



# Test report

REP008103-2R1TRFWL

Date of issue: April 10, 2023

Applicant:

Nalu Medical Inc

Product:

Charging System for Wearable Medical Device

Model:

43012

Variant(s):

None

FCC ID:

2AMB3-BSC

IC ID:

Not provided

Specifications:

- ◆ FCC 47 CFR Part 18: Industrial, scientific, and medical equipment
- ◆ RSS-216 Issue 2: 2016 + Amendment 1: 2020: Wireless Power Transfer Devices
- ◆ ICES-001 Issue 5: 2020: Industrial, scientific, and medical (ISM) equipment

#### Lab and test locations

|                    |                                                                                   |
|--------------------|-----------------------------------------------------------------------------------|
| Company name       | Nemko USA Inc.                                                                    |
| Address            | 2210 Faraday Ave, Suite 150                                                       |
| City               | Carlsbad                                                                          |
| State              | California                                                                        |
| Postal code        | 92008                                                                             |
| Country            | USA                                                                               |
| Telephone          | +1 760 444 3500                                                                   |
| Website            | www.nemko.com                                                                     |
| FCC Site Number    | Test Firm Registration Number: 392943; Designation Number: US5058                 |
| ISED Test Site     | 2040B-3                                                                           |
| Tested by          | Chenhao Ma, Wireless Test Technician                                              |
| Reviewed by        | James Cunningham, EMC/MIL/WL Supervisor                                           |
| Review date        | April 10, 2023                                                                    |
| Reviewer signature |  |

#### Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contain in this report are within Nemko USA's ISO/IEC 17025 accreditation.

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## Section 1 Report summary

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### 1.1 Test specifications

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|                                           |                                                     |
|-------------------------------------------|-----------------------------------------------------|
| FCC 47 CFR Part 18                        | Industrial, scientific, and medical equipment       |
| RSS-216 Issue 2: 2016 + Amendment 1: 2020 | Wireless Power Transfer Devices                     |
| ICES-001 Issue 5: 2020                    | Industrial, scientific, and medical (ISM) equipment |

### 1.2 Test methods

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|                 |                                                                                                                                                                  |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FCC MP-5        | FCC Methods of Measurements of Radio Noise Emissions from Industrial, Scientific, and Medical equipment                                                          |
| CSA CISPR 11:19 | Industrial, scientific, and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement (IEC CISPR 11:2015+A1:2016, MOD) |

### 1.3 Exclusions

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None.

### 1.4 Statement of compliance

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Testing was performed against all relevant requirements of the test standard(s).

Results obtained indicate that the product under test complies in full with the tested requirements.

The test results relate only to the item(s) tested.

See “Section 2 Summary of test results” for full details.

### 1.5 Test report revision history

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**Table 1.5-1:** Test report revision history

| Revision #         | Issue Date     | Details of changes made to test report |
|--------------------|----------------|----------------------------------------|
| REP008103-2TRFEMC  | March 29, 2023 | Original report issued                 |
| REP008103-2R1TRFWL | April 10, 2023 | Updated following TCB review comments  |

## Section 2 Summary of test results

### 2.1 Sample information

|                        |           |
|------------------------|-----------|
| Receipt date           | 08-Mar-23 |
| Nemko sample ID number | REP008103 |

### 2.2 Testing period

|                 |           |
|-----------------|-----------|
| Test start date | 09-Mar-23 |
| Test end date   | 10-Mar-23 |

### 2.3 Emissions test results

**Table 2.3-1: FCC 47 CFR Part 18 and RSS-216 Issue 2 / ICES-001 Issue 5 results**

| Standard                           | Clause  | Test description      | Verdict           |
|------------------------------------|---------|-----------------------|-------------------|
| FCC 47 CFR Part 18                 | §18.305 | Field strength limits | Pass              |
| FCC 47 CFR Part 18                 | §18.307 | Conduction limits     | Pass <sup>1</sup> |
| RSS-216 Issue 2 / ICES-001 Issue 5 | 3.1     | Radiated emissions    | Pass              |
| RSS-216 Issue 2 / ICES-001 Issue 5 | 3.1     | Conducted emissions   | Pass <sup>2</sup> |

Notes: <sup>1</sup> The EUT is AC powered

## Section 3 Equipment under test (EUT) details

### 3.1 Disclaimer

This section contains information provided by the applicant and has been utilized to support the test plan. Inaccurate information provided by the applicant can affect the validity of the results within this test report. Nemko accepts no responsibility for the information contained within this section and the impact it may have on the test plan and resulting measurements.

### 3.2 Applicant

|                 |                           |
|-----------------|---------------------------|
| Company name    | Nalu Medical Inc          |
| Address         | 2320 Faraday Ave. Ste.100 |
| City            | Carlsbad                  |
| State           | CA                        |
| Postal/Zip code | 92008                     |
| Country         | United States             |

### 3.3 Manufacturer

|                 |                           |
|-----------------|---------------------------|
| Company name    | Nalu Medical Inc          |
| Address         | 2320 Faraday Ave. Ste.100 |
| City            | Carlsbad                  |
| State           | CA                        |
| Postal/Zip code | 92008                     |
| Country         | United States             |

### 3.4 EUT information

|                                 |                                                                                                                       |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| Product name                    | Charging System for Wearable Medical Device                                                                           |
| Model                           | 43012                                                                                                                 |
| Variant(s)                      | None                                                                                                                  |
| Serial number                   | None                                                                                                                  |
| Part number                     | None                                                                                                                  |
| Power requirements              | 120 VAC                                                                                                               |
| Description/theory of operation | Qi: Inductive wireless power transfer. NFC: Data transfer via near field load modulation.(This report covers Qi mode) |
| Operational frequencies         | Qi: 150 kHz; NFC: 13.56 MHz (This report covers Qi mode)                                                              |
| Software details                | None                                                                                                                  |

- ☐ EUT operating on ISM frequency:
- ☐ 6.78 MHz ( $\pm 15.0$  kHz)
  - ☐ 13.56 MHz ( $\pm 7.0$  kHz)
  - ☐ 27.12 MHz ( $\pm 163.0$  kHz)
  - ☐ 40.68 MHz ( $\pm 20.0$  kHz)
  - ☐ 915 MHz ( $\pm 13.0$  MHz)
  - ☐ 2450 MHz ( $\pm 50.0$  MHz)
  - ☐ 5800 MHz ( $\pm 75.0$  MHz)
  - ☐ 24.125 GHz ( $\pm 125.0$  MHz)
- ☒ EUT not operating on ISM frequency:  
Operating frequency: 150 kHz

### 3.5 EUT exercise and monitoring details

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**EUT description of the methods used to exercise the EUT and all relevant ports:**

- The Qi system was configured to charge a battery at the maximum charge current. This represents the maximum transmitted power of the system.
- The NFC system was configured to continuously transmit data at the maximum power level and at the maximum data rate.

**EUT setup/configuration rationale:**

- The EUT setup in a configuration that was expected to produce the highest amplitude emissions relative to the limit and that satisfy normal operation/installation practice by the end user.
- The type and construction of cables used in the measurement set-up were consistent with normal or typical use. Cables with mitigation features (for example, screening, tighter/more twists per length, ferrite beads) have been noted below:
  - None
- The EUT was setup in a manner that was consistent with its typical arrangement and use. The measurement arrangement of the EUT, local ancillary equipment and associated cabling was representative of normal practice. Any deviations from typical arrangements have been noted below:
  - None

### 3.6 EUT setup details

**Table 3.6-1:** EUT sub assemblies

| Description | Brand name | Model/Part number | Serial number | Rev. |
|-------------|------------|-------------------|---------------|------|
| None        | None       | None              | None          | None |

**Table 3.6-2:** EUT interface ports

| Description | Qty. |
|-------------|------|
| None        | None |

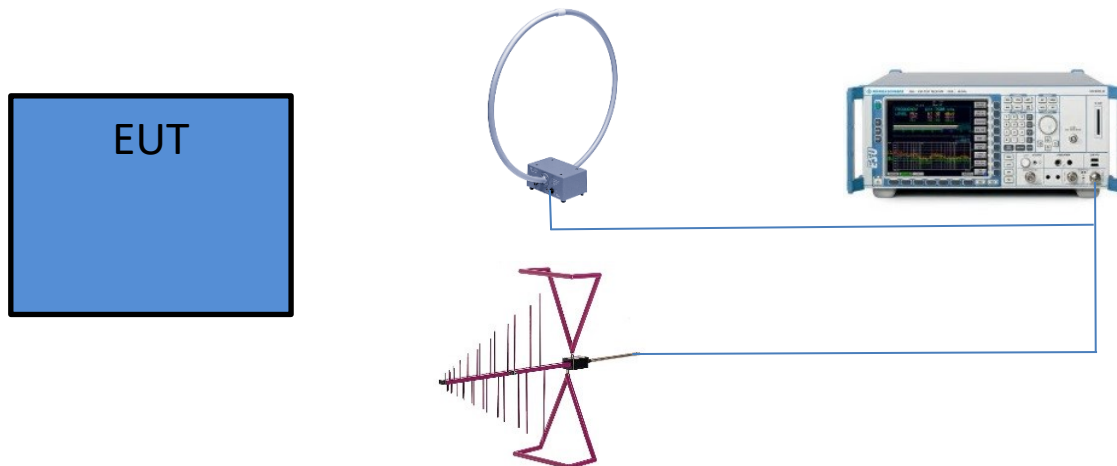
**Table 3.6-3:** Support equipment

| Description        | Brand name   | Model/Part number | Serial number | Rev. |
|--------------------|--------------|-------------------|---------------|------|
| Therapy Disc Gen 2 | Nalu Medical | 34014-001         | N/A           | N/A  |

**Table 3.6-4:** Inter-connection cables

| Cable description  | From         | To              | Length (m) |
|--------------------|--------------|-----------------|------------|
| USB C (power only) | Wall Adapter | Charging System | 1          |

**Figure 3.6-1:** Test setup diagram



## Section 4 Engineering considerations

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### 4.1 Modifications incorporated in the EUT

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None.

### 4.2 Technical judgement

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None.

### 4.3 Deviations from laboratory test procedures

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None.

## Section 5 Test conditions

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### 5.1 Atmospheric conditions

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|                   |            |
|-------------------|------------|
| Temperature       | 15–30 °C   |
| Relative humidity | 20–75 %    |
| Air pressure      | 86–106 kPa |

When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.

### 5.2 Power supply range

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The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages  $\pm 5$  %, for which the equipment was designed.

## Section 6 Measurement uncertainty

### 6.1 Uncertainty of measurement

Nemko USA Inc. has calculated measurement uncertainty and is documented in EMC/MUC/001 "Uncertainty in EMC measurements." Measurement uncertainty was calculated using the methods described in CISPR 16-4-2 Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics, and limit modelling – Measurement instrumentation uncertainty. The expression of Uncertainty in EMC testing. Measurement uncertainty calculations assume a coverage factor of K=2 with 95% certainty.

**Table 6.1-1: Measurement uncertainty calculations**

| Measurement                                                          |                   | $U_{\text{cispr}}$ dB | $U_{\text{lab}}$ dB |
|----------------------------------------------------------------------|-------------------|-----------------------|---------------------|
| Conducted disturbance at AC mains and other port power using a V-AMN | 9 kHz to 150 kHz  | 3.8                   | 2.9                 |
|                                                                      | 150 kHz to 30 MHz | 3.4                   | 2.3                 |
| Conducted disturbance at telecommunication port using AAN            | 150 kHz to 30 MHz | 5.0                   | 4.3                 |
| Conducted disturbance at telecommunication port using CVP            | 150 kHz to 30 MHz | 3.9                   | 2.9                 |
| Conducted disturbance at telecommunication port using CP             | 150 kHz to 30 MHz | 2.9                   | 1.4                 |
| Conducted disturbance at telecommunication port using CP and CVP     | 150 kHz to 30 MHz | 4.0                   | 3.1                 |
| Radiated disturbance (electric field strength in a SAC)              | 30 MHz to 1 GHz   | 6.3                   | 5.5                 |
| Radiated disturbance (electric field strength in a FAR)              | 1 GHz to 6 GHz    | 5.2                   | 4.7                 |
| Radiated disturbance (electric field strength in a FAR)              | 6 GHz to 18 GHz   | 5.5                   | 5.0                 |

- Notes:
- Compliance assessment:
    - If  $U_{\text{lab}}$  is less than or equal to  $U_{\text{cispr}}$  then:
      - compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
      - non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit
    - If  $U_{\text{lab}}$  is greater than  $U_{\text{cispr}}$  then:
      - compliance is deemed to occur if no measured disturbance level, increased by  $(U_{\text{lab}} - U_{\text{cispr}})$ , exceeds the disturbance limit;
      - non-compliance is deemed to occur if any measured disturbance level, increased by  $(U_{\text{lab}} - U_{\text{cispr}})$ , exceeds the disturbance limit

V-AMN: V type artificial mains network  
 AAN: Asymmetric artificial network  
 CP: Current probe  
 CVP: Capacitive voltage probe  
 SAC: Semi-anechoic chamber  
 FAR: Fully anechoic room

## Section 7 Test equipment

### 7.1 Test equipment list

**Table 7.1-1: Equipment list**

| Equipment                        | Manufacturer    | Model no. | Asset no. | Cal cycle  | Next cal.  |
|----------------------------------|-----------------|-----------|-----------|------------|------------|
| EMI Test Receiver                | Rohde & Schwarz | ESU40     |           | 03-14-2022 | 03-14-2024 |
| System controller                | Sunol Sciences  | SC104V    | E1191     | NCR        | NCR        |
| Active Loop Antenna (9kHz-30MHz) | EMCO            | 6507      | 1733      | 06-17-2022 | 06-17-2023 |
| Bilog Antenna (30-1000MHz)       | Schaffner-Chase | CBL 6111D | 1763      | 04-01-2022 | 04-01-2024 |
| EMI Test Receiver                | Rohde & Schwarz | ESCI 7    | E1026     | 03-22-2023 | 03-22-2024 |
| Two Line V-Network               | Rohde & Schwarz | ENV216    | E1019     | 09-30-2022 | 09-30-2023 |

Notes: N/A – not applicable  
NCR – no calibration required  
VOU – verify on use

**Table 7.1-2: Test Software**

| Manufacturer of Software | Details          |
|--------------------------|------------------|
| Rohde & Schwarz          | EMC32 V10.35.10  |
| Rohde & Schwarz          | EMC 32 V10.20.01 |

Notes: None

## Section 8 Testing data

### 8.1 Radiated emissions

#### 8.1.1 References and limits

- 47 CFR Part 18 §18.305
- ICES-001: §3.2.2 (referencing CSA CISPR 11:19 §6.2 and §6.3)

#### 47 CFR Part 18 §18.305:

- (a) ISM equipment operating on a frequency specified in §18.301 is permitted unlimited radiated energy in the band specified for that frequency.
- (b) The field strength levels of emissions which lie outside the bands specified in §18.301, unless otherwise indicated, shall not exceed the following

| Equipment                                        | Operating frequency   | RF power generated by equipment (Watts) | Field strength limit (µV/m)    | Distance (meters)       |
|--------------------------------------------------|-----------------------|-----------------------------------------|--------------------------------|-------------------------|
| Any type unless otherwise specified              | Any ISM frequency     | Below 500<br>500 or more                | 25<br>25 x SQRT(power/500)     | 300<br>300 <sup>1</sup> |
|                                                  | Any non-ISM frequency | Below 500<br>500 or more                | 15<br>15 x SQRT(power/500)     | 300<br>300 <sup>1</sup> |
| Industrial heaters and RF stabilized arc welders | On or below 5,725 MHz | Any                                     | 10                             | 1,600                   |
|                                                  | Above 5.725 MHz       | Any                                     | Note 2                         | Note 2                  |
| Medical diathermy                                | Any ISM frequency     | Any                                     | 25                             | 300                     |
|                                                  | Any non-ISM frequency | Any                                     | 15                             | 300                     |
| Ultrasonic                                       | Below 490 kHz         | Below 500                               | 2,400/F(kHz)                   | 300                     |
|                                                  |                       | 500 or more                             | 2,400/F(kHz) x SQRT(power/500) | 300 <sup>3</sup>        |
|                                                  | 490 kHz to 1,600 kHz  | Any                                     | 24,000/F(kHz)                  | 30                      |
|                                                  | Above 1,600 kHz       | Any                                     | 15                             | 30                      |
| Induction cooking ranges                         | Below 90 kHz          | Any                                     | 1,500                          | 30 <sup>4</sup>         |
|                                                  | On or above 90 kHz    | Any                                     | 30                             | 30 <sup>4</sup>         |

Notes: <sup>1</sup> Field strength may not exceed 10 µV/m at 1600 meters. Consumer equipment operating below 1000 MHz is not permitted the increase in field strength otherwise permitted here for power over 500 watts.

<sup>2</sup> Reduced to the greatest possible extent.

<sup>3</sup> Field strength may not exceed 10 µV/m at 1600 meters. Consumer equipment is not permitted the increase in field strength otherwise permitted here for power over 500 watts.

<sup>4</sup> Induction cooking ranges manufactured prior to February 1, 1980, shall be subject to the field strength limits for miscellaneous ISM equipment.

- (c) The field strength limits for RF lighting devices shall be the following:

| Frequency (MHz)         | Field strength limit at 30 meters (µV/m) |
|-------------------------|------------------------------------------|
| Non-consumer equipment: |                                          |
| 30 – 88                 | 30                                       |
| 88 – 216                | 50                                       |
| 216 – 1000              | 70                                       |
| Consumer equipment:     |                                          |
| 30 – 88                 | 10                                       |
| 88 – 216                | 15                                       |
| 216 – 1000              | 20                                       |

- Notes: 1. The tighter limit shall apply at the boundary between two frequency ranges
2. Testing for compliance with these limits may be made at closer distances, provided a sufficient number of measurements are taken to plot the radiation pattern, to determine the major lobes of radiation, and to determine the expected field strength level at 30, 300 or 1600 meters. Alternatively, if measurements are made at only one closer fixed distance, then the permissible field strength limits shall be adjusted using 1/d as an attenuation factor.

#### ICES-001: §3.1:

Equipment subject to this standard shall comply with all applicable requirements set forth in CSA CISPR 11:19, except if otherwise stated in this standard, and with the additional requirements specified herein.

### 8.1.2 Test summary

|               |                                                                                                                                                       |                   |             |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------|
| Verdict       | Pass                                                                                                                                                  |                   |             |
| Test date     | March 9, 2023                                                                                                                                         | Temperature       | 19.87 °C    |
| Test engineer | Chenhao Ma, Wireless Test Technician                                                                                                                  | Air pressure      | 1004.6 mbar |
| Test location | <input checked="" type="checkbox"/> 10m semi anechoic chamber<br><input type="checkbox"/> 3m semi anechoic chamber<br><input type="checkbox"/> Other: | Relative humidity | 49.8 %      |

### 8.1.3 Notes

The spectral plots within this section have been corrected with all relevant transducer factors.

### 8.1.4 Setup details

|                             |                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port under test             | Enclosure port                                                                                                                                                                                                                                                                                                                                                                                                           |
| EUT power input during test | 120 VAC                                                                                                                                                                                                                                                                                                                                                                                                                  |
| EUT setup configuration     | <input checked="" type="checkbox"/> Table-top<br><input type="checkbox"/> Floor standing<br><input type="checkbox"/> Other:                                                                                                                                                                                                                                                                                              |
| Measuring distance          | <input type="checkbox"/> 10m<br><input checked="" type="checkbox"/> 3m<br><input type="checkbox"/> Other:                                                                                                                                                                                                                                                                                                                |
| Antenna height variation    | 1 – 4 m                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Turn table position         | 0 – 360°                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Measurement details         | Preview measurements were performed with the receiver in continuous scan or sweep mode. Emissions detected within 6 dB or above limit (minimum of 6 frequencies) were maximized by rotating the EUT and adjusting the antenna height and polarization. At the position of maximum emission, the signal was measured with the appropriate detector against the corresponding limit and recorded as the final measurement. |

Spectrum analyzer settings 9 kHz to 150 kHz:

|                      |                                                                                  |
|----------------------|----------------------------------------------------------------------------------|
| Resolution bandwidth | 200 Hz                                                                           |
| Video bandwidth      | 600 Hz                                                                           |
| Detector mode        | – Peak (Preview measurement)<br>– Quasi-peak (Final measurement)                 |
| Trace mode           | Max Hold                                                                         |
| Measurement time     | – 100 ms (Peak preview measurement)<br>– 15000 ms (Quasi-peak final measurement) |

Spectrum analyzer settings 150 kHz to 30 MHz:

|                      |                                                                                  |
|----------------------|----------------------------------------------------------------------------------|
| Resolution bandwidth | 9 kHz                                                                            |
| Video bandwidth      | 30 kHz                                                                           |
| Detector mode        | – Peak (Preview measurement)<br>– Quasi-peak (Final measurement)                 |
| Trace mode           | Max Hold                                                                         |
| Measurement time     | – 100 ms (Peak preview measurement)<br>– 15000 ms (Quasi-peak final measurement) |

Receiver/spectrum analyzer settings for frequencies below 1 GHz:

|                      |                                                                                 |
|----------------------|---------------------------------------------------------------------------------|
| Resolution bandwidth | 120 kHz                                                                         |
| Detector mode        | – Peak (Preview measurement)<br>– Quasi-peak (Final measurement)                |
| Trace mode           | Max Hold                                                                        |
| Measurement time     | – 100 ms (Peak preview measurement)<br>– 5000 ms (Quasi-peak final measurement) |

Receiver/spectrum analyzer settings for frequencies above 1 GHz:

|                      |                                                                                       |
|----------------------|---------------------------------------------------------------------------------------|
| Resolution bandwidth | 1 MHz                                                                                 |
| Detector mode        | Peak (Preview measurement)<br>Peak and Average (Final measurement)                    |
| Trace mode           | Max Hold                                                                              |
| Measurement time     | – 100 ms (Peak preview measurement)<br>– 5000 ms (Peak and Average final measurement) |

8.1.5 Test data

Full Spectrum

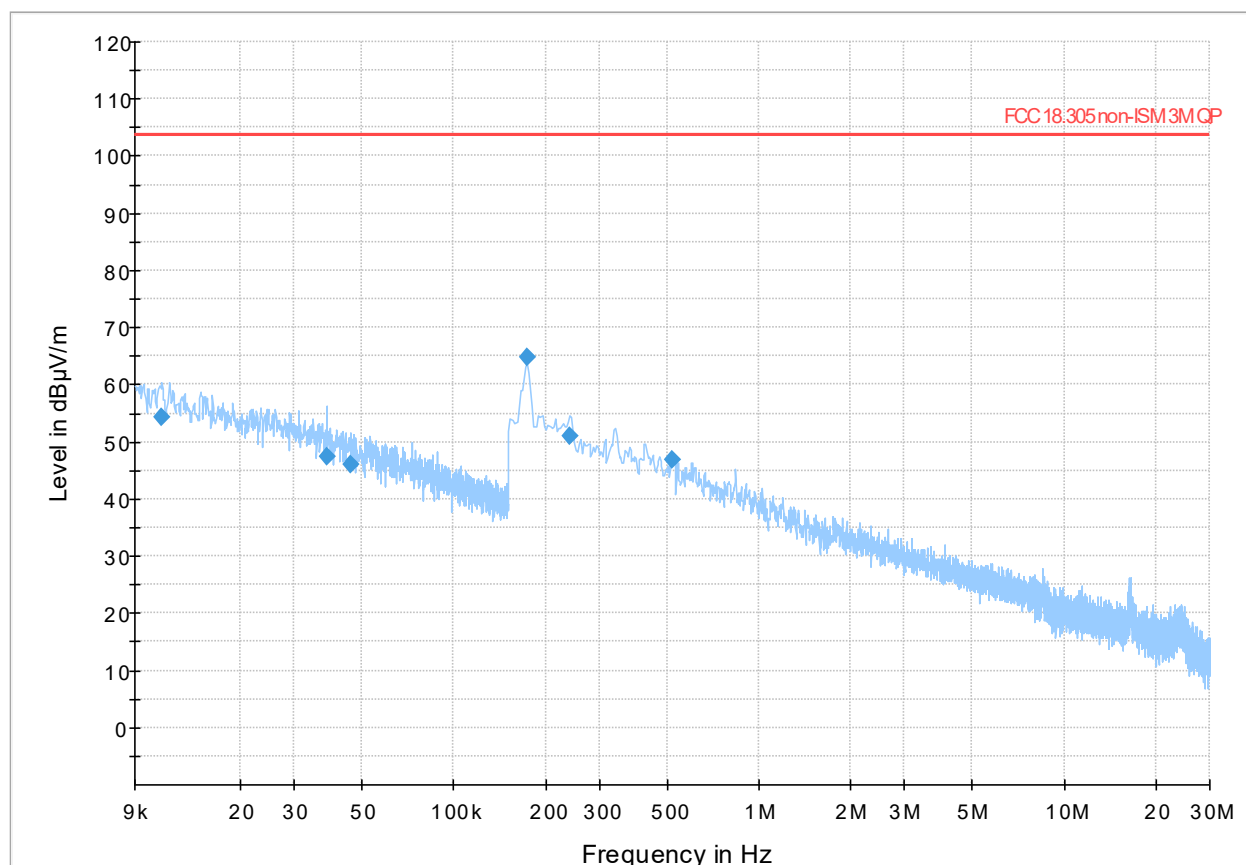


Figure 8.1-1: Radiated emissions spectral plot (9 kHz - 30 MHz) 0 degree

Table 8.1-1: Radiated emissions results

| Frequency (MHz) | QuasiPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-----|---------------|--------------|
| 0.011024        | 54.30              | 103.60         | 49.30       | 15000.0         | 0.200           | H   | 36.0          | 18.1         |
| 0.038388        | 47.35              | 103.60         | 56.25       | 15000.0         | 0.200           | H   | 283.0         | 12.6         |
| 0.045972        | 46.01              | 103.60         | 57.59       | 15000.0         | 0.200           | H   | 349.0         | 11.8         |
| 0.173380        | 64.81              | 103.60         | 38.79       | 15000.0         | 9.000           | H   | 32.0          | 10.3         |
| 0.239050        | 50.99              | 103.60         | 52.61       | 15000.0         | 9.000           | H   | 182.0         | 10.2         |
| 0.521610        | 46.79              | 103.60         | 56.81       | 15000.0         | 9.000           | H   | 86.0          | 10.4         |

Notes:

<sup>1</sup> Field strength (dB V/m) = receiver/spectrum analyzer value (dB V) + correction factor (dB)

<sup>2</sup> Correction factors = antenna factor ACF (dB) + cable loss (dB)

<sup>3</sup> Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

Full Spectrum

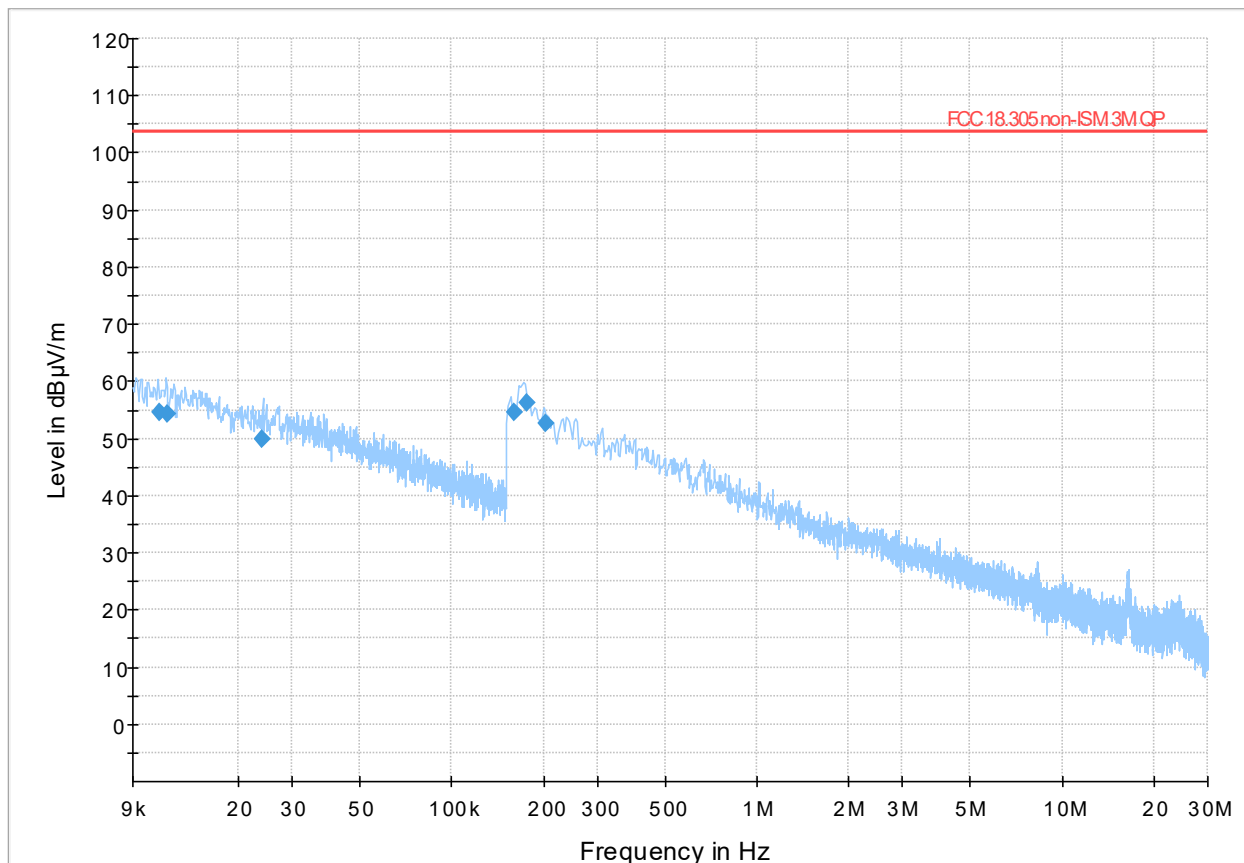


Figure 8.1-2: Radiated emissions spectral plot (9 kHz - 30 MHz) 90 degrees

Table 8.1-2: Radiated emissions results

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-----|---------------|--------------|
| 0.011004        | 54.53              | 103.60         | 49.07       | 15000.0         | 0.200           | H   | 158.0         | 18.1         |
| 0.011708        | 54.25              | 103.60         | 49.35       | 15000.0         | 0.200           | H   | 100.0         | 17.8         |
| 0.023996        | 49.89              | 103.60         | 53.71       | 15000.0         | 0.200           | H   | 212.0         | 13.9         |
| 0.159470        | 54.57              | 103.60         | 49.03       | 15000.0         | 9.000           | H   | 134.0         | 10.3         |
| 0.175395        | 56.14              | 103.60         | 47.46       | 15000.0         | 9.000           | H   | 127.0         | 10.3         |
| 0.202245        | 52.63              | 103.60         | 50.97       | 15000.0         | 9.000           | H   | 7.0           | 10.3         |

Notes:

<sup>1</sup> Field strength (dB V/m) = receiver/spectrum analyzer value (dB V) + correction factor (dB)

<sup>2</sup> Correction factors = antenna factor ACF (dB) + cable loss (dB)

<sup>3</sup> Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

Full Spectrum

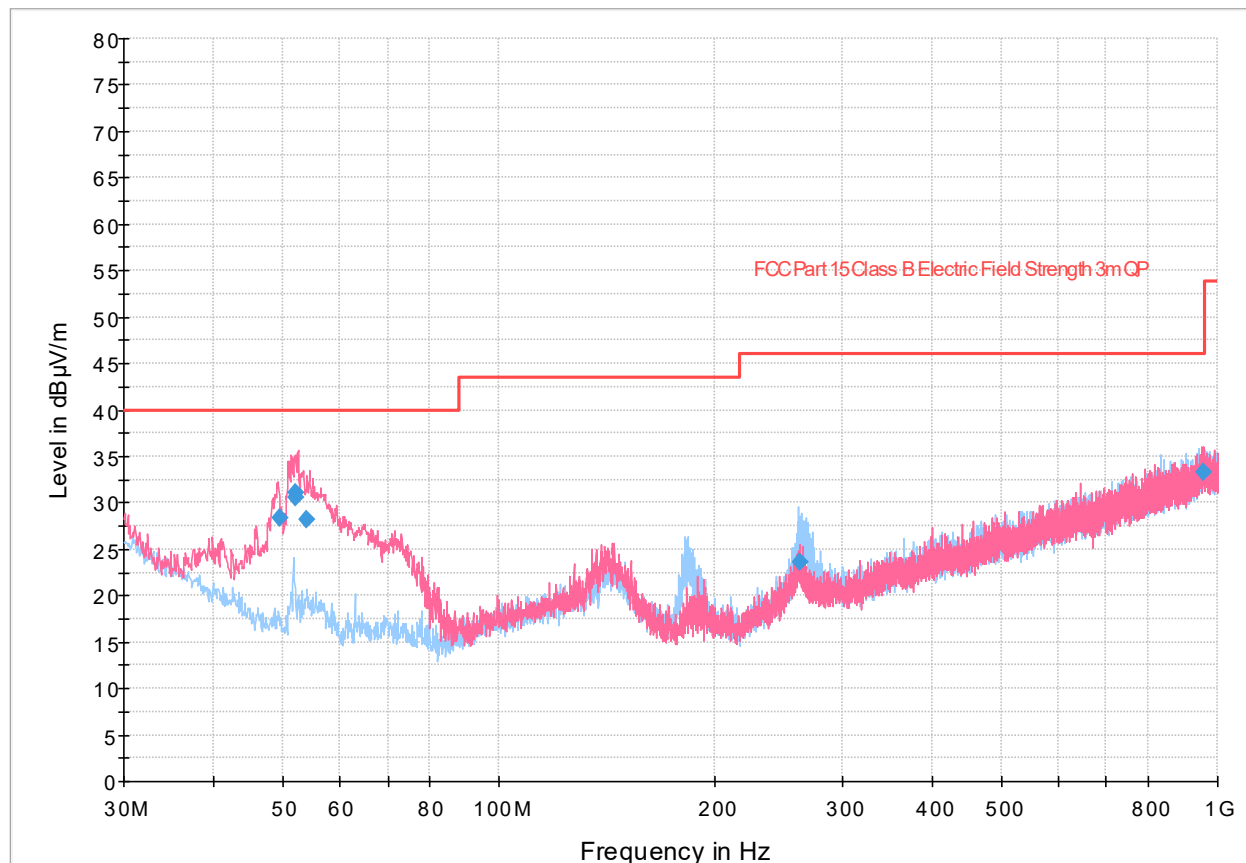


Figure 8.1-3: Radiated emissions spectral plot (30 MHz - 1 GHz)

Table 8.1-3: Radiated emissions results

| Frequency (MHz) | QuasiPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 49.592000       | 28.38              | 40.00          | 11.62       | 5000.0          | 120.000         | 128.0       | V   | 272.0         | 16.0         |
| 51.964000       | 30.57              | 40.00          | 9.43        | 5000.0          | 120.000         | 121.0       | V   | 68.0          | 15.0         |
| 52.160000       | 31.11              | 40.00          | 8.89        | 5000.0          | 120.000         | 112.0       | V   | 11.0          | 14.9         |
| 53.984000       | 28.21              | 40.00          | 11.79       | 5000.0          | 120.000         | 128.0       | V   | 185.0         | 14.1         |
| 261.588000      | 23.55              | 46.00          | 22.45       | 5000.0          | 120.000         | 102.0       | H   | 162.0         | 21.8         |
| 956.775000      | 33.35              | 46.00          | 12.65       | 5000.0          | 120.000         | 256.0       | V   | 276.0         | 34.3         |

Notes: <sup>1</sup> Field strength (dB V/m) = receiver/spectrum analyzer value (dB V) + correction factor (dB)  
<sup>2</sup> Correction factors = antenna factor ACF (dB) + cable loss (dB)  
<sup>3</sup> Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

8.1.6 Setup photos

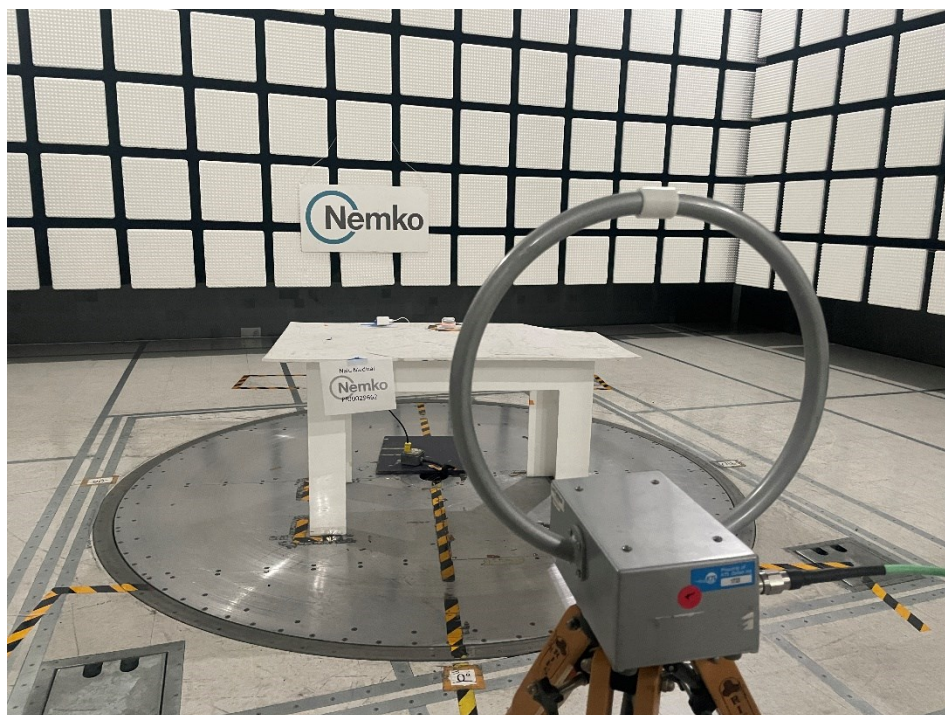


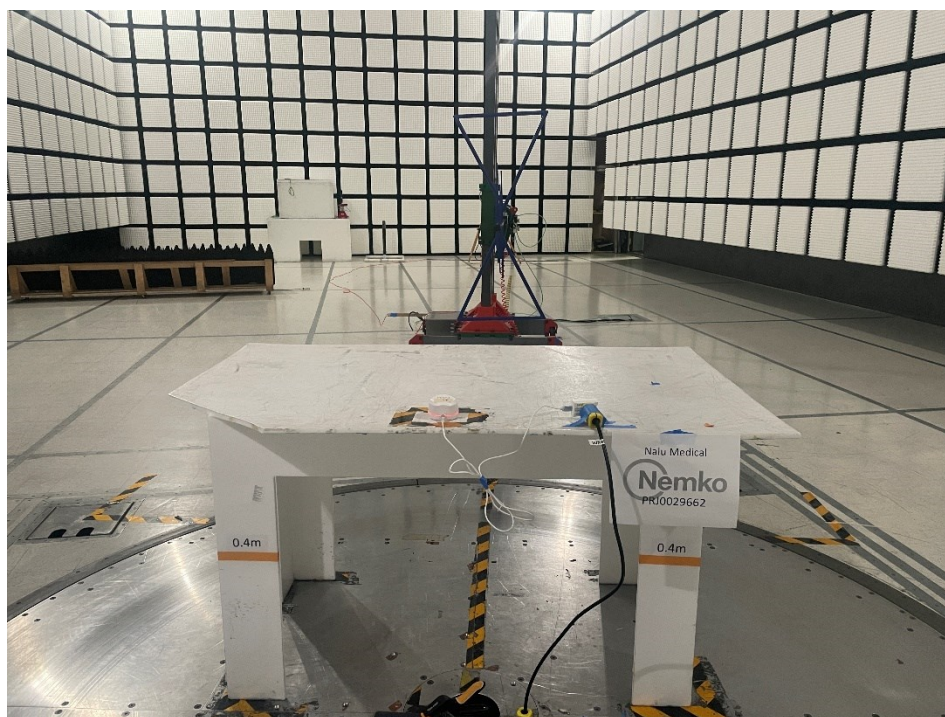
Figure 8.1-4: Radiated emissions setup photo, front – below 30 MHz



Figure 8.1-5: Radiated emissions setup photo, back – below 30 MHz



**Figure 8.1-6:** Radiated emissions setup photo, front – above 30 MHz



**Figure 8.1-7:** Radiated emissions setup photo, back – above 30 MHz

## 8.2 Conducted emissions

### 8.2.1 References and limits

- FCC 47 CFR Part 15, Subpart B: §15.107
- ICES-003: §3.2.1
- Test method: ANSI C63.4-2014

**Table 8.2-1:** Requirements for conducted emissions from the AC mains power ports for Class A

| Frequency range [MHz] | Coupling device | Measurement              | Limits<br>[dBμV] |
|-----------------------|-----------------|--------------------------|------------------|
|                       |                 | Detector type/ bandwidth |                  |
| 0.15–0.5              | AMN             | Quasi peak/9 kHz         | 79.0             |
| 0.5–30                |                 |                          | 73.0             |
| 0.15–0.5              | AMN             | Average/9 kHz            | 66.0             |
| 0.5–30                |                 |                          | 60.0             |

**Table 8.2-2:** Requirements for conducted emissions from the AC mains power ports for Class B

| Frequency range [MHz] | Coupling device | Measurement              | Limits<br>[dBμV] |
|-----------------------|-----------------|--------------------------|------------------|
|                       |                 | Detector type/ bandwidth |                  |
| 0.15–0.5              | AMN             | Quasi peak/9 kHz         | 66.0–56.0        |
| 0.5–5                 |                 |                          | 56.0             |
| 5–30                  |                 |                          | 60.0             |
| 0.15–0.5              | AMN             | Average/9 kHz            | 56.0–46.0        |
| 0.5–5                 |                 |                          | 46.0             |
| 5–30                  |                 |                          | 50.0             |

Notes: The lower limit shall apply at the transition frequency.

### 8.2.2 Test summary

|               |                                                                                     |                   |             |
|---------------|-------------------------------------------------------------------------------------|-------------------|-------------|
| Verdict       | Pass                                                                                |                   |             |
| Test date     | March 9, 2023                                                                       | Temperature       | 19.87 °C    |
| Test engineer | Chenhao Ma, Wireless Test Technician                                                | Air pressure      | 1004.6 mbar |
| Test location | <input checked="" type="checkbox"/> Ground plane<br><input type="checkbox"/> Other: | Relative humidity | 49.8 %      |

### 8.2.3 Notes

The spectral plots within this section have been corrected with all relevant transducer factors.

Equipment with a DC power port powered by a dedicated AC/DC power converter is considered to be AC mains powered equipment and tested with a power converter. Where the manufacturer provided the power converter, the supplied converter was used.

Phase and neutral measurements are combined into a single worst-case plot.

### 8.2.4 Setup details

|                                   |                                                                                                                                                                                                                             |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port under test – Coupling device | AC input – Artificial Mains Network (AMN)                                                                                                                                                                                   |
| EUT power input during test       | 120 VAC                                                                                                                                                                                                                     |
| EUT setup configuration           | <input checked="" type="checkbox"/> Table-top<br><input type="checkbox"/> Floor standing<br><input type="checkbox"/> Other:                                                                                                 |
| Measurement details               | A preview measurement was generated with the receiver in continuous scan mode. Selected emissions were re-measured with the appropriate detector(s) against the correlating limit(s) and recorded as the final measurement. |

Receiver settings:

|                      |                                                                                                         |
|----------------------|---------------------------------------------------------------------------------------------------------|
| Resolution bandwidth | 9 kHz                                                                                                   |
| Detector mode        | – Peak and Average (Preview measurement)<br>– Quasi-peak and Average (Final measurement)                |
| Trace mode           | Max Hold                                                                                                |
| Measurement time     | – 100 ms (Peak and Average preview measurement)<br>– 5000 ms (Quasi-peak and Average final measurement) |

8.2.5 Test data

Full Spectrum

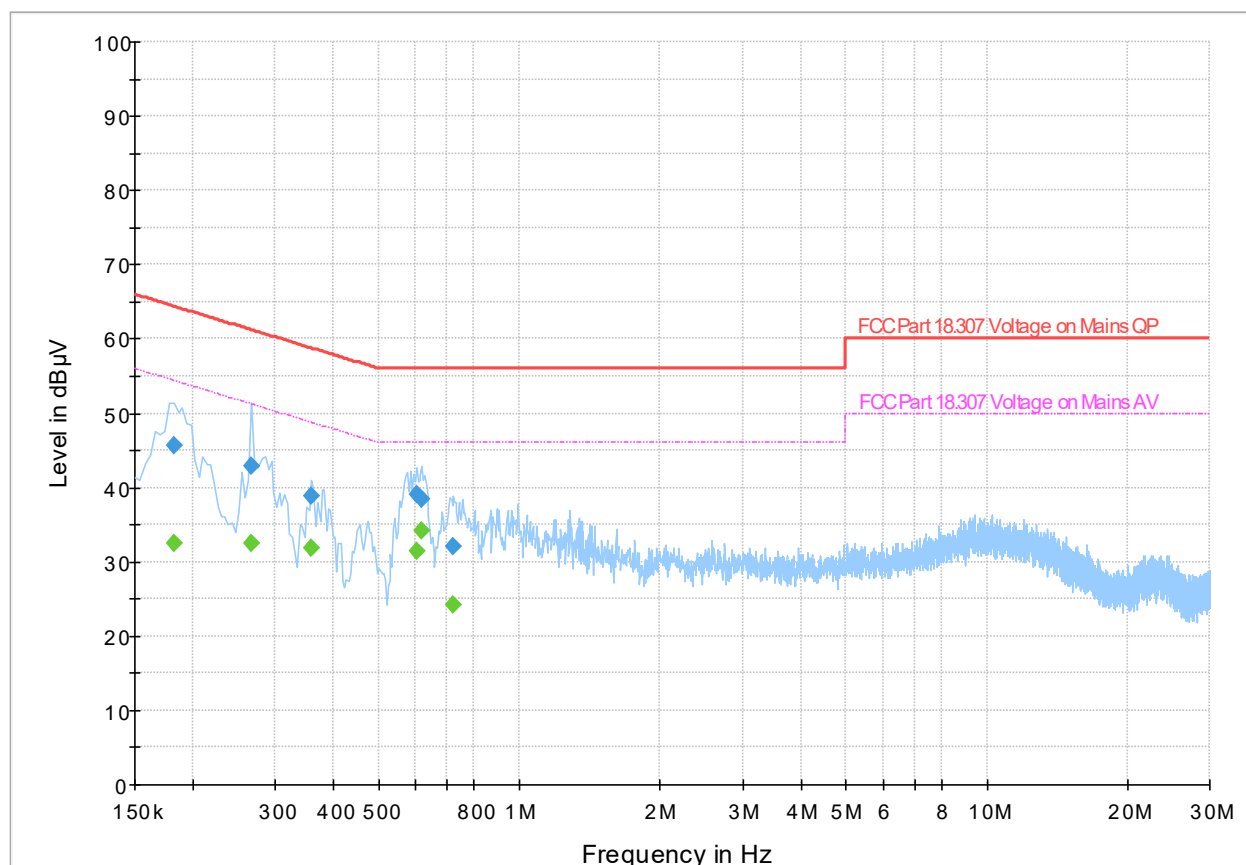


Figure 8.2-1: Conducted emissions at mains port spectral plot (150 kHz - 30 MHz)

Table 8.2-3: Conducted emissions at mains port results

| Frequency (MHz) | QuasiPeak (dBμV) | CAverage (dBμV) | Limit (dBμV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Filter | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|------|--------|------------|
| 0.182000        | ---              | 32.45           | 54.39        | 21.94       | 5000.0          | 9.000           | L1   | ON     | 19.5       |
| 0.182000        | 45.70            | ---             | 64.39        | 18.69       | 5000.0          | 9.000           | L1   | ON     | 19.5       |
| 0.266000        | 42.99            | ---             | 61.24        | 18.25       | 5000.0          | 9.000           | N    | ON     | 19.5       |
| 0.266000        | ---              | 32.48           | 51.24        | 18.76       | 5000.0          | 9.000           | N    | ON     | 19.5       |
| 0.358000        | 38.85            | ---             | 58.78        | 19.92       | 5000.0          | 9.000           | N    | ON     | 19.4       |
| 0.358000        | ---              | 31.76           | 48.78        | 17.01       | 5000.0          | 9.000           | N    | ON     | 19.4       |
| 0.602000        | 39.03            | ---             | 56.00        | 16.97       | 5000.0          | 9.000           | N    | ON     | 19.4       |
| 0.602000        | ---              | 31.50           | 46.00        | 14.50       | 5000.0          | 9.000           | N    | ON     | 19.4       |
| 0.618000        | 38.42            | ---             | 56.00        | 17.58       | 5000.0          | 9.000           | N    | ON     | 19.4       |
| 0.618000        | ---              | 34.10           | 46.00        | 11.90       | 5000.0          | 9.000           | N    | ON     | 19.4       |
| 0.722000        | ---              | 24.25           | 46.00        | 21.75       | 5000.0          | 9.000           | L1   | ON     | 19.4       |
| 0.722000        | 32.12            | ---             | 56.00        | 23.88       | 5000.0          | 9.000           | L1   | ON     | 19.4       |

Notes: <sup>1</sup> Result (dBμV) = receiver analyzer value (dBμV) + correction factor (dB).  
<sup>2</sup> Correction factors = LISN factor IL (dB) + cable loss (dB) + transient limiter (dB)  
<sup>3</sup> Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

8.2.6 Setup photos



Figure 8.2-2: Conducted emissions from AC mains power ports setup photo



Figure 8.2-3: Conducted emissions – from AC mains power ports setup photo

## Section 9 EUT photos

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### 9.1 External photos

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**Figure 9.1-1:** Front view photo



**Figure 9.1-2:** Rear view photo



**Figure 9.1-3:** Side view photo



**Figure 9.1-4:** Side view photo



**Figure 9.1-5:** Top view photo



**Figure 9.1-6:** Bottom view photo

**End of test report**