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4: 2009 and RSS-Gen, Issue 4. Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.5 Test Facility

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

I.T.L.'s EMC Laboratory is also accredited by A2LA, certificate No. 1152.01.

1.6 Measurement Uncertainty

Conducted Emission

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

0.15 – 30 MHz:

Expanded Uncertainty (95% Confidence, K=2): ± 3.44 dB

Radiated Emission

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

Expanded Uncertainty (95% Confidence, K=2): ± 4.96 dB

2. System Test Configuration

2.1 Justification

The EUT received limited single modular approval under FCC ID: Q3HEX3300 and IC: 5115A-EX3300.

The following changes have been made to the EUT.

1. A buffer circuit was added at the Trigger Signal based on Q6, Q7.
2. A fuse, diode and TVS parts were added to meet safety requirements.

A C2PC is being requested based on the above changes and to expand the existing LMA approval to the following hosts:

- 1) M/N: 92021188 (Ecolab NEXA big)
- 2) M/N: 92021184 (Ecolab NEXA small)
- 3) M/N: 92021121 (Ecolab Next Gen)
- 4) M/N: 1371-04 (Gojo Provon Ltx small)
- 5) M/N: 1971-04 (Gojo Provon Ltx big)
- 6) M/N: 2720-12 (Gojo TFX Purell)
- 7) M/N: 2745-12 (Gojo TFX Provon)
- 8) M/N: 2785-12 (Gojo Purell Surg Scrub)
- 9) M/N: 2845-12 (Gojo Provon TFX)

The following model numbers were tested:

- 1) M/N: 92021188 (Ecolab NEXA big)
- 2) M/N: 92021184 (Ecolab NEXA small)
- 3) M/N: 1971-04 (Gojo Provon Ltx big)
- 4) M/N: 2720-12 (Gojo TFX Purell)

*Note – See customer's Declaration regarding host models on the following page.

2.2 Special Accessories

No special accessories were needed.

2.3 Equipment Modifications

No modifications were needed in order to achieve compliance

AeroScout[®]

DECLARATION

March 29, 2015

I HEREBY DECLARE THE FOLLOWING REGARDING THE BELOW EX-3300 HOST MODELS:

- 1) M/N: 92021188
- 2) M/N: 92021184
- 3) M/N: 92021121
- 4) M/N: 1371-04
- 5) M/N: 1971-04
- 6) M/N: 2720-12
- 7) M/N: 2745-12
- 8) M/N: 2785-12
- 9) M/N: 2845-12

1. All the above host models contain the identical 125.00 kHz radio transmitter.
2. The following host models are identical. The only difference between them is the front label on the face of the host.
M/N 2720-12, M/N 2745-12, M/N 2785-12 and M/N 2845-12.

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


Reuven Amsalem
VP HW R&D
AeroScout Ltd.

2.4 Configuration of Tested System

The E.U.T. was transmitting continuously at 125 kHz while in the installation position.

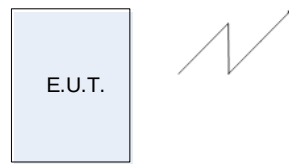


Figure 1. Configuration of Tested System

3. Test Set-up Photos

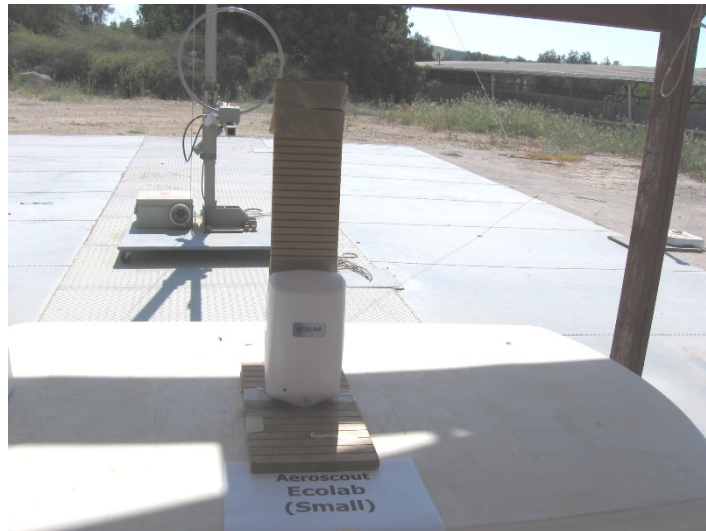


Figure 2. Radiated Emission Test – M/N 92021184 (Ecolab NEXA small)

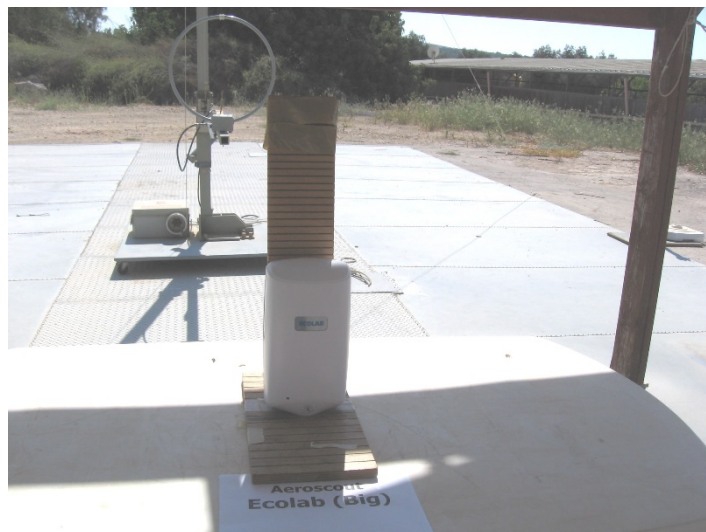


Figure 3. Radiated Emission Test – M/N: 92021188 (Ecolab NEXA big)

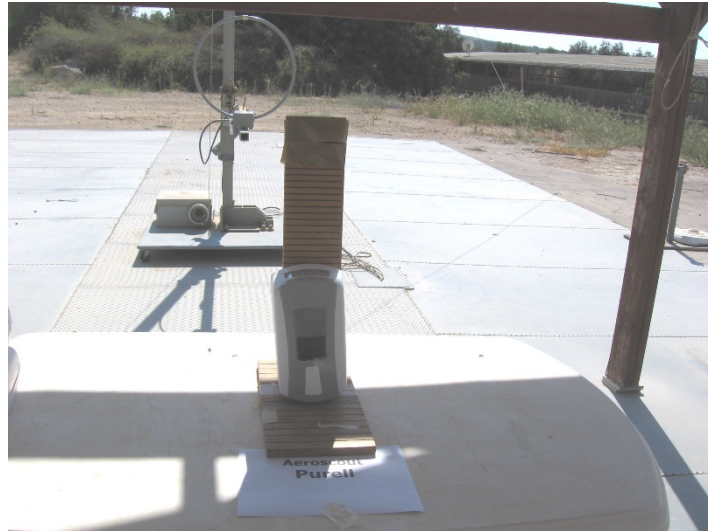


Figure 4. Radiated Emission Test – M/N: 1971-04 (Gojo Provon Ltx big)



Figure 5. Radiated Emission Test – M/N: 2720-12 (Gojo TFX Purell)

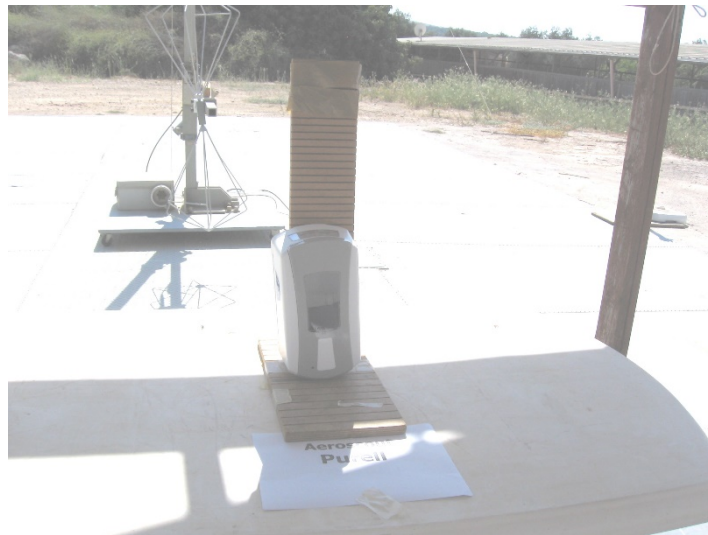


Figure 6. Radiated Emission Test – M/N: 1971-04 (Gojo Provon Ltx big)

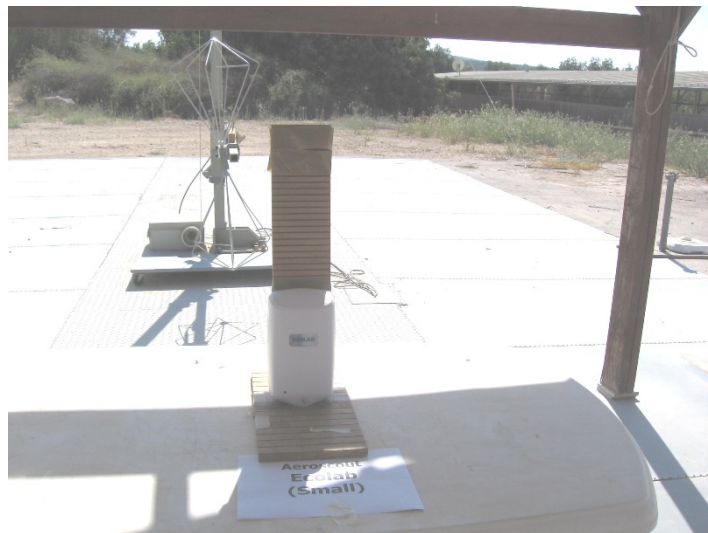


Figure 7. Radiated Emission Test M/N: 92021184 (Ecolab NEXA small)



Figure 8. Radiated Emission Test M/N: 92021188 (Ecolab NEXA big)



Figure 9. Radiated Emission Test M/N: 2720-12 (Gojo TFX Purell)



Figure 10. Radiated Emission Test M/N: 92021188 (Ecolab NEXA big)

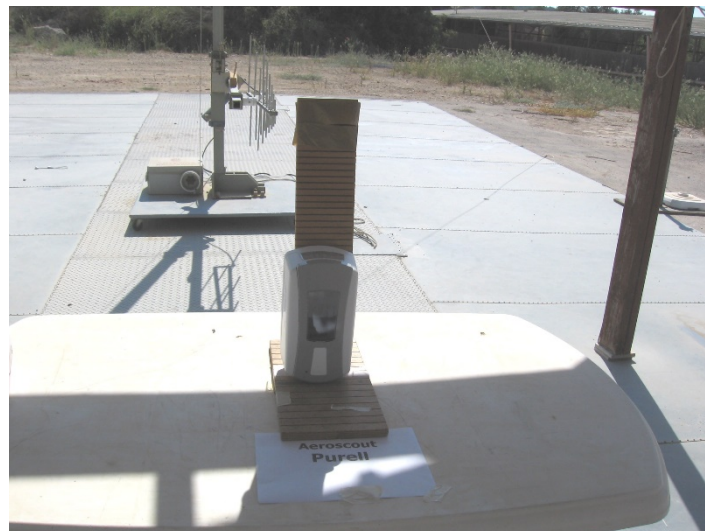


Figure 11. Radiated Emission Test M/N: 1971-04 (Gojo Provon Ltx big)



Figure 12. Radiated Emission Test M/N: 92021184 (Ecolab NEXA small)



Figure 13. Radiated Emission Test M/N: 2720-12 (Gojo TFX Purell)

4. Average Factor Calculation

1. According the customer "MANCHESTER" code operated in the burst duration therefore the ratio between Transmission pulse duration to Transmission pulse period is 50%
2. Burst duration = 60msec
3. Time between bursts = >100msec

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

$$\text{Average Factor} = 20 \log [0.6 \times 0.5 \times 1] = -10.4\text{dB}$$

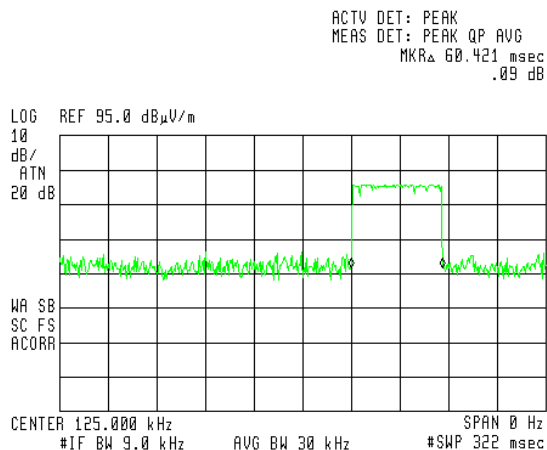


Figure 14. Burst Duration

4.1 Test Results

JUDGEMENT: Passed

The EUT met the FCC Part 15, Subpart C, Section 15.209 specification requirements.

TEST PERSONNEL:

Tester Signature: _____

Date: 15.04.15

Typed/Printed Name: M. Zohar



5. Field Strength of Fundamental

5.1 Test Specification

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

5.2 Test Procedure

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

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 (125 kHz) 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. The loop antenna was rotated on its vertical axis. The antenna height (center of loop) was 1 meter.

5.3 Measured Data

JUDGEMENT: Passed by 24.87 dB

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

The details of the highest emissions are given in *Figure 16*.

TEST PERSONNEL:

Tester Signature:  Date: 15.04.15

Typed/Printed Name: M. Zohar

Field Strength of Fundamental

E.U.T Description Hand Hygiene
Integrated Exciter
Type EX-3300
Serial Number: Not Designated

Unit	Frequency (MHz)	Peak Reading (dB μ V/m)	Specification (dB μ V/m)	Margin (dB)
M/N: 1971-04	0.125	66.22	105.67	-39.45
M/N: 92021188	0.125	67.87	105.67	-37.80
M/N: 92021184	0.125	80.80	105.67	-24.87
M/N: 2845-12*	0.125	80.60	105.67	-25.07
M/N: 2785-12*	0.125	80.94	105.67	-24.73
M/N: 2745-12* and M/N: 2720-12*	0.125	80.28	105.67	-25.39

*NOTE – The modules for each of the hosts were tested in host M/N 2720-12 since all 4 hosts are identical as per paragraph 2 of Declaration on page 8.

**Figure 15. Field Strength of Fundamental.
Detector: Peak**



ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 125.05 kHz
66.22 dB μ V/m

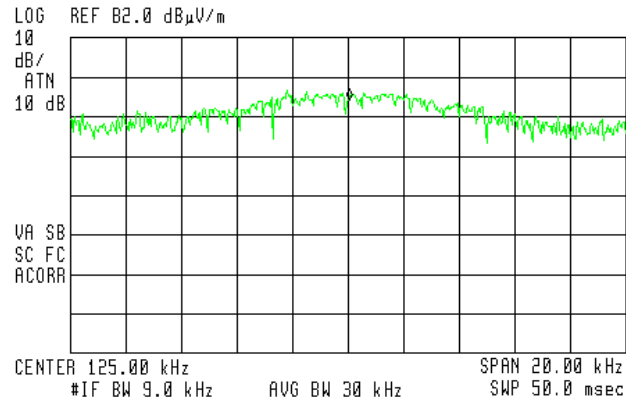


Figure 16. Field Strength of Fundamental – M/N 1971-04
Detector: Peak



ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 125.05 kHz
67.87 dB μ V/m

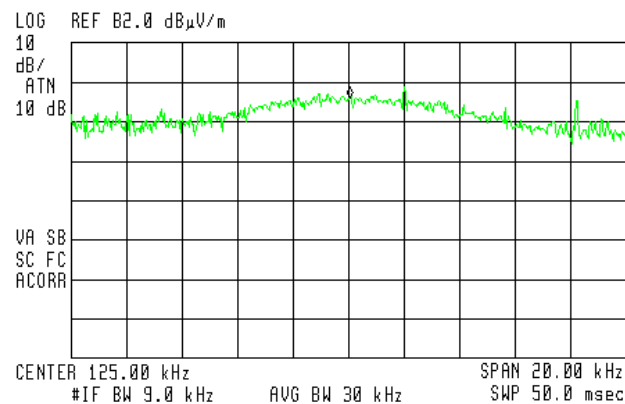


Figure 17. Field Strength of Fundamental –M/N 92021188
Detector: Peak



ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 125.00 kHz
80.80 dB μ V/m

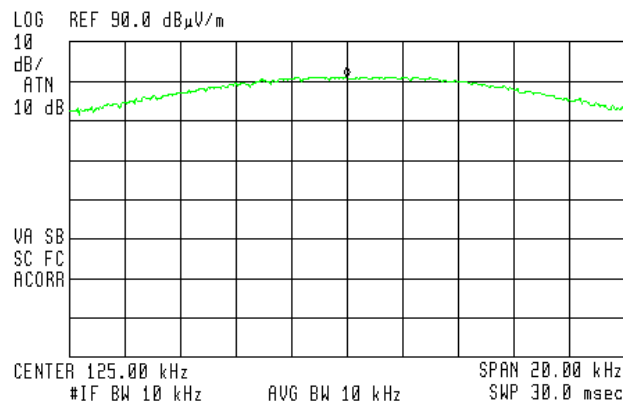


Figure 18. Field Strength of Fundamental – M/N 92021184
Detector: Peak



ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 124.65 kHz
80.94 dB μ V/m

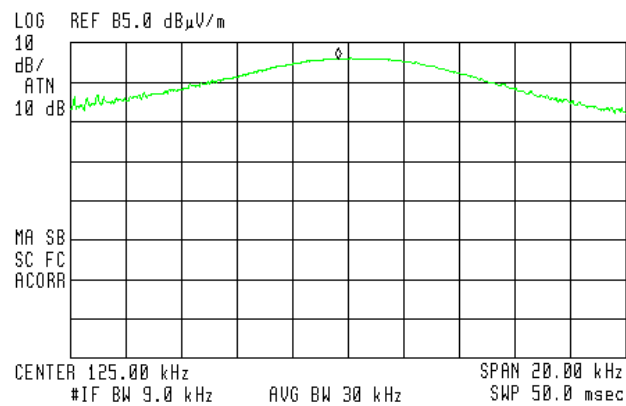
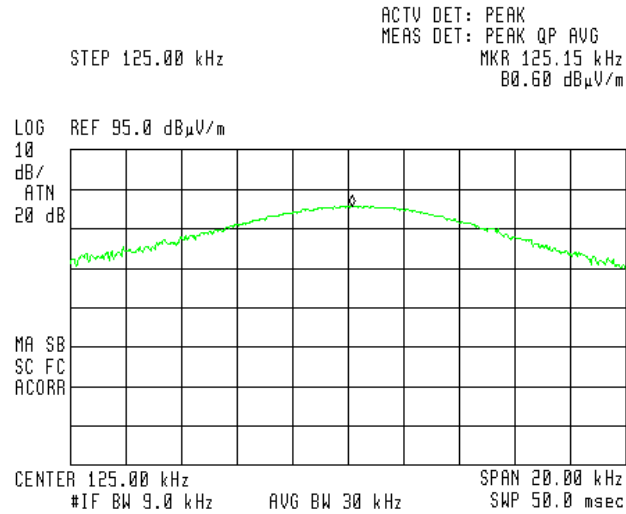
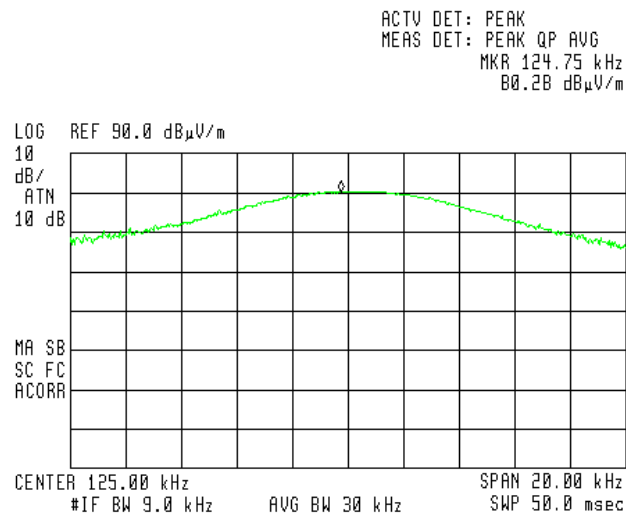


Figure 19. Field Strength of Fundamental – M/N 2785-12
Detector: Peak



**Figure 20. Field Strength of Fundamental – M/N 2845-12
Detector: Peak**



**Figure 21. Field Strength of Fundamental – M/N 2745-12 & M/N 2720-12
Detector: Peak**

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
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	JPKGC19982	N/A	N/A

Figure 22. Test Instrumentation 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 2.

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-30 MHz was scanned.

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

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

The E.U.T. was operated at the frequency of 125 kHz. This frequency was measured using a peak detector.

6.3 Measured Data

JUDGEMENT: Passed by 52.05dB

The EUT was tested and it met the requirements of the FCC Part 15, Subpart C specification.

TEST PERSONNEL:

Tester Signature: _____  _____

Date: 15.04.15

Typed/Printed Name: M. Zohar

Radiated Emission

E.U.T Description Hand Hygiene
Integrated Exciter
Type EX-3300
Serial Number: Not Designated

Specification: FCC Part 15, Subpart C

Antenna: 3 meters distance

Frequency range: 9 kHz to 30 MHz

Detectors: Peak

Unit	Frequency (kHz)	Peak Reading (dB μ V/m)	Average Factor (dB)	Average Result (dB μ V/m)	Average Specification (dB μ V/m)	Margin (dB)
M/N 1971-04	250.0	45.0	-10.4	34.6	99.65	-65.05
M/N 1971-04	375.0	44.0	-10.4	33.6	96.12	-62.52
M/N 92021188	250.0	54.8	-10.4	44.4	99.65	-55.25
M/N 92021188	375.0	52.2	-10.4	42.2	96.12	-53.90
M/N 92021184	250.0	58.0	-10.4	47.6	99.65	-52.05
M/N 92021184	375.0	51.2	-10.4	40.8	96.12	-55.32
M/N 2785-12*	250.0	52.3	-10.4	41.9	99.65	-57.75
M/N 2785-12*	375.0	52.0	-10.4	41.6	96.12	-54.52
M/N 2845-12*	250.0	54.2	-10.4	43.8	99.65	-55.85
M/N 2845-12*	375.0	51.6	-10.4	41.2	96.12	-54.92
M/N 2720-12* and 2745-12*	250.0	57.8	-10.4	47.4	99.65	-52.25
M/N 2720-12* and 2745-12*	375.0	54.1	-10.4	43.7	96.12	-52.42

*NOTE – The modules for each of the hosts were tested in host M/N 2720-12 since all 4 hosts are identical as per paragraph 2 of Declaration on page 8.

**Figure 23. Radiated Emission.
Detectors: 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.

6.4 Test Instrumentation Used, Radiated Measurements

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

Figure 24. 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 are used.

7. Spurious Radiated Emission

7.1 Test Specification

30 - 1000 MHz, F.C.C., Part 15, Subpart C

7.2 Test Procedure

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

See Section 2.4 Configuration of Tested System 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 signals from the list of the highest emissions were verified and the list was 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.

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.

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 emissions were measured at a distance of 3 meters.

7.3 Test Data

JUDGEMENT: Passed

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

No signals were detected in the frequency range of 30 -1000 MHz.

TEST PERSONNEL:

Tester Signature:  _____ Date: 15.04.15

Typed/Printed Name: M. Zohar

7.4 Test Instrumentation Used, Radiated Measurements

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 Biconical	ETS	3104	2606	August 30, 2012	2 years
Antenna Log Periodic	ARA	LPD-2010/A	1038	April 2, 2013	2 years
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A

Figure 25. Test Instrumentation Used

8. APPENDIX A - CORRECTION FACTORS

8.1 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".

8.2 Correction factors for CABLE
from EMI receiver
to test antenna
at 3 meter range.

FREQUENCY	CORRECTION
(GHz)	FACTOR
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.

8.3 Correction factors for LOG PERIODIC ANTENNA

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

Distance of 3 meters

FREQUENCY	AFE
(MHz)	(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	AFE
(MHz)	(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".

8.4 Correction factors for BICONICAL ANTENNA

**Type 3109,
at 3 meter range**

FREQUENCY (MHz)	AFE (dB/m)
30.0	13.3
40.0	12.7
50.0	11.0
60.0	9.2
70.0	10.0
80.0	7.2
90.0	7.9
100.0	9.4
120.0	11.9
140.0	13.1
160.0	12.3
180.0	12.4
200.0	14.8
250.0	15.3
300.0	17.9

NOTE:

1. Antenna serial number is 002-3244.

8.5 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. APPENDIX B – Comparison of Industry Canada Requirements With FCC Requirements

FCC Specification	FCC Standard	IC Standard
Spurious Emission	47CFR15.209	RSS-210 Section 2.5