EKTOS
Testing & Reliability Services

A. C. Meyers Vænge 15
2450 Copenhagen SV
Denmark
+45 7070 1499
info@ektos.net

REPORT

Accredited by DANAK under registration number 563 to testing.
TEST: Testing laboratory (DS/EN ISO/IEC 17025)
FCC reg. no.: DK0002
IC reg. no.: DK0001

| Date | Reference | Page |
|---|---|---|
| 2019-10-24 | P19-0165-2 rev. 2 | 1 (14) |

# FCC and IC Test Report

of

M1845006 AMP-X300

according to

FCC 47 CFR, Part 15 Subpart B, Class B
ICES‑003, Issue 6:2016, Class B

Performed by

**Volodymyr Hraivoronskyi**
Test Engineer, M. Sc. EE.

Examined by

**David Busk**
Lab. Manager, M. Sc. EE.

DANAK
TEST Reg.No. 563
Member of EA MLA

DANAK is the national accreditation body in Denmark in compliance with EU regulation No. 765/2008.

DANAK participates in the multilateral agreements for testing and calibration under European co-operation for Accreditation (EA) and under International Laboratory Accreditation Cooperation (ILAC) based on peer-evaluation. Accredited test reports issued by laboratories accredited by DANAK are recognized cross border by members of EA and ILAC equal to test reports issued by these members' accredited laboratories.

The use of the accreditation mark on test reports, documents that the service is provided as an accredited service under the company's DANAK accreditation.

| | | | |
|---|---|---|---|
| **Report no.:** | P19-0165-2 rev. 2 | **Report date:** | 2019-10-24 |
| **Test started:** | 2019-09-24 | **Test ended:** | 2019-09-24 |
| **Test laboratory:** | EKTOS TRS A/S<br>A. C. Meyers Vænge 15<br>2450 Copenhagen SV<br>Denmark | **Client:** | ICEpower A/S<br>Vandtårnsvej 62A. 3B<br>2860 Søborg<br>Denmark |
| **Contact person:** | Henrik Brosbøl | **Contact person:** | Thomas Forstberg Petersen |

| | |
|---|---|
| **Facility reg. no.** | FCC registration number: DK0002<br>Industry Canada registration number: DK0001 |
| **Test specimens:** | Model: M1845006 SKU: AMP-X300 |
| **Test specifications:** | FCC 47 CFR Part 15 Subpart B<br><br>ICES‑003, Issue 6:2016<br><br>The tests relevant for the test specimens are listed in *section 1.1*. |
| **Documentation:** | P19-0165-2 rev. 2 supersedes P19-0165-2 rev. 1 issued 2019-10-22.<br>Changes: Model name stated by client was updated.<br><br>This test report shall not be reproduced except in full, without written approval of the laboratory.<br><br>The complete test documentation is archived for 10 years at the testing laboratory. |
| **Test results:** | The test specimen complies with relevant parts of the test specifications.<br><br>The test results relate only to the specimen tested. |
| **Test personnel:** | David Busk |

# CONTENTS

# 1 SUMMARY

## 1.1 Test plan

| Test method | Name of the test | Results |
|---|---|---|
| FCC 47 CFR Part 15 Subpart B, Class B<br>ICES‑003, Issue 6:2016, Class B | Radiated emission | PASSED |
| FCC 47 CFR Part 15 Subpart B, Class B<br>ICES‑003, Issue 6:2016, Class B | Conducted emission | PASSED |

| | |
|---|---|
| PASSED | The test was performed and the test specimen complies with the essential requirements in the standard. |
| FAILED | The test was performed and the test specimen does not comply with the essential requirements in the standard. |
| REF | The test is covered by a test in another report and/or on a similar test specimen. |
| NR | The test is not relevant for the test specimen or has been waived by the manufacturer. |

Note: Measuring uncertainties are listed on the last page of the report.

## 1.2 Test Specimens

### 1.2.1 Test specimen 1

| | |
| --- | --- |
| **Manufacturer** | ICEpower A/S |
| **Model** | M1845006  SKU: AMP-X300 |
| **Serial no.** | 1937IPS00006 Modified to X300 |
| **Part no.** | 6510866 Modified to X300 |
| **EUT no.** | 4060 |
| **Details** | - |
| **Supply voltage** | 120VAC 50/60 Hz |
| **Operational mode** | 1 channel and Hi-Z BTL-16Ω |


**Photo 1. Test specimen.**

## 1.3 Auxiliary Equipment

### 1.3.1 Mobile Phone

| | |
| --- | --- |
| **Manufacturer** | Samsung |
| **Model** | Galaxy S6 |
| **Serial no.** | |
| **Software** | Android 7.1 |
| **Details** | - |
| **Supply voltage** | - |
| **Operational mode** | Used as the tone/noise generator |

### 1.3.2 Load

| | |
| --- | --- |
| **Manufacturer** | ICEpower |
| **Model** | 2 x 8 Ohm |
| **Serial no.** | N/A |
| **Details** | Used in a serial connection |

## 1.4 I/O ports / cables to test specimens

| I/O Port Cable | Type | Shielding | Max Cable length |
|---|---|---|---|
| AC Power | 3 Wire | Unshielded | <3 m |
| Unbalanced Input | 1 Wire | Shielded | <3 m |
| Balanced Input | 3 Wire | Shielded | <3 m |
| Output | 2 Wire | Unshielded | <30 m |

Conducted emission test is performed on AC power port.

## 1.5 Test set-up

The test set-up with 1 channel and Hi-Z loaded by BTL-16Ω is selected during Radiated emission pre-tests as the worst case.

Pre-tests were done in various modes of channels: 1, 2 and 4 Channels. And in various modes of loads: SE-4Ω, SE-8Ω, BTL-4Ω, BTL-8Ω, Hi-Z BTL-16Ω, Hi-Z BTL-32Ω.

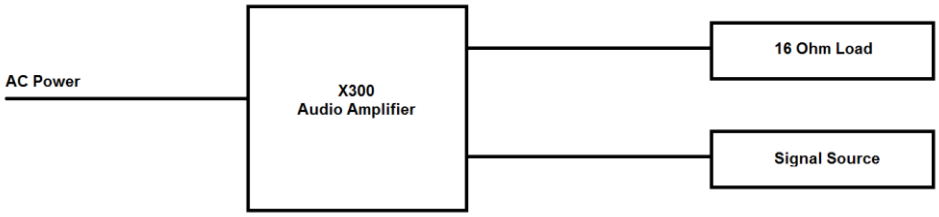


**Figure 1. Test set-up.**

# 2 TESTS

## 2.1 Radiated emission

| | |
|---|---|
| **Test specimen** | M1845006 SKU: AMP-X300 |
| **Test specification** | FCC 47 CFR Part 15 Subpart B<br>ICES‑003, Issue 6:2016 |
| **Test method** | ANSI C63.4:2014 |
| **Frequency range** | 30-1000 MHz |
| **Limits** | FCC 47 CRF §15.109 (a), Class B, Distance 3 m |
| **Comments** | Pre-tests were done in various modes of channels: 1, 2 and 4 Channels. And in various modes of loads: SE-4Ω, SE-8Ω, BTL-4Ω, BTL-8Ω, Hi-Z BTL-16Ω, Hi-Z BTL-32Ω.<br>The worst case was found to be 1 channel and Hi-Z BTL-16Ω |
| **Temperature / Humidity** | 22 °C / 51 %RH |
| **Date of measurements** | 2019-09-24 |
| **Test personnel** | David Busk |

### 2.1.1 Test setup

A measuring distance of 3 m was used during the tests.

The EUT was placed 80 cm above ground on a non-conductive table.

The auxiliary equipment was positioned on the table.

Exploratory radiated emission measurements in the frequency range 30 – 1000 MHz with reflective floor were made by rotating the turntable between 0-360° and variating the antenna height between 1-4 m, in both horizontal and vertical antenna polarization.

Based on the preliminary measurements the frequencies with the highest emissions are selected for final radiated emission measurements. Final measurements were made by rotating the turntable and changing the height of the antenna to maximize the emission level.

**Photo 2. Radiated emission test setup for 30 - 1000 MHz.**

### 2.1.2 Test limits Class B

| Frequency range [MHz] | Field strength limit [µV/m] | Field strength limit [dBµV/m] |
|---|---|---|
| 30 – 88 | 100 | 40.0 |
| 88 – 216 | 150 | 43.5 |
| 216 – 960 | 200 | 46.0 |
| Above 960 | 500 | 54.0 |

**Table 1. Radiated emission limits. FCC 47 CRF §15.109 (a), Class B.**

The field strength limit in µV/m is converted to limit in dBµV/m.

### 2.1.3 Test results

The measured test results were below the limits.

The measurement time during final measurements were 15 s.

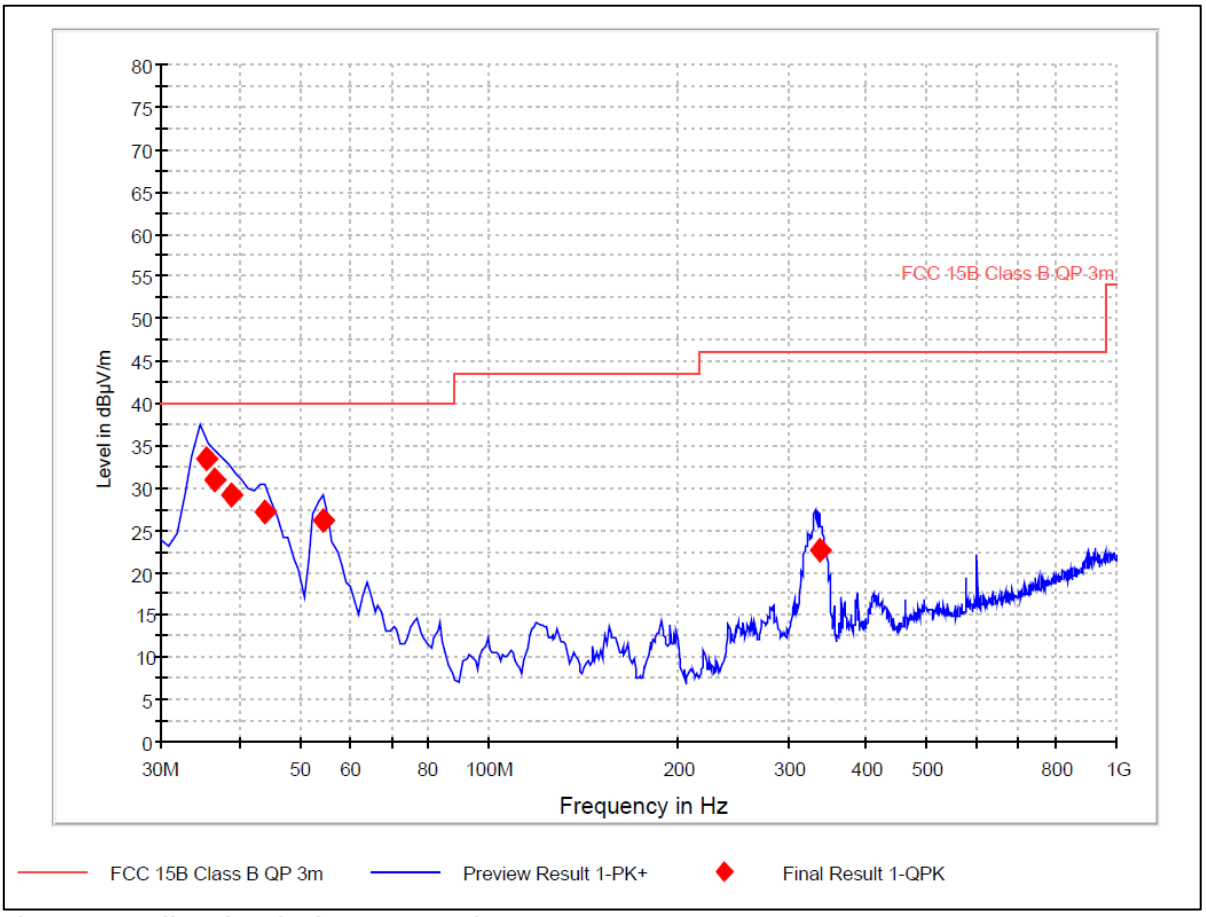


**Figure 2. Radiated emission test results. 30 - 1000 MHz.**

| Frequency [MHz] | QP [dBµV/m] | BW [kHz] | Height [cm] | Pol. | Azimuth [deg] | Margin [dB] | Limit [dBµV/m] | Result |
|---|---|---|---|---|---|---|---|---|
| 35.549419 | 33.4 | 120.0 | 100.0 | V | 128.0 | 6.60 | 40.00 | PASSED |
| 36.555070 | 31.1 | 120.0 | 100.0 | V | 157.0 | 8.90 | 40.00 | PASSED |
| 38.838838 | 29.3 | 120.0 | 100.0 | V | 180.0 | 10.70 | 40.00 | PASSED |
| 43.956373 | 27.1 | 120.0 | 100.0 | V | 94.0 | 12.90 | 40.00 | PASSED |
| 54.578978 | 26.2 | 120.0 | 100.0 | V | 244.0 | 13.80 | 40.00 | PASSED |
| 336.010341 | 22.7 | 120.0 | 100.0 | H | 274.0 | 23.30 | 46.00 | PASSED |

**Table 2. Radiated emission test results. 30 - 1000 MHz.**

### 2.1.4 Test equipment

| Description | Supplier | Model | Tag no. | Cal. due date |
|---|---|---|---|---|
| Antenna, Ultra Broadband | Rohde&Schwarz | HL562 | 19830 | 2019-10-14 |
| Analyzer 20 Hz-26.5 GHz | Rohde&Schwarz | ESI26 | 20763 | 2019-12-10 |

**Table 3. Radiated emission test equipment.**

## 2.2 Conducted emission

| | |
|---|---|
| **Test specimen** | M1845006 SKU: AMP-X300 |
| **Test specification** | FCC 47 CFR Part 15 Subpart B<br>ICES‑003, Issue 6:2016 |
| **Test method** | ANSI C63.4:2014 |
| **Frequency range** | 0.15 - 30 MHz |
| **Limits** | FCC 47 CRF §15.107 (a), Class B |
| **Comments** | Tested at 1 channel and Hi-Z BTL-16Ω |
| **Temperature / Humidity** | 22°C / 50%RH |
| **Date of measurements** | 2019-09-24 |
| **Test personnel** | David Busk |

### 2.2.1 Test setup

The AC power port test was performed with Mains connected to an Artificial Mains Network and powered by 120 VAC.

Excess lengths of cables were bundled at the cable center.

Auxiliary equipment is located on the table during the test.

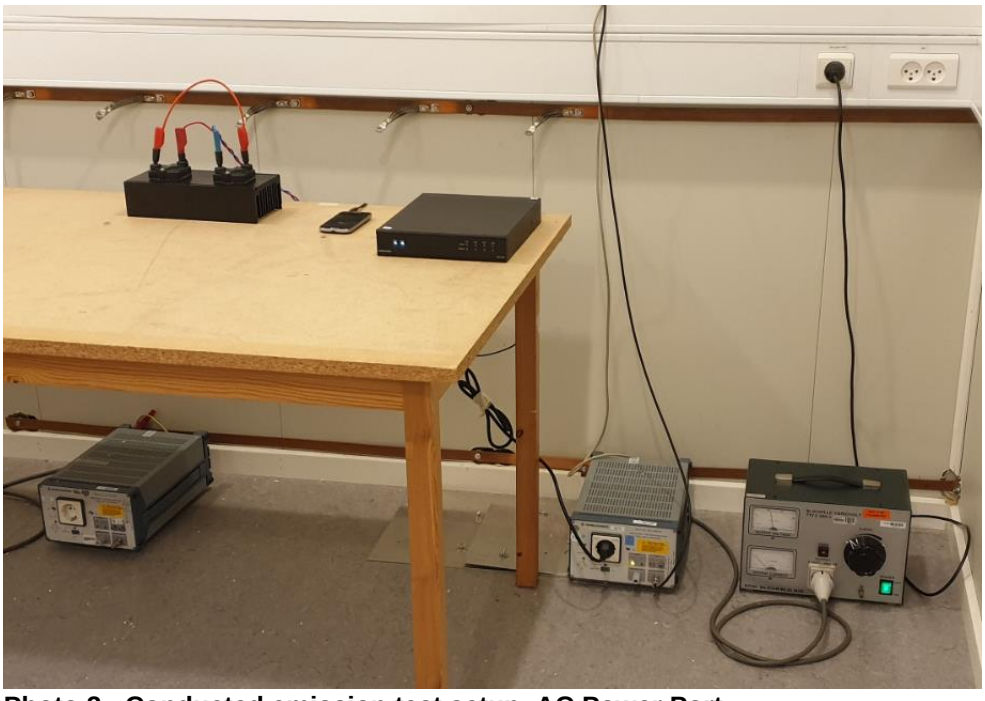

**Photo 3 - Conducted emission test setup. AC Power Port.**

### 2.2.2 Test results

The measured test results were below the limits.

The measurement time during final measurements were 15 s.

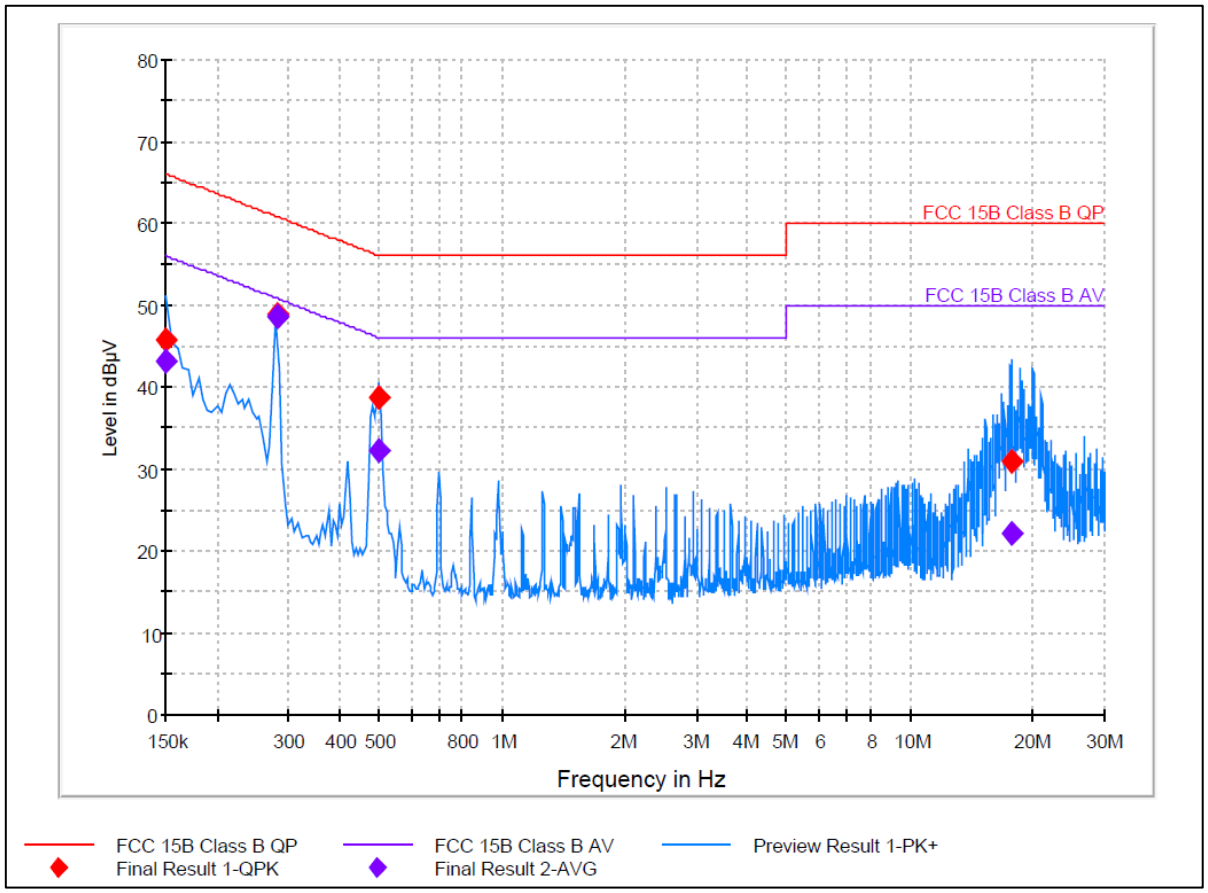


**Figure 3. Conducted emission test results. AC Power Port**

| Frequency [MHz] | QuasiPeak [dBµV] | BW [kHz] | Line | Margin [dB] | Limit [dBµV] | Result |
|---|---|---|---|---|---|---|
| 0.150200 | 45.7 | 9.000 | L1 | 20.30 | 66.00 | PASSED |
| 0.280400 | 48.8 | 9.000 | L1 | 12.00 | 60.80 | PASSED |
| 0.497400 | 38.8 | 9.000 | N | 17.30 | 56.00 | PASSED |
| 17.696400 | 30.8 | 9.000 | N | 29.20 | 60.00 | PASSED |

**Table 4. Conducted emission test results. QP detector. AC Power Port.**

| Frequency [MHz] | Average [dBµV] | BW [kHz] | Line | Margin [dB] | Limit [dBµV] | Result |
|---|---|---|---|---|---|---|
| 0.150200 | 43.2 | 9.000 | L1 | 12.80 | 56.00 | PASSED |
| 0.280400 | 48.5 | 9.000 | L1 | 2.30 | 50.80 | PASSED |
| 0.497400 | 32.2 | 9.000 | N | 13.90 | 46.00 | PASSED |
| 17.696400 | 22.1 | 9.000 | N | 27.90 | 50.00 | PASSED |

**Table 5. Conducted emission test results. Average detector. AC Power Port.**

### 2.2.3 Test equipment

| Description | Supplier | Model | Tag no. | Cal. due date |
|---|---|---|---|---|
| Pulse Limiter 9KHz-30MHz | Rohde&Schwarz | ESH3-Z2 | 13513 | - |
| Receiver EMI Test 20Hz-26.5GHz | Rohde&Schwarz | ESIB 26 | 18880 | 2019-09-24 |
| V-network Two Line | Rohde&Schwarz | ESH3-Z5 | 13935 | 2019-09-25 |

**Table 6. Conducted emission test equipment.**

# 3 MEASURING UNCERTAINTIES

Compliancy evaluation is based on a shared risk principle with respect to the measurement uncertainty.

## 3.1 EMC

| *EMC tests* | Frequency [MHz] | Polarization | Expanded Uncertainty [dB] (k=2) |
|---|---|---|---|
| Radiated emission | 30 - 200 | Vertical | **4.73** |
| | 200 - 1000 | Vertical | **4.97** |
| | 30 - 200 | Horizontal | **4.72** |
| | 200 - 1000 | Horizontal | **5.08** |
| Conducted emission | 0.01 - 30 | | **3.44** |