Electromagnetic Compatibility
Test Report

Test Report No: LIF 100521 Rev.2
Issued on: October 17, 2021

Product Name
BCone Pool Unit

Tested According to
FCC 47 CFR, Part 15.231
Industry Canada ICES-003:07

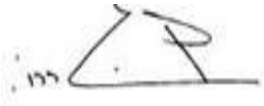
Tests Performed for
Lifebuoy Ltd.
Lohamey Hagetaot 12, Ness Ziona, 7409612, Israel.
Tel: +97286188828

QualiTech EMC Laboratory
30 Hasivim Street, P.O.Box 7500
Petah-Tikva, 4951169, Israel
Tel: +972-52-4006068
Fax: +972-3-928 7490

Test Personnel

Tests Performed By: ----------
Agenehu Yizhak

Report Prepared By: ----------
Bina Talkar



Report Approved By: ----------
Carlos Guerrero
EMC Lab. Manager
QualiTech EMC Laboratory

Test Report details:

Test commencement date: 15.11.2020

Test completion date: 31.12.2020

Customer's Representative: Yuval Tepper

Issued on: 17.10.2021

Revision details:

Version	Date	Details/Reasons
Rev. 1	10.05.2021	-
Rev.2	17.10.2021	Test report updated to include correct model name and IC Canada ID

Equipment Tested

Production Model ☑

Equipment preliminary model ☐

Assessment information:

This report contains an assessment of the EUT against Electromagnetic Compatibility based upon tests carried out on the samples submitted. The results contained in this report relate only to the items tested. Manufactured products will not necessarily give identical results due to production and measurement tolerances. QualiTech, EMC Lab does not assume responsibility for any conclusion and generalization drawn from the test results with regards to other specimens or samples of type of the equipment represented by test item.

The EUT was set up and exercised using the configuration, modes of operation and arrangements defined in this report only.

Modifications:

Modifications made to the EUT:

None

Modifications made to the Test Standard:

None

Summary of Compliance:

The EUT was tested according to the following test methods.
Test results are given in full in section 3.

Test Spec. Clause	Test Case	Test results
§15.231(a)(3)	Transmission time	Pass
§15.35 (c)	Duty cycle correction factor	Pass
§15.231(b)	Field strength of fundamental, Radiated	Pass
§15.205(a) (b), §15.209(a), §15.231(b)	Field strength of the Spurious Emissions in Restricted Bands and Non-Restricted Bands, Radiated	Pass
§15.231(c)	Emission Bandwidth	Pass
§15.203	Antenna Connector requirement	Pass
§15.207	Power line emission measurement	N.A.

Table of Contents

1. General

1.1. Referenced documents:

FCC Part 15	Code of Federal Regulations (Washington, DC: Federal Communications Commission), Title 47, Part 15, Subpart C
ANSI C63.10:2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
ICES-003	Industry Canada

1.2. Description of the EUT system:

General description of the EUT, configuration used for Emission testing were defined by the manufacturer.

1.2.1. General Description:

BCone Pool Unit model: LBPABCPU01

BCone Pool Unit FCC ID: 2AOXNBCPU1

BCone Pool Unit IC Canada ID: 27681-BCPU1

EUT Description

The Pool Unit consists of a RF transceiver, motion sensor and siren.

When the pool unit senses motion in the pool that can be related to a child fall into the pool, it triggers the siren and send and RF message over 433Mhz to the Home Unit.

Maximum Peak Output Power: 0.0069562 ERP (mW)

Frequency Range:

2. Method of Measurements

2.1. Radiated Emissions Measurements in the restricted bands:

For radiated emissions, which fall in the restricted bands the spectrum from 9 kHz to 25GHz was investigated following the guidelines in ANSI C63.10-2013, with the transmitter set to the lowest, middle and highest channel frequencies. Measurements were performed with peak detector and repeated averaged with VBW=10Hz. Only Peak detection plots are presented.

2.2. Radiated Field Strength and Emission BW Measurements:

During the testing process, the EUT was controlled via dedicated software. The EUT was operated at maximum power, continuous transmission and FSK data modulation.

The EUT was placed in a semi-anechoic chamber, on a non-metallic table/support, 0.8m above the turntable, at 3 meter from the receive antenna, and its position where the maximum antenna gain occurs was identified. The peak readings and duty cycle correction to convert to average readings of the emissions were measured and recorded. (Duty Cycle Correction = 20 log (effective on time/ 100ms period), per §15.35).

2.3. Duration of Transmission, Emission BW, Conducted Measurement:

During the testing process, the EUT was controlled via dedicated software. The EUT was operated at maximum power, continuous transmission and FSK data modulation.

The transmitter output was connected to the Spectrum Analyzer via an RF attenuator, and peak output power was measured.

The duration of transmission was measured at the fundamental frequency at zero span.
The Emission Bandwidth is determined at the 20dB down from the modulated carrier.

2.4. Radiated Emission measurements:

During the testing process, the EUT was controlled via dedicated software. The EUT was operated at in receive mode.
Measurements were performed at a 3-meter measurement distance in the semi-anechoic chamber in order to evaluate the radiated electromagnetic interference characteristics of the EUT. The EUT was placed on a non-metallic table/support, 0.8m above the turntable, was configured, arranged and operated in a manner consistent with typical application and load conditions.
An appropriate antenna depending upon the frequency range, per ANSI C63.10-2013 was used. While the turntable was being rotated, the height of the antenna was varied from 1 to 4m for the frequency range of 9 kHz to 5 GHz. The highest radiated emission was detected by manipulating the system cables to the worst-case position. This process was repeated for both antenna polarizations.
The amplitudes of worst-case emission were measured with the detector modes and resolution bandwidths over various frequency ranges according to the requirements of ANSI C63.10-2013.

Since Quasi-Peak Detector requires long integration times, it is not practical to automatically sweep through the Quasi-Peak levels. Therefore, radiated emissions from the test item were first scanned using a Peak Detector and automatically plotted. The frequencies where significant emission levels were noted were then re-measured using the Quasi-Peak Detector.

3. Test Facility & Uncertainty of Measurement

3.1. Accreditation/ Registration reference:

- *A2LA Certificate Number: 1633.01*
- *FCC Designation Number:IL1006*
- *Industry Canada File Number: IC4808A-1*

3.2. Test Facility description

The tests were performed at the EMC Laboratory, QualiTech Division, ECI Telecom

Address: 30, Hasivim St., Petah Tikva, Israel.
Tel: +972-52-4006068

Semi Anechoic Configuration:

Measurement distance	3m
Chamber dimensions	9.5m x 6.5m x 5.2m
Antenna height	1 - 4m
Shielding Effectiveness	Magnetic field ≥80dB at 15 kHz ≥90dB at 100 kHz Electric field >120dB from 1MHz to 1GHz >110dB from 1GHz to 10GHz
Absorbing material	Ferrite tiles on the walls and ceiling Emerson and Cuming absorbing material in selected positions on the walls
Normalized Site Attenuation measured at 5 positions	±3.9dB, 30MHz to 200MHz ±3dB, 200MHz to 1000MHz
Transmission Loss measured at 5 positions, at 1.5m height	±3dB, 1GHz to 18GHz

3.3. The measurement software used:

Software Name	Software Version
Test Software “TILE	Version 7.1.4.1

4. Report of Measurements and examinations

4.1. Transmission time – Periodic transmissions time measurement

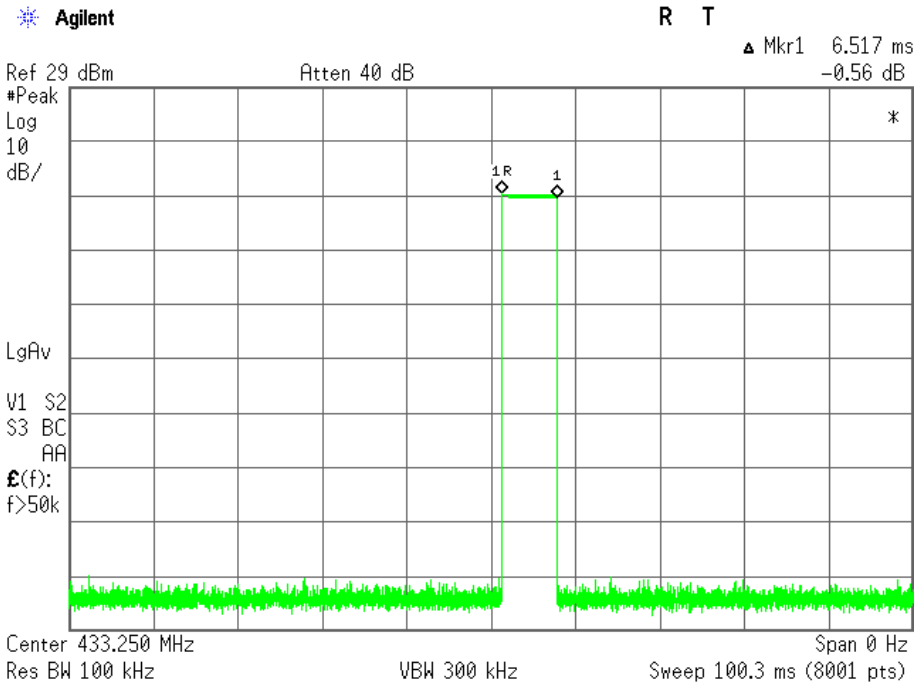
Reference document:	**47 CFR §15.231(a) (3)**		
Test Requirements:	Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.		
Operating conditions:	Under normal test conditions	Pass	
Method of testing:	Radiated		
S.A. Settings:	RBW: 100kHz, VBW: 300kHz		
Environment conditions:	Ambient Temperature: 22.3°c	Relative Humidity: 59.8%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	Plots 4.1.1 – 4.1.2	

Test results: pass

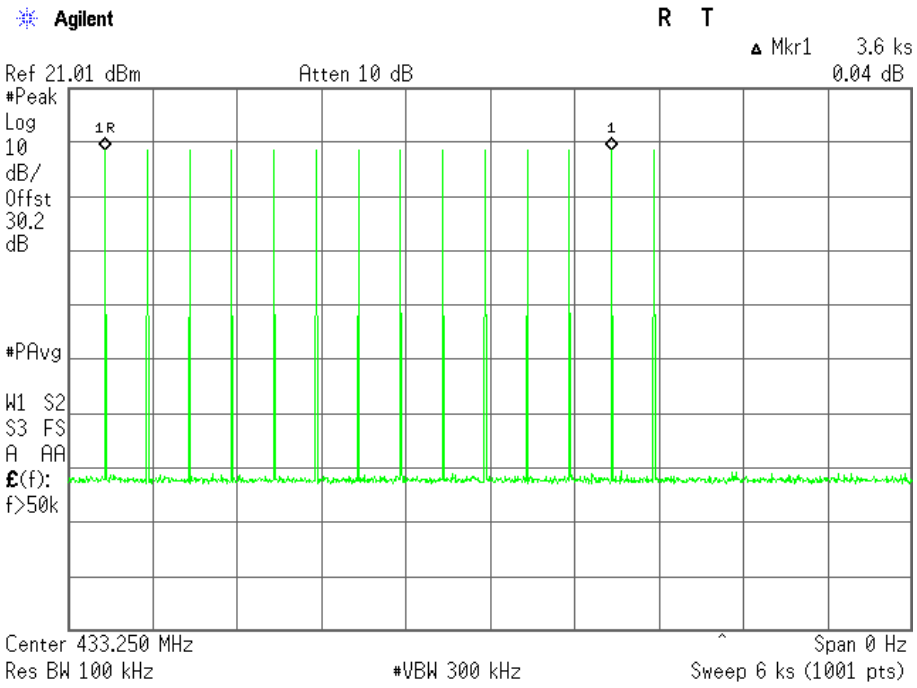
Table 4.1.1: Transmission one TX duration- time measurement

One transmit duration time [ms]	Number of transmit per hour	Total duration of transmission time per hour [ms]	Limit [ms]	Margin [ms]	Result
6.517	13	84.721	2000.0	1915.279	Pass

Plot 4.1.1: Transmission one TX duration- time measurement



Plot 4.1.2: Transmission time – total duration per hour measurement



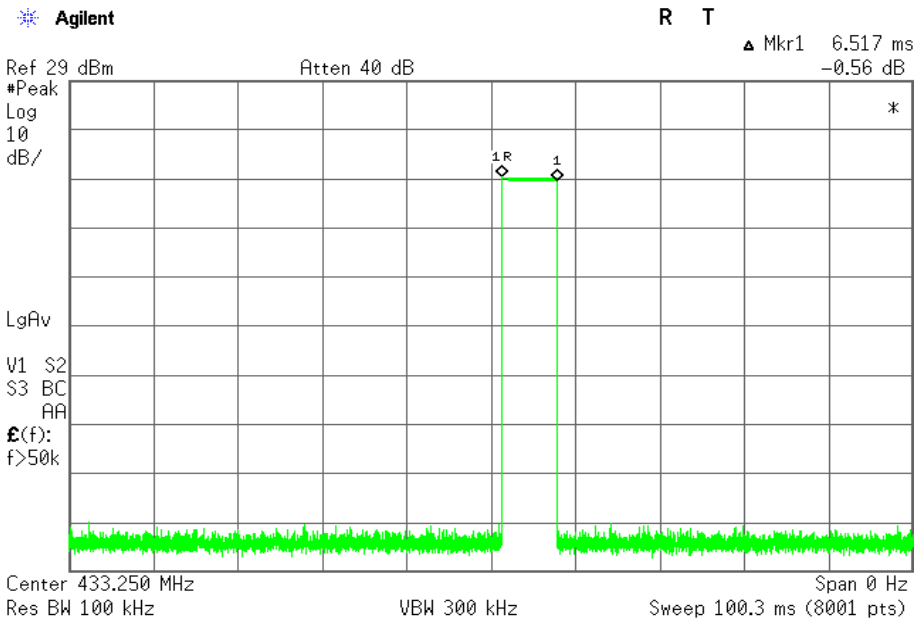
Number of transmit per hour=13
One transmit duration time=6.517ms
Total duration of transmission time per hour= One transmit duration time* Number of transmit per hour
Total duration of transmission time per hour= 84.721ms

4.2. Duty cycle correction factor measurement

Reference document:	**47 CFR §15.35(c)**		
Test Requirements:	The measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.		
Test setup:	See Sec. 2.2	**Pass**	
Operating conditions:	Under normal test conditions		
Method of testing:	Radiated		
S.A. Settings:	RBW: 120kHz, VBW: 300kHz		
Environment conditions:	Ambient Temperature: 22.3°c	Relative Humidity: 59.8%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	Plot 4.2.1	

Test results:

Plot 4.2.1: Duty cycle correction factor measurement



Duty Cycle Correction factor = 20 log (effective on time / 100ms period)
Duty Cycle Correction factor = 20 log (6.517ms / 100ms period) = 23.719

4.3. Field Strength of Fundamental

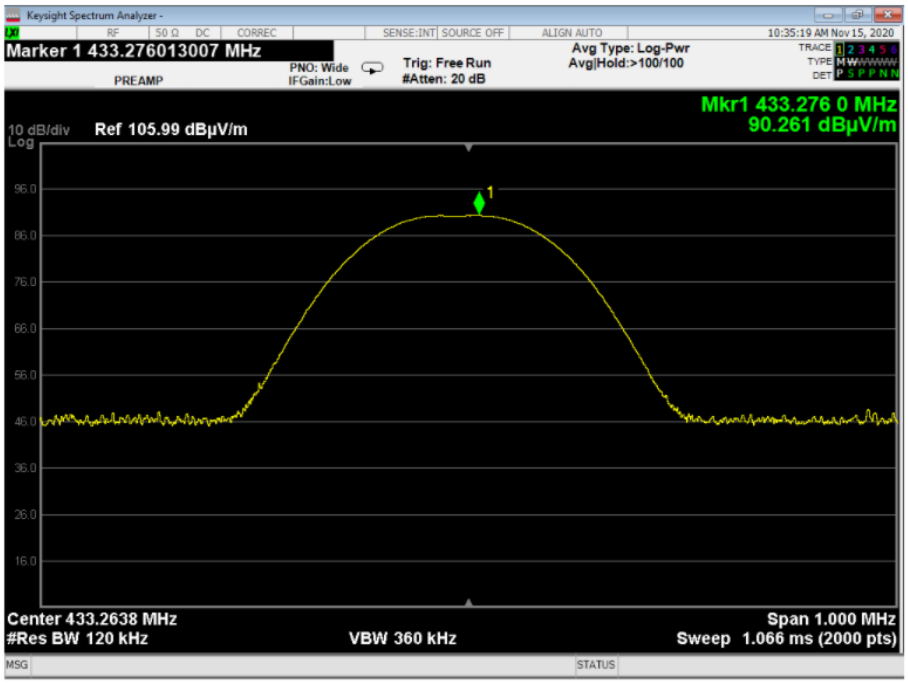
Reference document:	**47 CFR §15.231(b)**		
Test Requirements:	In addition to the provisions of § 15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following: **Fundamental frequency (MHz)** / **Field strength of fundamental (microvolts/meter)** / **Field strength of spurious emissions (microvolts/meter)** 40.66-40.70 / 2,250 / 225 70-130 / 1,250 / 125 130-174 / [1]1,250 to 3,750 / [1]125 to 375 174-260 / 3,750 / 375 260-470 / [1]3,750 to 12,500 / [1]375 to 1,250 Above 470 / 12,500 / 1,250 [1]Linear interpolations.		
Test setup:	See Sec. 2.2	**Pass**	
Operating conditions:	Under normal test conditions		
Method of testing:	Radiated		
S.A. Settings:	RBW: 120kHz, VBW: 360kHz		
Environment conditions:	Ambient Temperature: 22.3°c	Relative Humidity: 59.8%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	Plot 4.3.1 – 4.3.2	

Test results:

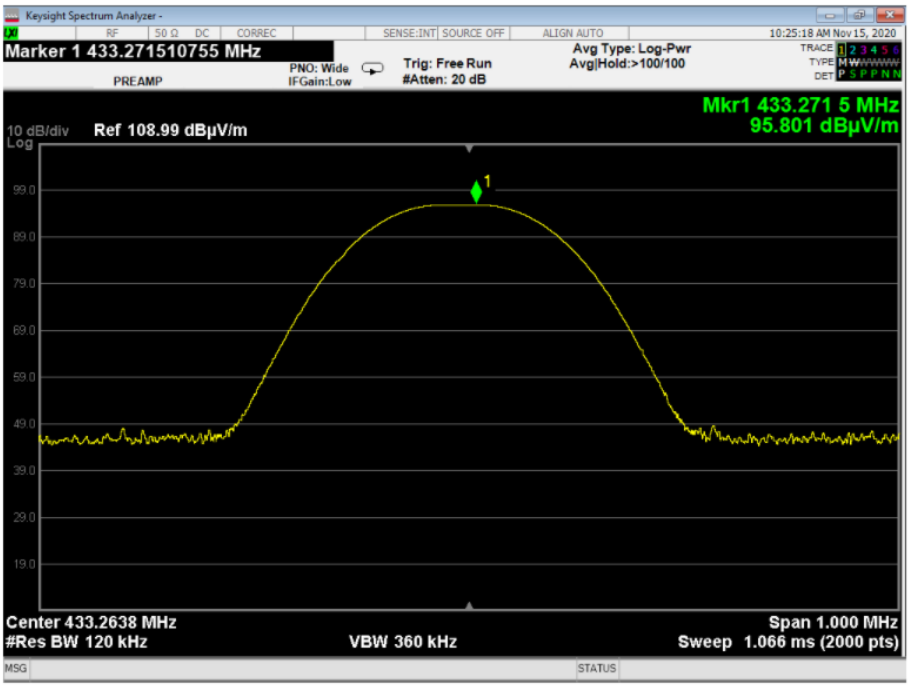
Frequency [MHz]	Measured field Strength, Peak Value at 3m [dBµV/m]	Ant pol	Duty Cycle Correction Factor [dB]	Field Strength, Avg Value at 3m [dBµV/m]	Calculated field Strength limit at 3m [dBµV/m] *	Margin [dB]	Result
433.271	95.801	H	-20.0	75.801	80.797	-4.996	Pass
433.276	90.261	V	-20.0	70.261	80.797	-10.536	Pass

$Limit_{AVR}$[µv/m] = 41.6667(F)-7083.3333
Average Value = Peak Value + Duty Cycle Correction Factor
Margin [dB] = Average Value [dBµV/m] - $Limit_{AVR}$[dBµv/m]

Plot 4.3.1: Field Strength of Fundamental Vertical Polarization, Fc=433.276 MHz



Plot 4.3.2: Field Strength of Fundamental Horizontal Polarization, Fc =433.271 MHz



4.4. Field Strength of Spurious Emission Restricted Bands and Non-Restricted Bands

Reference document:	**47 CFR §15.205(a) (b), §15.209(a), §15.231(b)**
Test Requirements:	Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0110	16.42-16.423	399.9-410	4.5-5.15
[1]0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	([2])
13.36-13.41			

[1]Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
[2]Above 38.6.

Except as provided in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in § 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in § 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in § 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in § 15.35 apply to these measurements.

Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	**Field strength (microvolts/meter)**	**Measurement distance (meters)**
0.009-0.490	2400/F(kHz)	300
0490-1.705	2400/F(kHz)	30
1.705-30.0	30	30
30.0-88.0	100**	3
88.0-216.0	150**	3
216-960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241.

In the emission table above, the tighter limit applies at the band edges.

<table>
<tr><td></td><td colspan="3">In addition to the provisions of § 15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

<table>
<tr><th>Fundamental frequency (MHz)</th><th>Field strength of fundamental (microvolts/meter)</th><th>Field strength of spurious emissions (microvolts/meter)</th></tr>
<tr><td>40.66-40.70</td><td>2,250</td><td>225</td></tr>
<tr><td>70-130</td><td>1,250</td><td>125</td></tr>
<tr><td>130-174</td><td>[1]1,250 to 3,750</td><td>[1]125 to 375</td></tr>
<tr><td>174-260</td><td>3,750</td><td>375</td></tr>
<tr><td>260-470</td><td>[1]3,750 to 12,500</td><td>[1]375 to 1,250</td></tr>
<tr><td>Above 470</td><td>12,500</td><td>1,250</td></tr>
</table>
[1]Linear interpolations.</td></tr>
<tr><td>Test setup:</td><td>See Sec. 2.1</td><td colspan="2" rowspan="4">Pass</td></tr>
<tr><td>Operating conditions:</td><td>Under normal test conditions</td></tr>
<tr><td>Method of testing:</td><td>Radiated</td></tr>
<tr><td>S.A. Settings:</td><td>f <1GHz: RBW: 120kHz, VBW: 1MHz
f >1GHz: RBW: 1MHz, VBW: 3MH</td></tr>
<tr><td>Environment conditions:</td><td>Ambient Temperature: 22.3°c</td><td>Relative Humidity: 59.8%</td><td>Atmospheric Pressure: 1011.4 hPa</td></tr>
<tr><td>Test Result:</td><td>See below</td><td colspan="2">Plots 4.4.1 - 4.4.5</td></tr>
</table>

Test results:

Spurious below 1 GHz:

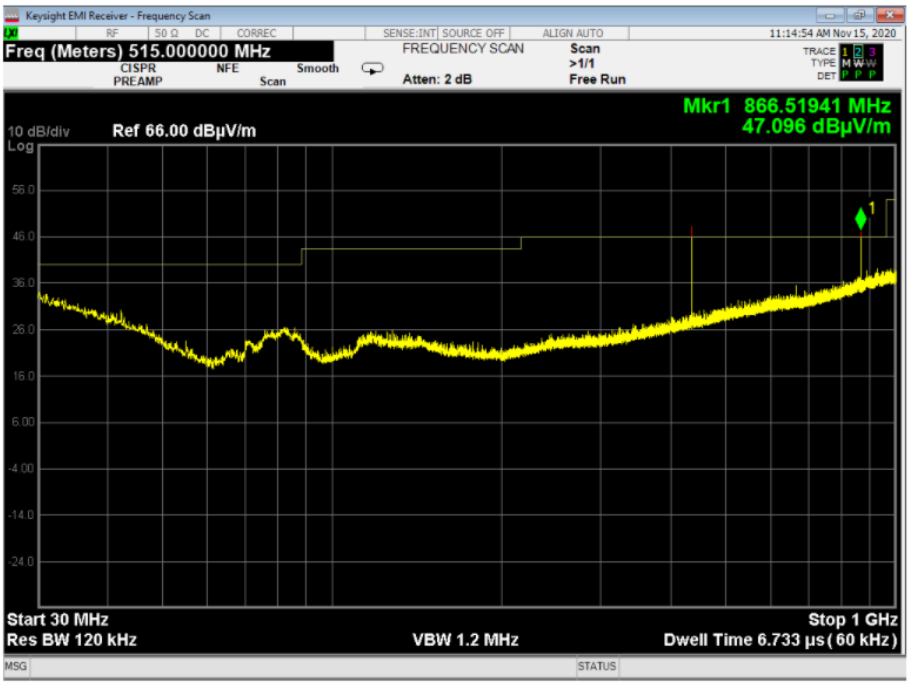
Frequency [MHz]	Polarity	Measured field Strength, Peak Value at 3m [dBµV/m]	Duty Cycle Correction Factor [dB]	Field Strength, Avg Value at 3m [dBµV/m]	Calculated field Strength limit at 3m [dBµV/m]	Margin [dB]	Result
866.548	V	47.096	-20	27.096	61.94	-34.844	Pass
866.494	H	50.182	-20	30.182	61.94	-31.758	Pass

Spurious above 1 GHz:

Frequency [MHz]	Polarity	Measured field Strength, Peak Value at 3m [dBµV/m]	Duty Cycle Correction Factor [dB]	Field Strength, Avg Value at 3m [dBµV/m]	Calculated field Strength limit at 3m [dBµV/m]	Margin [dB]	Result
1731.00	H	33.480	-20	13.480	61.40	-47.92	Pass
1842.00	V	33.753	-20	13.753	61.94	-47.642	Pass
2598.50	H	32.782	-20	12.782	61.94	-49.158	Pass
3599.50	H	38.796	-20	18.796	61.94	-43.144	Pass
3599.50	V	38.234	-20	18.234	61.94	-43.706	Pass

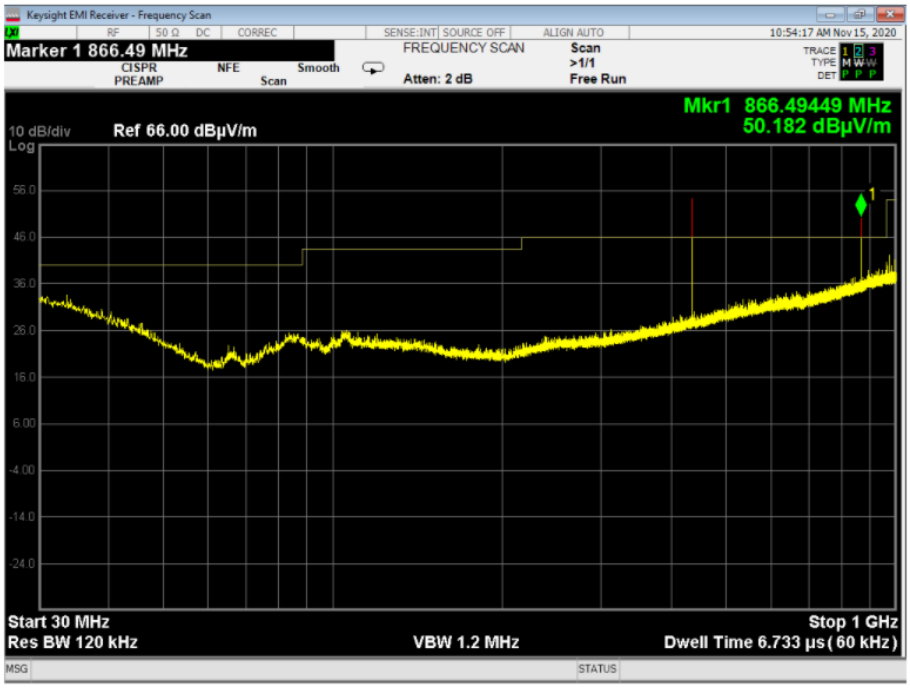
Plot 4.4.1: Field Strength of Spurious Emission Vertical Polarization 0.009 – 30.0 MHz, Fc=433.0966 MHz

Plot 4.4.2: Field Strength of Spurious Emission Vertical Polarization 30 – 1000 MHz, Fc =433.27 MHz



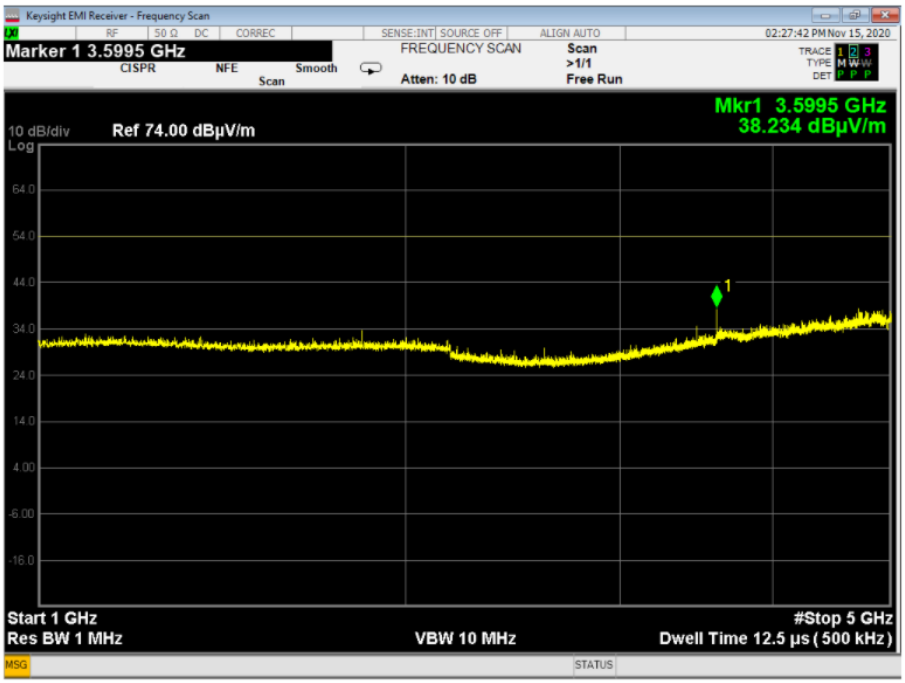
Used tunable band-reject filter 3TNT-250/500-N/N S/N: 208

Plot 4.4.3: Field Strength of Spurious Emission Horizontal Polarization 30 – 1000 MHz, Fc =433.27 MHz

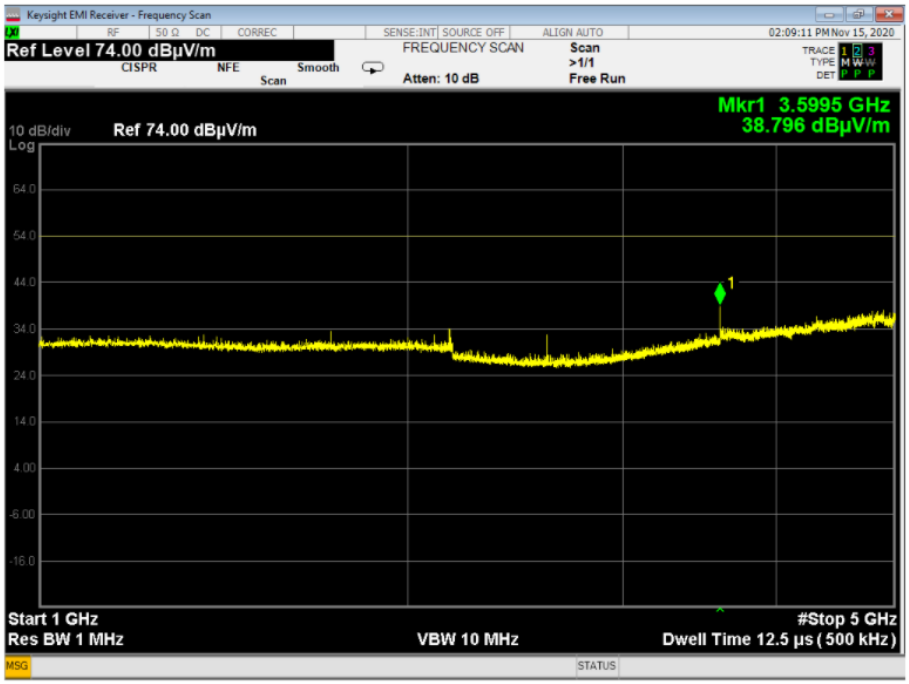


Used tunable band-reject filter 3TNT-250/500-N/N S/N: 208

Plot 4.4.4: Field Strength of Spurious Emission Vertical Polarization 1 – 5 GHz, Fc =433.27 MHz



Plot 4.4.5: Field Strength of Spurious Emission Horizontal Polarization 1 – 5 GHz, Fc =433.27 MHz



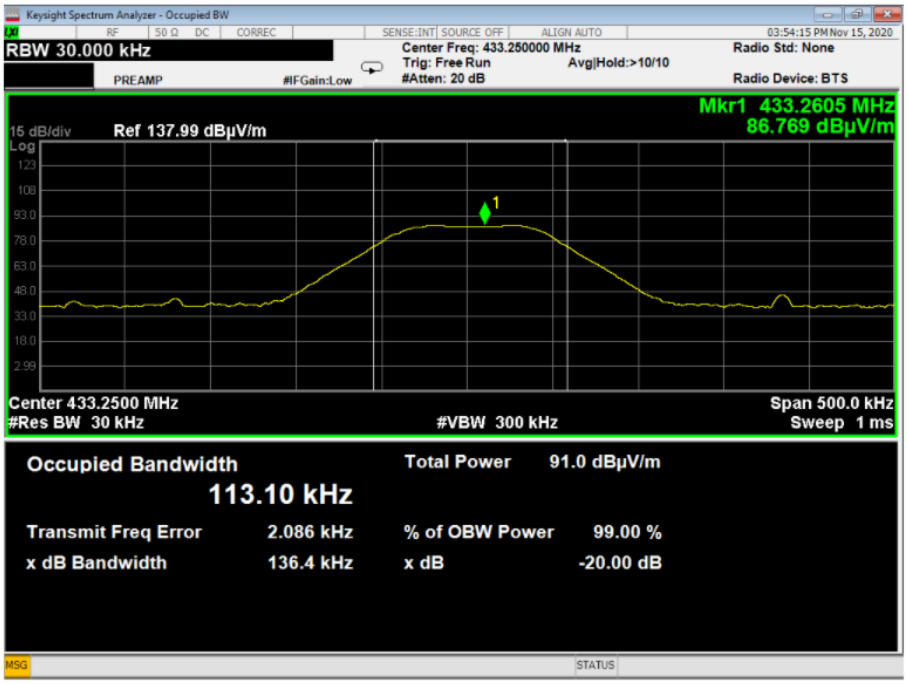
4.5. Emission bandwidth

Reference document:	**47 CFR §15.231(c)**		
Test Requirements:	The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900MHz. Bandwidth is determined at the 20dB down from the modulated carrier.		
Test setup:	See Sec. 2.2	**Pass**	
Operating conditions:	Under normal test conditions		
Method of testing:	Radiated		
S.A. Settings:	RBW: 30kHz, VBW: 300kHz		
Environment conditions:	Ambient Temperature: 22.3°c	Relative Humidity: 59.8%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	Plot 4.5.1 – 4.5.2	

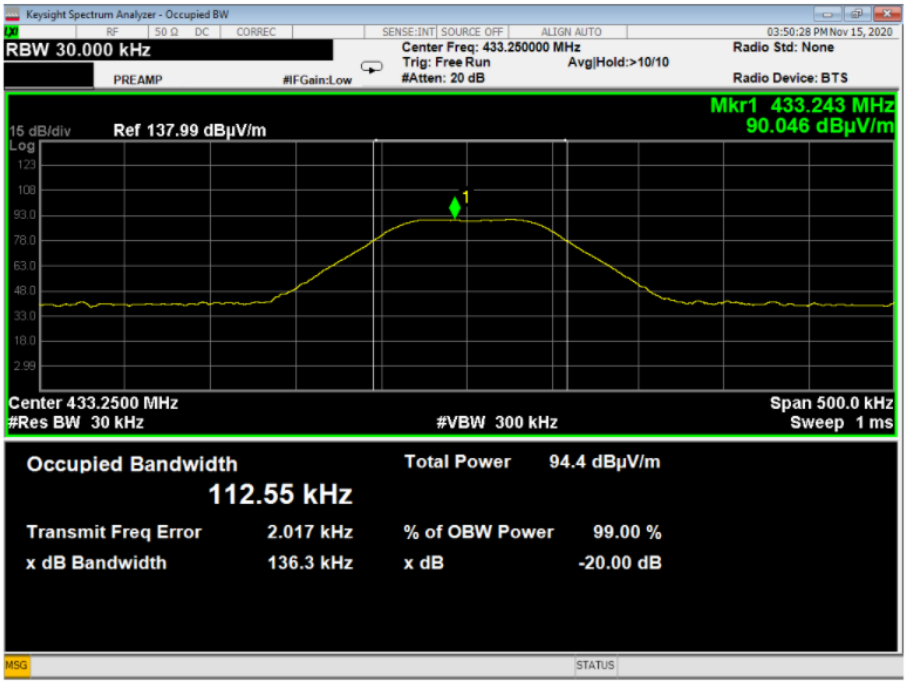
Test results:

20dB BW [kHz]	Ante pos	Center frequency [MHz]	0.25% of Center frequency [kHz]	Result
136.4	V	433.25	1083.125	Pass
136.3	H	433.25	1083.125	Pass

Plot 4.5.1: Emission bandwidth Vertical polarization



Plot 4.5.2: Emission bandwidth Horizontal polarization, Low channel



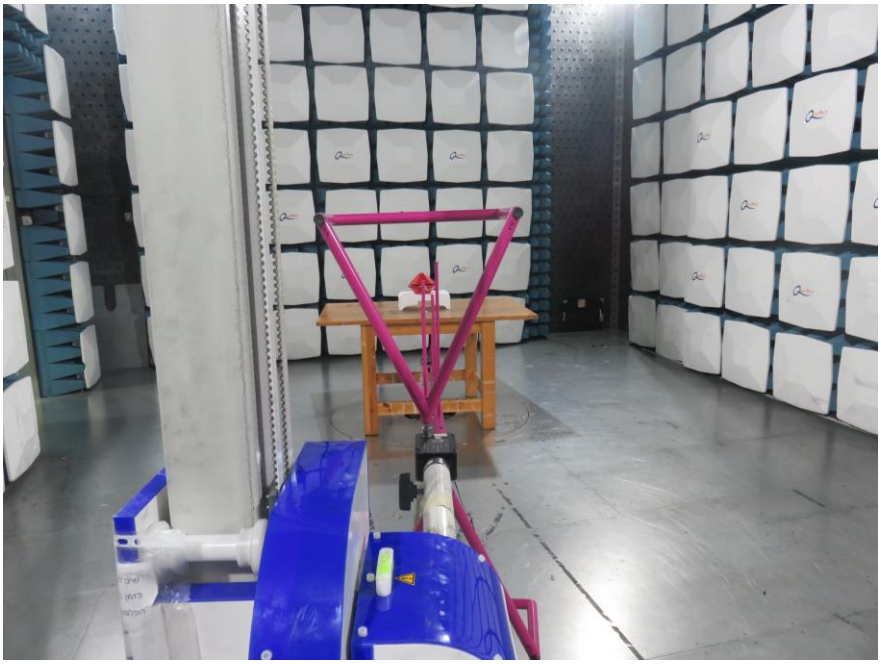
4.6. Antenna Connector Requirements

Reference document:	**47 CFR §15.203**	
Test Requirements:	An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with provisions of this section.	
Test Result:	The B-Cone Pool employs an integral printed antenna.	**Comply**

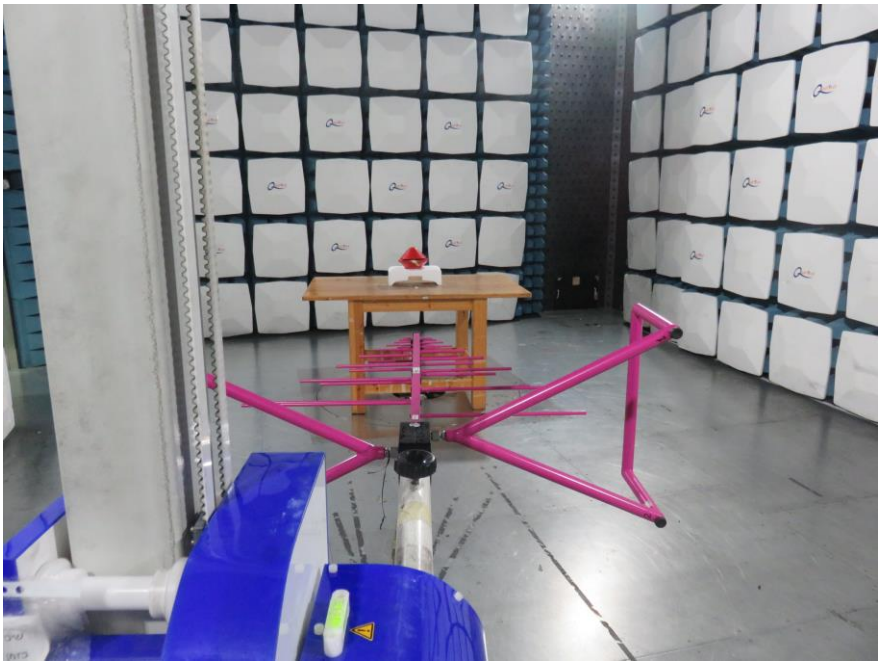
5. Appendix

Appendix A: Test photographs

Photograph 1: Radiated Emission Testing



Photograph 2: Radiated Emission Testing



Photograph 3: Radiated Emission Testing

Photograph 4: Radiated Emission Testing

Appendix B: List of test equipment used

Description	Manufacturer	Model	Serial No.	Last Cal	Cal Due
Temp & Hum Meter	Zico	Zi-9622	141101658	20-02-2020	20-08-2021
Anechoic new (large) chamber	-----	-----	-----	11-02-2020	11-02-2022
Antenna, loop, 10 kHz to 30 MHz	EMCO	6502	3424	10-03-2020	10-03-2022
Bilog Antenna 30MHz - 1000MHz	Teseq	CBL 6141B	34119	18-03-2019	18-03-2022
Horn Antenna (EMM) 1-18GHz	A.R.A	DRG-118/A	17188	07-10-2020	07-10-2021
LNA 1-18GHz (New)	Spacek Labs	SL1018-56-5	17J29	08-01-2020	08-08-2021
MXE EMI RECEIVER 3Hz-44GHz	Keysight Technologies	N9038A	MY55420200	07-11-2019	07-08-2021

Appendix C: Accreditation Certificate

ilac-MRA A2LA

Accredited Laboratory

A2LA has accredited

QUALITECH

Petah-Tikva, Israel

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated April 2017*).

Presented this 22nd day of December 2020.

Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1633.01
Valid to June 30, 2022

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

End of the Test Report