

Test Report

Electromagnetic Compatibility

Product	Wireless IoT Gateway
Name and address of the applicant	EL-Watch AS Rindalsveien 6 6657 Rindal, Norway
Name and address of the manufacturer	EL-Watch AS Rindalsveien 6 6657 Rindal, Norway
Model	Cellular Gateway
Rating	1A, 12-24V DC (EUT input)
Trademark	/
Additional information	This device contains FCC-ID N7NWP76B
Tested according to	FCC CFR 47 Subpart 15B ISED Canada ICES-003, Issue 7
Order number	462954 / PRJ0012457
Tested in period	2022-09-01 – 2022-12-15
Issue date	2023-05-10
Name and address of the testing laboratory	Nemko Scandinavia AS Philip Pedersens vei 11, 1366 Lysaker, Norway
  An accredited technical test executed under the Norwegian accreditation scheme	
  Prepared by [Frode Sveinsen] Approved by [G.Suhanthakumar]	

REPORT REVISIONS

Report Edition	Date	Project	Description
A	2023-03-23	462954 / PRJ0012457	First issued
B	2023-05-10	462954 / PRJ0012457	Editorials FCC-ID and marking label



THIS REPORT APPLIES ONLY TO THE ITEM(S) AND CONFIGURATION(S) TESTED.

It is the manufacturer's responsibility to assure the additional production units of this product are manufactured with identical electrical and mechanical components. The manufacturer is responsible to the authorities for any modifications made to the product, which result in non-compliance to the relevant regulations.

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Opinions expressed within this report regarding general assessments and qualifications for PASS or FAIL to the standards limits and requirements, are not part of the current accreditation. Neither is opinions expressed regarding model variants covered by the testing performed in this report.

Deviations from, additions to, or exclusions from the test specifications are described in "Test Report Summary".

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DESCRIPTION OF TESTED ITEM(S)

Product description.....	Wireless IoT Gateway Neuron Cellular Gateway connects your Neuron sensors to Neuron Cloud via a cellular connection.
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FCC-ID Contained	This device contains FCC-ID N7NWP76B
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Model/type	Cellular Gateway
Serial number.....	V2926700971110
Operating voltage.....	12-24V DC input til EUT 110V AC / 60 Hz (supported to ACDC converter, for conducted tests)
Maximum power/current.....	0.6A
Insulation class	II
Highest clock frequency	
Hardware version	Rev 3
Software version	RTXv0327

Mounting position.....	<input type="checkbox"/> Tabletop equipment <input type="checkbox"/> Wall/ceiling mounted equipment <input type="checkbox"/> Floor standing equipment <input type="checkbox"/> Handheld equipment <input type="checkbox"/> Rack mounted equipment <input checked="" type="checkbox"/> Console equipment <input type="checkbox"/> Other:
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CRITICAL MODULES/PARTS

Description	Manufacturer	Type
Wireless IoT Gateway	EL-Watch AS	Cellular Gateway
AC/DC Adapter	XP Power	VEL18US240-EU-JA

ACCESSORIES USED DURING TEST

Description	Manufacturer	Type
Laptop	HP	Probook

INPUT/OUTPUT PORTS

Port name and description	Cable		
	Longer than 3m	Attached during test	Shielded
DC mains supply (AC/DC converter)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
915 MHz antennas A and B (RX only),	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Cellular (2G/3G/4G)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GNSS (GPS)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ethernet	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
USB (service)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

This equipment has been tested with certain cable types and cable configurations. Any changes to these parameters when installed may influence the EMC properties of this equipment.

OPERATING MODES

OP no.	Description	Applied for testing	
		Emissions	Immunity
OP1	Short Range 902 – 928 MHz band RX only	<input checked="" type="checkbox"/>	<input type="checkbox"/>
OP2	Cellular communications (not active during test)	<input type="checkbox"/>	<input type="checkbox"/>
OP3	GNSS (GPS) reception	<input type="checkbox"/>	<input type="checkbox"/>

POWER SUPPLY CONDITIONS

The following nominal power supply conditions have been tested:

PC no.	Voltage	Frequency	Type	Ground terminal
PC1	115 V (for conducted measurements only)	<input type="checkbox"/> AC 50Hz / <input checked="" type="checkbox"/> AC 60Hz / <input type="checkbox"/> DC	<input type="checkbox"/> 3AC / <input type="checkbox"/> 3ACN / <input type="checkbox"/> PoE	<input type="checkbox"/> PE / <input type="checkbox"/> GND / <input type="checkbox"/> None
PC2	12-24 V	<input type="checkbox"/> AC 50Hz / <input type="checkbox"/> AC 60Hz / <input checked="" type="checkbox"/> DC	<input type="checkbox"/> 3AC / <input type="checkbox"/> 3ACN / <input type="checkbox"/> PoE	<input type="checkbox"/> PE / <input type="checkbox"/> GND / <input type="checkbox"/> None
PC3	xxx V	<input type="checkbox"/> AC 50Hz / <input type="checkbox"/> AC 60Hz / <input type="checkbox"/> DC	<input type="checkbox"/> 3AC / <input type="checkbox"/> 3ACN / <input type="checkbox"/> PoE	<input type="checkbox"/> PE / <input type="checkbox"/> GND / <input type="checkbox"/> None

The power supply voltage has been selected after a maximum disturbance investigation over the product's rated voltage range.
 Additional chassis grounding was applied.

PHOTOS AND DRAWINGS

Copy of marking label.....:	<p>Label: Neuron Cellular Gateway PN: 422470 Contains: FCC ID: N7NWP76B, IC: 2417C-WP76B Region: NOAM FCC ID: 2A8NTEW10004 Prod date: mm.yy IC: 29286-EW10004  </p>
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Photo of the test item	 Device used for North-American market.
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OTHER INFORMATION

Modifications	None
Additional information.....:	None

TEST ENVIRONMENT

Test laboratory	<input checked="" type="checkbox"/> KJELLER (Instituttveien 6, N-2007 Kjeller, Norway) <input type="checkbox"/> LYSAKER (Philip Pedersens vei 11, N-1366 Lysaker, Norway)						
Laboratory accreditation	 <p>Norsk Akkreditering – TEST 033 P06 – Electromagnetic Compatibility</p>						
Environmental conditions	<p>The climatic conditions during the tests are within limits specified by the manufacturer for the operation of the product and the test equipment.</p> <p>The climatic conditions during tests are within the following limits:</p> <table> <tr> <td>Ambient temperature:</td> <td>15 – 35 °C</td> </tr> <tr> <td>Relative humidity:</td> <td>25 – 75 %RH</td> </tr> <tr> <td>Atmospheric pressure:</td> <td>86 – 106 kPa</td> </tr> </table> <p>If explicitly required by the test standard, or the requirements are tighter than the above; the climatic conditions are recorded and documented separately in this test report.</p>	Ambient temperature:	15 – 35 °C	Relative humidity:	25 – 75 %RH	Atmospheric pressure:	86 – 106 kPa
Ambient temperature:	15 – 35 °C						
Relative humidity:	25 – 75 %RH						
Atmospheric pressure:	86 – 106 kPa						
Calibration	<p>All instruments used in the tests of this test report are calibrated and traceable to national or international standards. Between calibrations test set-ups are controlled and verified on a regular basis by intermediate checks to ensure, with 95% confidence that the instruments remain within their calibrated levels.</p> <p>The instrumentation accuracy is within limits agreed by the IECEE/CTL and defined by Nemko.</p>						
Measurement uncertainties.....	<p>Uncertainty in EMC emission measurements stated in this report are calculated from the standard measurement uncertainties multiplied by the coverage factor $k=2$. It was determined in accordance with CISPR 16-4-2. The true value is in the corresponding interval with a probability of 95%.</p> <p>Uncertainties for continuous immunity tests are calculated based on the same principles as for EMC emission uncertainties.</p> <p>For Harmonics and Flicker measurements the measurement uncertainty is calculated based on the same principles as for EMC emission uncertainties.</p> <p>Uncertainties for transient immunity are kept within the requirements of the relevant basic standard.</p> <p><i>Further information about measurement uncertainties is provided on request.</i></p>						
Decision rules	<p>As specified by CISPR 16-4-2; if our measurement uncertainty U_{LAB} is less than or equal to U_{CISPR}, compliance is deemed to occur if no measured disturbance level exceeds the limit hence "PASS" is indicated, and non-compliance is deemed to occur if any measured disturbance level exceeds the limits hence "FAIL" is indicated.</p> <p>For continuous immunity tests, uncertainties are not considered when applying the calibrated test levels. Tests are performed at the test levels specified by the test standard. PASS and FAIL decisions are based on behaviour observations of the specimen.</p> <p>For transient immunity tests, uncertainties are not considered if the test equipment is kept within the requirements of the relevant basic standard. Tests are performed at the test levels specified by the test standard. PASS and FAIL decisions are based on behaviour observations of the specimen.</p> <p>For Harmonics and Flicker measurements the measurement uncertainty is considered, and measurements are marked if necessary. In doing so, the associated uncertainty of measurement has been considered.</p> <p><i>Further information about decision rules is provided on request.</i></p>						

TEST REPORT SUMMARY

APPLIED STANDARDS

Standards	Titles
FCC CFR 47 Subpart 15B	<i>Digital devices - Unintentional radiators, Class B Digital Device</i>
ISED Canada ICES-003, Issue 7	<i>Spectrum Management and Telecommunications Policy. Interference-Causing Equipment Standard. Information Technology Equipment (Including Digital Apparatus - Limits and Methods of Measurement (Issue 7, June 2020)</i>

TEST SUMMARY

Requirements – Tests	Reference standards	Verdict
Conducted Emissions	FCC CFR 47 Subpart 15B:0 ISED Canada ICES-003, Issue 7:0 FCC Part 12.107 per ANSI C63.4-2014	PASS
Radiated Emissions (Below 1GHz)	FCC CFR 47 Subpart 15B:0 ISED Canada ICES-003, Issue 7:0 FCC Part 12.109 per ANSI C63.4-2014	PASS
Radiated Emissions (Above 1GHz)	FCC CFR 47 Subpart 15B:0 ISED Canada ICES-003, Issue 7:0 FCC Part 12.109 per ANSI C63.4-2014	PASS

PASS : Tested and complied with the requirements
FAIL : Tested and failed the requirements
N/A : Test not relevant to this specimen (evaluated by the test laboratory)
- : Test not performed (instructed by the applicant)
* : An asterisk (*) placed after the verdict in the Result column indicates test items that are not within Nemko's scope of accreditation
: A grid (#) placed after the verdict in the Result column indicates test items that are only partly covered by Nemko's scope of accreditation. Further information is detailed in the test section

ABOUT REFERENCE STANDARDS AND TEST LEVELS

Product standards with dated references to basic standards may have been performed according to the newest edition of the basic standard. This may impact the compliance criteria or technical performance of the test, still this is adequate if the test is expected to confirm compliance to the intention of the product standard. The table above lists the actual editions of the basic standards which have been used during testing.

The choice of immunity test levels could be higher than those specified by the reference standards when we consider the nature of the specimen and its intended use or based on customer requests.

NOTES

None



TEST REPORT
Report No. REP010945-B
FCC-ID 2A8NTEW10004

Test Results

CONDUCTED EMISSIONS

TEST DESCRIPTION

Method

The reference method for this test is listed in the table under clause TEST SUMMARY.

Set-up

The measurement was performed at the power supply terminal of the specimen. Nominal supply voltage was provided. The specimen was energized and in normal operating mode during the measurement.

- The specimen and its cables were elevated 10 cm above a ground plane.
- The specimen and its cables were elevated 40 cm above a ground plane.
- The specimen and its cables were placed 40 cm from a vertical ground plane, 80 cm over ground plane.
- The specimen was mounted directly on, and bonded to a ground plane. Cables and auxiliary equipment were elevated by 1 cm

- The specimen was connected to an Artificial Mains Network (AMN) by its power supply cable, which was adjusted to 100cm length by folding.
- The specimen was connected to an Artificial Mains Network (AMN) by a 0.8 m shielded power supply cable directly connected to the AMN

Conditions

- Frequency range was 9kHz – 30MHz.
- Frequency range was 10kHz – 30MHz.
- Frequency range was 150kHz – 30MHz.

The measuring bandwidth is 200Hz in the frequency range 9 kHz – 150 kHz. Measurement was made with a 100 Hz step size and 100 ms dwell time.

The measuring bandwidth is 9 kHz in the frequency range 150 kHz – 30 MHz. Measurement was made with a 4.5 kHz step size and 20 ms dwell time.

Measurement uncertainty: ± 3.7 dB (9 kHz – 150 kHz); ± 3.3 dB (150 kHz – 30 MHz)

Instruments used during measurement

Instrument list: [AMN: R&S / ENV216 \(LR-1665\) \(11/2023\)](#)
[EMI Receiver: R&S / ESCI 3 \(N-4259\) \(10/2023\)](#)

Conformity

Verdict:

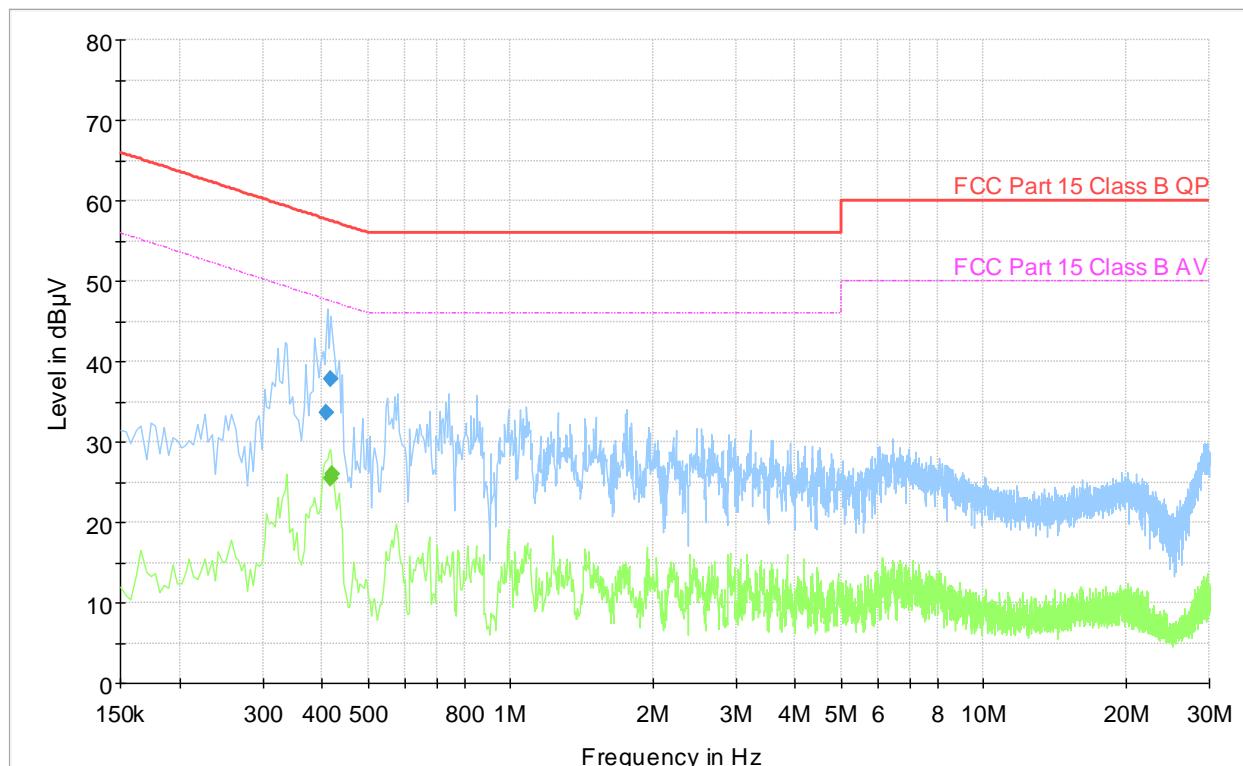
PASS

Test engineer:

Frode Sveinsen

EMISSION SPECTRUM

Full Spectrum



MEASUREMENT DATA

Frequency (MHz)	QuasiPeak (dB μ V)	Average (dB μ V)	Limit (dB μ V)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter
0.408	33.72	---	57.69	23.97	1000	9	L1	OFF
0.416	---	25.42	47.53	22.11	1000	9	N	OFF
0.416	37.73	---	57.53	19.80	1000	9	L1	OFF
0.420	---	26.06	47.45	21.39	1000	9	L1	OFF

RADIATED EMISSIONS (BELOW 1GHZ)

TEST DESCRIPTION

Method

The reference method for this test is listed in the table under clause TEST SUMMARY.

Set-up

The measurements were performed in a semi-anechoic chamber (SAC). Nominal supply voltage was provided. The specimen was energized and in normal operating mode during the measurement.

- The specimen and its cables were elevated 10 cm above the site ground plane and placed in the centre of the turntable.
- The specimen and its cables were placed on a table 80 cm above the site ground plane and placed in the centre of the turntable.
- Ferrite clamps type CMAD were applied to cables leaving the test volume.
- A CDNE was applied to the power supply cable.

Antenna type = Hybrid bilog antenna

Antenna elevation = 100-400 cm above the ground reference plane.

Specimen rotation = 0-360°.

Frequency range:

- 30-300MHz
- 30-1000MHz
- Other:

Measurement distance:

- 3m
- 5m
- 10m

Conditions

The measuring bandwidth is 120 kHz in the frequency range 30 MHz – 1000 MHz. Frequency sweeps with RBW = 120 kHz and VBW = 1 MHz was applied with a sweep time of 20 ms (step size resolution < 60 kHz).

Measurement uncertainty: ± 4.9 dB (3m distance in SAC10); ± 4.6 dB (3m distance in SAC3); ± 4.6 dB (10m distance in SAC10)

Instruments used during measurement

Instrument list:

Antenna, bilog: Schwarzbeck / VULB 9163 (LR-1616) (05/2023)

EMI Receiver: R&S / ESU40 (LR-1639) (01/2023)

Preamplifier: Sonoma / 310N (LR-1686) (08/2023)

Conformity

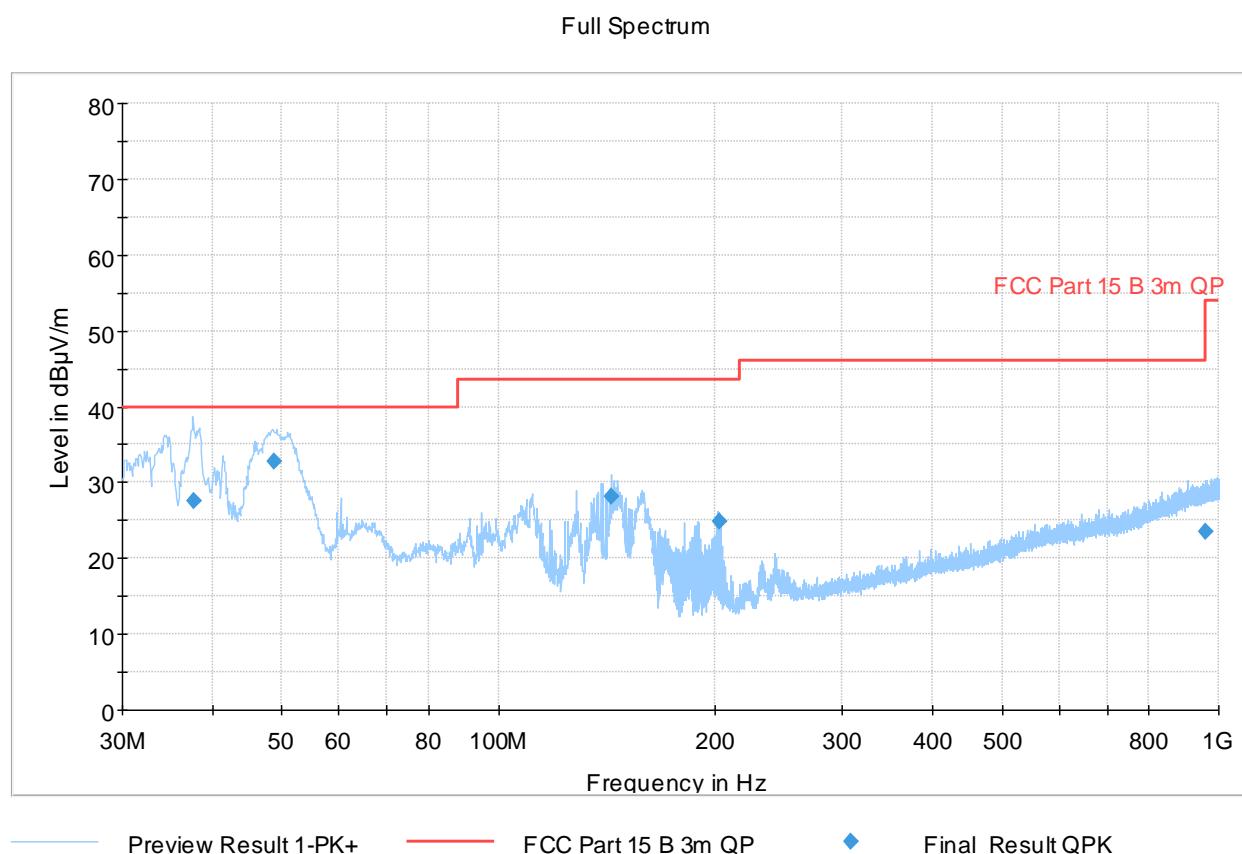
Verdict:

PASS

Test engineer:

Frode Sveinsen

EMISSION SPECTRUM



MEASUREMENTS DATA

Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
37.701550	27.49	40.00	12.51	1000.0	120.000	123.0	V	352.0	-14.1
48.675050	32.71	40.00	7.29	1000.0	120.000	129.0	V	354.0	-13.7
143.487900	28.08	43.50	15.42	1000.0	120.000	240.0	H	270.0	-17.7
202.456800	24.91	43.50	18.59	1000.0	120.000	168.0	H	259.0	-14.0
957.033450	23.56	46.00	22.44	1000.0	120.000	236.0	H	199.0	1.6

RADIATED EMISSIONS (ABOVE 1GHZ)

TEST DESCRIPTION

Method

The reference method for this test is listed in the table under clause TEST SUMMARY.

Set-up

Nominal supply voltage was provided. The specimen was energized and in normal operating mode during the measurement.

- The measurements were performed in a semi-anechoic chamber (SAC3) (calibrated volume: D=2.0m / H=2.0m).
- The measurements were performed in a semi-anechoic chamber (SAC10) (calibrated volume: D=1.5m / H=2.0m).
- The measurements were performed in a fully anechoic room (FAR) (calibrated volume: D=1.2m / H=2.0m).

- The specimen and its cables were elevated 10 cm above the site ground plane, and placed in the centre of the turntable.
- The specimen and its cables were placed on a table 80 cm above the site ground plane, and placed in the centre of the turntable.

The reference ground plane was covered with ferrite absorbers in the reflecting area between the specimen and the measuring antenna.

Measurement distance = 3m.

Antenna elevation = fixed at centre of specimen height.

Specimen rotation = 0-360°.

Measurements were performed with a double-ridged guide horn antenna.

Frequency range:	Highest internal frequency of specimen:
<input type="checkbox"/> 1-2 GHz	<input type="checkbox"/> Below 108MHz
<input type="checkbox"/> 1-5 GHz	<input checked="" type="checkbox"/> Between 108MHz and 500MHz
<input checked="" type="checkbox"/> 1-6 GHz	<input type="checkbox"/> Between 500MHz and 1000MHz
<input type="checkbox"/> 1-12 GHz	<input type="checkbox"/> Above 1000MHz

The measuring bandwidth is 1 MHz in the above frequency range. Frequency sweeps with RBW = 1 MHz and VBW = 1 MHz was applied with a sweep time of 100 ms (proper segmentation of the frequency range was applied to obtain step size resolution < 500 kHz).

Measurement uncertainty: ± 5.1 dB

Instruments used during measurement

Instrument list:
Antenna, Horn: EMCO / 3115 (N-3453) (10/2024)
EMI Receiver: R&S / ESU40 (LR-1639) (01/2024)
Preamplifier: HP / 8449B (LR-1322) (08/2023)

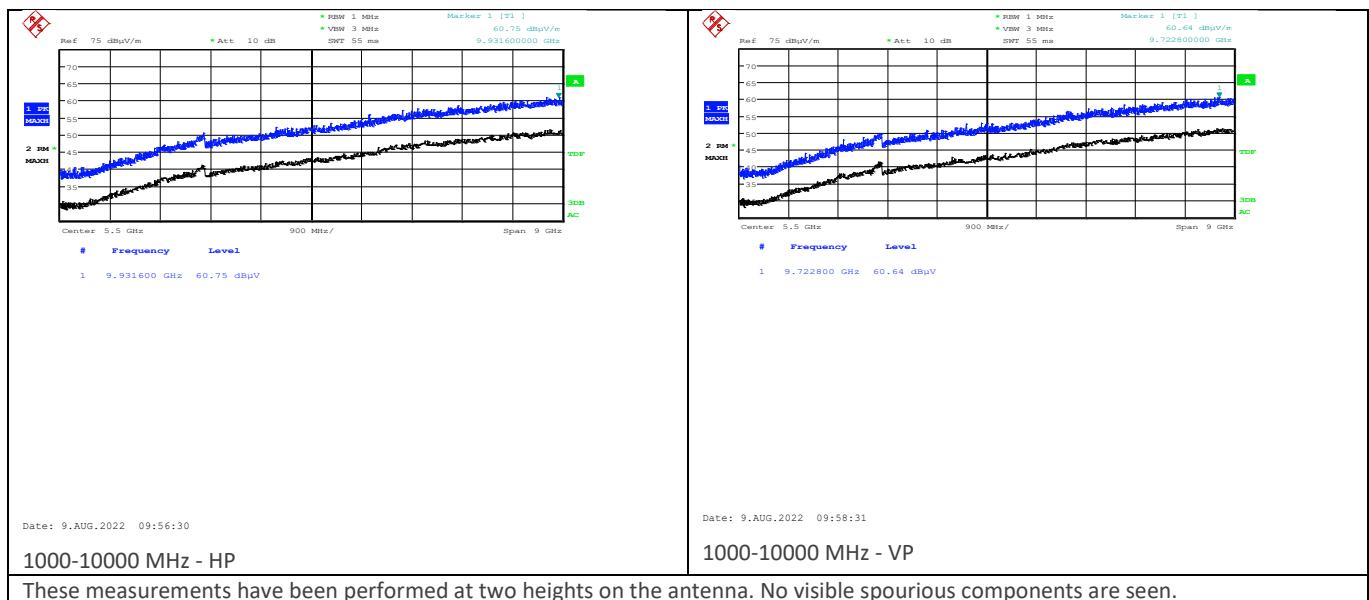
Conformity

Verdict:

PASS

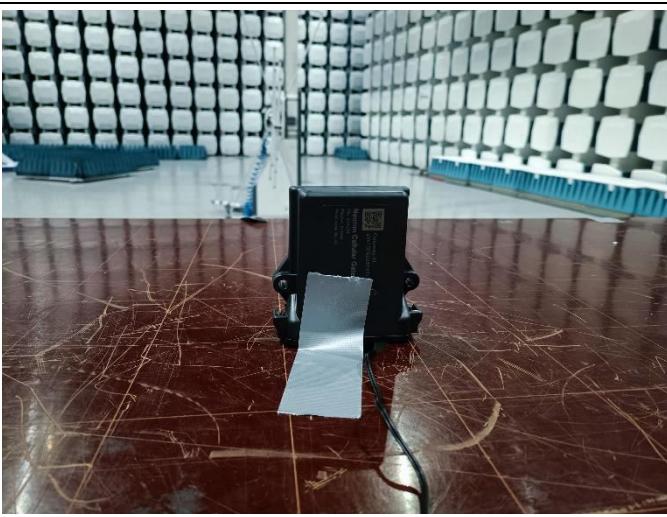
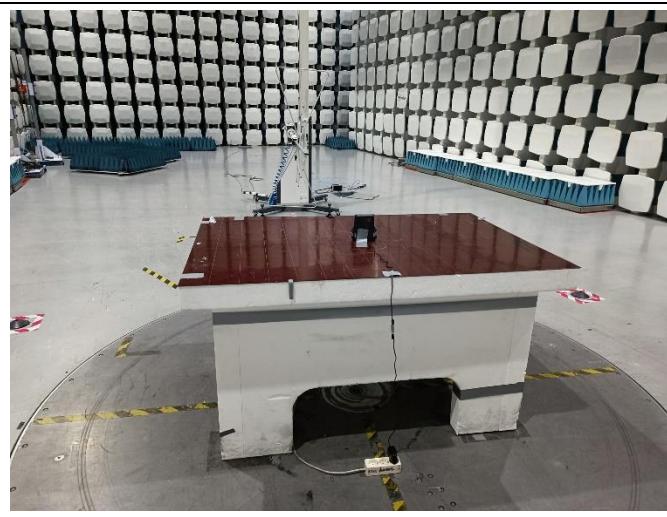
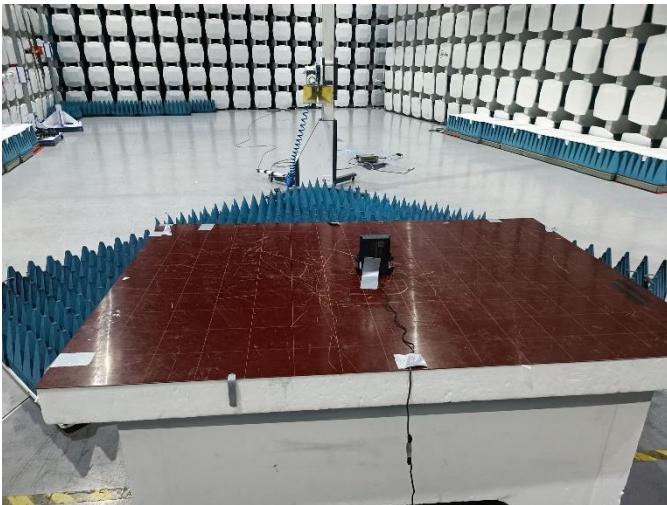
Test engineer:

Frode Sveinssen



Annexes

PHOTOS

Test set-up for EMC emissions measurements		
Radiated 30 – 1000 MHz from EUT		Radiated 30 – 1000 MHz from antenna
Radiated 1000 – 10000 MHz from EUT		
Conducted spurious emissions		