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RADIO TEST REPORT –425385-1TRFWL

Type of assessment:

Final product testing

Applicant:

Gigasense AB

Product:

Anti-Collision system

Model:

GII10525A

Model variant:

GII10525B

FCC ID:

YBQ-GII10525

IC Registration number:

8963A-GII10525

Specifications:

- FCC 47 CFR Part 15 Subpart C, §15.245
- RSS-210 Issue 10, December 2019 Amendment (April 2020), Annex F.2

Date of issue: August 17, 2021

Andrey Adelberg, Senior EMC/RF Specialist
Tested by


Signature

David Duchesne, EMC/RF Lab Manager
Reviewed by


Signature

Lab locations

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Test site identifier	**Organization**	**Ottawa/Almonte**	**Montreal**	**Cambridge**
	FCC:	CA2040	CA2041	CA0101
	ISED:	2040A-4	2040G-5	24676
Website	www.nemko.com			

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 contained in this report are within Nemko Canada's ISO/IEC 17025 accreditation.

Copyright notification

Table of Contents

Section 1 Report summary

1.1 Test specifications

FCC 47 CFR Part 15, Subpart C, §15.245	Operation within the bands 902–928 MHz, 2435–2465 MHz, 5785–5815 MHz, 10500–10550 MHz, and 24075–24175 MHz.
RSS-210 Issue 10, December 2019 Amendment (April 2021), Annex F.2	Speed radar meters operating in the bands 10.50–10.55 GHz, 24.075–24.175 GHz and 33.4–36.0 GHz.

1.2 Test methods

ANSI C63.10 v2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
RSS-Gen, Issue 5, March 2019	General Requirements for Compliance of Radio Apparatus

1.3 Exclusions

None

1.4 Statement of compliance

In the configuration tested, the EUT was found compliant.

Testing was performed against all relevant requirements of the test standard except as noted in section 1.3 above. Results obtained indicate that the product under test complies In full with the requirements tested. The test results relate only to the items tested.
Determining compliance is based on the results of the compliance measurement, not taking into account measurement uncertainty, in accordance with section 1.3 of ANSI C63.10 v2013.

See "Summary of test results" for full details.

1.5 Test report revision history

Table 1.5-1: *Test report revision history*

Revision #	Date of issue	Details of changes made to test report
TRF	August 17, 2021	Original report issued

Section 2 Engineering considerations

2.1 Modifications incorporated in the EUT for compliance

There were no modifications performed to the EUT during this assessment.

2.2 Technical judgment

None

2.3 Model variant declaration

As declared by the applicant, both EUT model variants are identical except for the tuned fundamental central frequency. Both model variants were tested.
GII10525-2 = Complete system with an active A and an active B unit.
GII10525A = 1 active A + 1 Transponder B (the configuration that was tested)
GII10525B = 1 active B + 1 Transponder A

2.4 Deviations from laboratory tests procedures

No deviations were made from laboratory procedures.

Section 3 Test conditions

3.1 Atmospheric conditions

Temperature	15 °C – 35 °C
Relative humidity	20 % – 75 %
Air pressure	86 kPa (860 mbar) – 106 kPa (1060 mbar)

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.

3.2 Power supply range

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 ±5 %, for which the equipment was designed.

Section 4 Measurement uncertainty

4.1 Uncertainty of measurement

UKAS Lab 34 and TIA-603-B have been used as guidance for measurement uncertainty reasonable estimations with regards to previous experience and validation of data. Nemko Canada, Inc. follows these test methods in order to satisfy ISO/IEC 17025 requirements for estimation of uncertainty of measurement for wireless products.

Measurement uncertainty budgets for the tests are detailed below. Measurement uncertainty calculations assume a coverage factor of K = 2 with 95% certainty.

Table 4.1-1: *Measurement uncertainty calculations*

Test name	Measurement uncertainty, ±dB
Occupied bandwidth	4.45
Radiated spurious emissions	3.78

Section 5 Information provided by the applicant

5.1 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 contained 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.

5.2 Applicant/Manufacture

Applicant name	Gigasense AB
Applicant address	Stationsvägen 16, SE-184 50 Åkersberga, Sweden
Manufacture name	Same as applicant
Manufacture address	Same as applicant

5.3 EUT information

Product	Anti-Collision system
Model	GII10525A
Model variants	GII10525B or GII10525-2 (complete system)
Part number	GII10525A
Serial number	1000
Power supply requirements	24 V_{DC}. (For setup supplied AC/DC adapter 100–240 V, 50/60 Hz with power cord)
Product description and theory of operation	GIGASENSE II is a microwave Anti Collision System. To protect two cranes: one crane uses a A-unit and one crane uses a B-unit. The antenna sends a Microwave signal to the opposite unit. By using SFCW (Stepped Frequency Continuous Wave) radar, the distance and relative speed are calculated.

5.4 Radio technical information

Frequency band	10.500–10.550 GHz
Frequency Min (MHz)	10524 (Model variant A)
Frequency Max (MHz)	10526 (Model variant B)
Field strength (dBµV/m @ 3 m)	95.78
Measured BW (kHz), 99% OBW	46497
Type of modulation	SFCW-radar, Stepped Frequency Continuous Wave
Emission classification	N0N
Transmitter spurious (dBµV/m @ 3 m)	52.5 (peak) at 10550 MHz
Antenna information	Type: Parabolic reflector, Manufacturer: Gigasense, Gain: 24.2 dBi

5.5 EUT setup details

5.5.1 Radio exercise details

Operating conditions	SW antenna box 5.36
Transmitter state	The sample was modified in such a way that the transmitter sets into continuous Tx mode once energized.

5.5.2 EUT setup configuration

Table 5.5-1: *EUT sub assemblies*

Description	Brand name	Model, Part number, Serial number, Revision level
Antenna unit	Gigasense	MN: GII, PN: GII10525A, SN: 1000
Relay box	Gigasense	MN: Relay box 52dB, PN: GIIRELAY52, SN: 1000
Transponder unit	Gigasense	MN: Transponder B, PN: GIITR10525B, SN: 1002

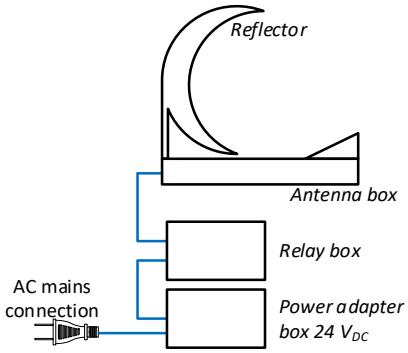


Figure 5.5-1: *Test setup block diagram*

Section 6 Summary of test results

6.1 Testing location

Test location (s)	Ottawa

6.2 Testing period

Test start date	April 26, 2021	Test end date	April 29, 2021

6.3 Sample information

Receipt date	April 26, 2021	Nemko sample ID number(s)	1

6.4 FCC test results

Table 6.4-1: *FCC requirements results*

Part	Test description	Verdict
§15.207(a)	Conducted limits	Not applicable
§15.31(e)	Variation of power source	Pass
§15.31(m)	Number of tested frequencies	Pass
§15.203	Antenna requirement	Pass
§15.245(b)	Radiated emissions not in restricted bands	Pass
§15.245(b)(3)	Spurious emissions (except harmonics)	Pass
§15.215(c)	Occupied 20 dB bandwidth	Pass

Notes: EUT is a DC powered device

6.5 ISED General test results

Table 6.5-1: *ISED General requirements results*

Part	Test description	Verdict
7.3	Receiver radiated emission limits	Not applicable
7.4	Receiver conducted emission limits	Not applicable
6.7	Occupied bandwidth (or 99% emission bandwidth) and x dB bandwidth	Pass
6.9	Operating bands and selection of test frequencies	Pass
8.8	AC power-line conducted emissions limits	Not applicable

Notes: [1] According to sections 5.2 and 5.3 of RSS-Gen, Issue 5 the EUT does not have a stand-alone receiver neither scanner receiver, therefore exempt from receiver requirements.
EUT is a DC powered device

6.6 ISED RSS-210, Issue 10, test results

Table 6.6-1: *RSS-210 requirements results*

Section	Test description	Verdict
F.2.a, F.2.b, F.2.c	Radiated Emissions of fundamental and harmonics	Pass
F.2.d	Radiated Emissions except for harmonic	Pass
F.2.e	Frequency stability	Pass

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.
3 m EMI test chamber	TDK	SAC-3	FA002047	1 year	March 26, 2022
Flush mount turntable	Sunol	FM2022	FA002082	—	NCR
Controller	Sunol	SC104V	FA002060	—	NCR
Antenna mast	Sunol	TLT2	FA002061	—	NCR
Bilog antenna (20–3000 MHz)	Sunol	JB3	FA002108	1 year	February 2, 2022
Signal and Spectrum Analyzer	Rhode & Schwarz	FSW50	FA003267	1 year	December 7, 2021
Receiver/spectrum analyzer	Rohde & Schwarz	ESU 26	FA002043	1 year	November 6, 2021
Pre-amplifier (18–26 GHz)	Narda	BBS-1826N612	FA001550	—	VOU
Pre-amplifier (26–40 GHz)	Narda	DBL-2640N610	FA001556	—	VOU
Horn antenna (18–40 GHz)	EMCO	3116	FA001847	1 year	May 7, 2021
Temperature chamber	Espec	EPX-4H	FA002735	1 year	October 8, 2021

Notes: NCR - no calibration required, VOU - verify on use

Section 8 Testing data

8.1 Variation of power source

8.1.1 References, definitions and limits

FCC §15.31 (e):

For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

8.1.2 Test summary

Verdict	Pass		
Tested by	Andrey Adelberg	Test date	April 26, 2021

8.1.3 Observations, settings and special notes

The testing was performed as per ANSI C63.10 Section 5.13.

a) Where the device is intended to be powered from an external power adapter, the voltage variations shall be applied to the input of the adapter provided with the device at the time of sale. If the device is not marketed or sold with a specific adapter, then a typical power adapter shall be used.
b) For devices, where operating at a supply voltage deviating ±15% from the nominal rated value may cause damages or loss of intended function, test to minimum and maximum allowable voltage per manufacturer's specification and document in the report.
c) For devices with wide range of rated supply voltage, test at 15% below the lowest and 15% above the highest declared nominal rated supply voltage.
d) For devices obtaining power from an input/output (I/O) port (USB, firewire, etc.), a test jig is necessary to apply voltage variation to the device from a support power supply, while maintaining the functionalities of the device.

For battery-operated equipment, the equipment tests shall be performed using a variable power supply.

8.1.4 Test data

EUT Power requirements:	☐ AC	☒ DC	☐ Battery
If EUT is an AC or a DC powered, was the noticeable output power variation observed?	☐ YES	☒ NO	☐ N/A
If EUT is battery operated, was the testing performed using fresh batteries?	☐ YES	☐ NO	☒ N/A
If EUT is rechargeable battery operated, was the testing performed using fully charged batteries?	☐ YES	☐ NO	☒ N/A

8.2 Number of frequencies

8.2.1 References, definitions and limits

FCC §15.31:

(m) Measurements on intentional radiators or receivers shall be performed and, if required, reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in the following table.

RSS-Gen, Clause 6.9:

Except where otherwise specified, measurements shall be performed for each frequency band of operation for which the radio apparatus is to be certified, with the device operating at the frequencies in each band of operation shown in table below. The frequencies selected for measurements shall be reported in the test report.

Table 8.2-1: *Frequency Range of Operation*

Frequency range over which the device operates (in each band)	Number of test frequencies required	Location of measurement frequency inside the operating frequency range
1 MHz or less	1	Center (middle of the band)
1–10 MHz	2	1 near high end, 1 near low end
Greater than 10 MHz	3	1 near high end, 1 near center and 1 near low end

Notes: "near" means as close as possible to or at the centre / low end / high end of the frequency range over which the device operates.

8.2.2 Test summary

Verdict	Pass		
Tested by	Andrey Adelberg	Test date	April 26, 2021

8.2.3 Observations, settings and special notes

ANSI C63.10, Clause 5.6.2.1:

The number of channels tested can be reduced by measuring the center channel bandwidth first and then applying the following relaxations as appropriate:

a) For each operating mode, if the measured channel bandwidth on the middle channel is at least 150% of the minimum permitted bandwidth, then it is not necessary to measure the bandwidth on the high and low channels.

b) For multiple-input multiple-output (MIMO) systems, if the measured channel bandwidth on testing the middle channel exceeds the minimum permitted bandwidth by more than 50% on one transmit chain, then it is not necessary to repeat testing on the other chains.

c) If the measured channel bandwidth on the middle channel is less than 50% of the maximum permitted bandwidth, then it is not necessary to measure the bandwidth on the high and low channels.

ANSI C63.10, Clause 5.6.2.2:

For devices with multiple operating modes, measurements on the middle channel can be used to determine the worst-case mode(s). The worst-case modes are as follows:

a) Band edge requirements—Measurements on the mode with the widest bandwidth can be used to cover the same channel (center frequency) on modes with narrower bandwidth that have the same or lower output power for each modulation family (e.g., OFDM and direct sequence spread spectrum).

b) Spurious emissions—Measure the mode with the highest output power and the mode with the highest output power spectral density for each modulation family (e.g., OFDM and direct sequence spread spectrum).

c) In-band PSD—Measurements on the mode with the narrowest bandwidth can be used to cover all modes within the same modulation family of an equal or lower output power provided the result is less than 50% of the limit.

8.2.4 Test data

EUT is a Stepped Frequency Continuous Wave radar that transmits using 32 discrete frequencies with total 46 MHz band of operation at 10.524 GHz central frequency and 10.526 GHz.

8.3 Antenna requirement

8.3.1 References, definitions and limits

FCC §15.203:

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 the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

FCC §15.247:

(b) The maximum peak conducted output power of the intentional radiator shall not exceed the following:

(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

RSS-Gen, Clause 6.8:

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report.

8.3.2 Test summary

Verdict	Pass		
Tested by	Andrey Adelberg	Test date	April 26, 2021

8.3.3 Observations, settings and special notes

None

8.3.4 Test data

Must the EUT be professionally installed?	☒ YES	☐ NO	
Does the EUT have detachable antenna(s)?	☐ YES	☒ NO	
If detachable, is the antenna connector(s) non-standard?	☐ YES	☐ NO	☒ N/A

8.4 Occupied (Emission) bandwidth

8.4.1 References, definitions and limits

FCC.215(c)

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80 % of the permitted band in order to minimize the possibility of out-of-band operation.

RSS-GEN, 6.7

The occupied bandwidth or the "99% emission bandwidth" is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

RSS-210 Annex F.2.e

The carrier frequency stability shall be sufficient to ensure that the 40 dB bandwidth stays within the operating frequency band when tested at the temperature and supply voltage variations specified for the frequency stability measurement in RSS-Gen.

8.4.1 Test summary

Verdict	Pass		
Tested by	Andrey Adelberg	Test date	April 29, 2021

8.4.1 Observations, settings and special notes

Spectrum analyser settings:

Detector mode	Peak
Resolution bandwidth	≥1 % of OBW
Trace mode	Max Hold

8.4.2 Test data

Table 8.4-1: *–20 dBc frequency cross result*

Central frequency, MHz	–20 dBc frequency cross, MHz	Lower/Upper limit, MHz	Margin, kHz
10524.000	10500.680	10500.000	680.000
10526.000	10549.620	10550.000	380.000

Calculation of the central 80 % of the permitted band:
Permitted band between 10500–10550 MHz is 50 MHz. 80 % of 50 MHz is 40 MHz.
Therefore, the central 80 % of the permitted band is within 10505–10545 MHz.
Both central frequencies 10524 MHz and 10526 MHz are located within this band.

Test data, continued

Table 8.4-2: *–40 dBc frequency cross result*

Fundamental frequency, MHz	–40 dBc frequency cross, MHz	Lower/Upper limit, MHz	Margin, kHz
10524.000	10500.021	10500.000	21.000
10526.000	10549.970	10550.000	30.000

Table 8.4-3: *99% occupied bandwidth results*

Fundamental frequency, MHz	99% occupied bandwidth, MHz
10524.000	46.473
10526.000	46.497

Figure 8.4-1: *20 dB bandwidth, sample plot*

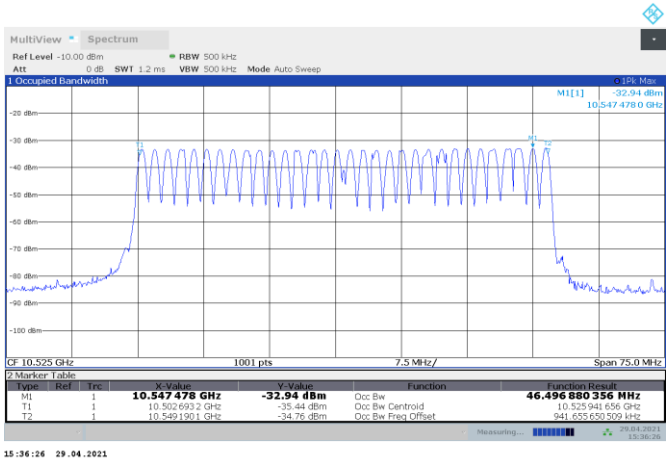


Figure 8.4-2: *99% dB bandwidth, sample plot*

Figure 8.4-3: *40 dB bandwidth, sample plot*

8.5 Field strength of fundamental and harmonics outside restricted bands

8.5.1 Definitions and limits

FCC 15.245(b)

The field strength of emissions from intentional radiators shall comply with the following FCC table.

ISED RSS-210 Annex F.2.a

The average field strength of emissions measured at 3 m shall not exceed:

- 2500 mV/m for fundamental emissions for devices operating in all frequency bands
- 25 mV/m for harmonic emissions for devices operating in the bands 10.5–10.55 GHz, 24.075–24.175 GHz and 80 mV/m for harmonic emissions for devices operating in the band 33.4–36 GHz

ISED RSS-210 Annex F.2.b

Harmonic emissions falling into restricted frequency bands listed in RSS-Gen and that are below 17.7 GHz shall meet the general field strength limits specified in RSS-Gen.

ISED RSS-210 Annex F.2.c

Harmonic emissions falling into restricted frequency bands listed in RSS-Gen and that are at or above 17.7 GHz shall not exceed the following field strength limits measured at a distance of 3 m:

- 25 mV/m for the second and third harmonic emissions of devices operating in the band 24.075–24.175 GHz and for the second harmonic emission of devices operating in the band 33.4–36.0 GHz
- 7.5 mV/m for all other devices

Table 8.5-1: *FCC field strength limits at a distance of 3 meters*

Fundamental frequencies, MHz	Field strength of fundamental		Field strength of harmonics	
	mV/m	dBµV/m	mV/m	dBµV/m
902–928	500	114	1.6	64
2435–2465	500	114	1.6	64
5785–5815	500	114	1.6	64
10500–10550	2500	128	25.0	88
24075–24175	2500	128	25.0	88

Note: The emission limits shown above are based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply.

Regardless of the limits shown in the above table, harmonic emissions in the restricted bands below 17.7 GHz, as specified in §15.205, shall not exceed the field strength limits shown in §15.209. Harmonic emissions in the restricted bands at and above 17.7 GHz shall not exceed the following field strength limits:

(i) For the second and third harmonics of field disturbance sensors operating in the 24075–24175 MHz band and for other field disturbance sensors designed for use only within a building or to open building doors, 25.0 mV/m.

(ii) For all other field disturbance sensors, 7.5 mV/m.

8.5.2 Test summary

Verdict	Pass		
Tested by	Andrey Adelberg	Test date	April 28, 2021

8.5.3 Observations, settings and special notes

- Radiated measurements were performed at a distance of 3 m for frequencies up to 18 GHz, 1 m within 18–40 GHz, 30 cm above 40 GHz.
- All distance corrections were included in the correction factors settings.

Spectrum analyser settings:

Detector mode	Peak
Resolution bandwidth	50 MHz
Video bandwidth	50 MHz
Trace mode	Max Hold

8.5.4 Test data

Table 8.5-2: *Field strength measurement results*

Frequency band, GHz	Field strength (peak[1]), dBµV/m	Average limit, dBµV/m	Margin, dB
10.50–10.55	95.78	128.00	32.22

Note: [1]Peak emission level was found below the average limit, therefore no additional average measurement was performed.

No harmonics of the fundamental frequency were detected above the noise floor of the test equipment.

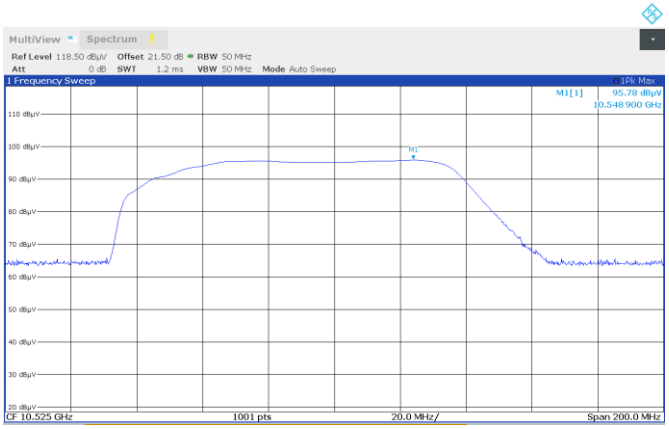


Figure 8.5-1: *Total transmission field strength*

8.6 Spurious emissions (except for harmonics)

8.6.1 Definitions and limits

FCC 15.245(b)(3)

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

ISED RSS-210 Annex F.2.d

Emissions radiated outside of these specified operating frequency bands, except for harmonic emissions, shall be attenuated by at least 50 dB below the level of the fundamental emissions or to the general field strength limits specified in RSS-Gen, whichever is less stringent.

Table 8.6-1: *15.209 and RSS-Gen emissions field strength limits*

Frequency,	Field strength of emissions		Measurement distance, m
MHz	µV/m	dBµV/m	
30–88	100	40.0	3
88–216	150	43.5	3
216–960	200	46.0	3
above 960	500	54.0	3

Notes: In the emission table above, the tighter limit applies at the band edges. For frequencies above 1 GHz the limit on peak RF emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test

Table 8.6-2: *ISED restricted frequency bands*

MHz	MHz	MHz	GHz
0.090–0.110	12.57675–12.57725	399.9–410	7.25–7.75
0.495–0.505	13.36–13.41	608–614	8.025–8.5
2.1735–2.1905	16.42–16.423	960–1427	9.0–9.2
3.020–3.026	16.69475–16.69525	1435–1626.5	9.3–9.5
4.125–4.128	16.80425–16.80475	1645.5–1646.5	10.6–12.7
4.17725–4.17775	25.5–25.67	1660–1710	13.25–13.4
4.20725–4.20775	37.5–38.25	1718.8–1722.2	14.47–14.5
5.677–5.683	73–74.6	2200–2300	15.35–16.2
6.215–6.218	74.8–75.2	2310–2390	17.7–21.4
6.26775–6.26825	108–138	2483.5–2500	22.01–23.12
6.31175–6.31225	149.9–150.05	2655–2900	23.6–24.0
8.291–8.294	156.52475–156.52525	3260–3267	31.2–31.8
8.362–8.366	156.7–156.9	3332–3339	36.43–36.5
8.37625–8.38675	162.0125–167.17	3345.8–3358	Above 38.6
8.41425–8.41475	167.72–173.2	3500–4400	
12.29–12.293	240–285	4500–5150	
12.51975–12.52025	322–335.4	5350–5460	

Note: Certain frequency bands listed in this table and above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.

Table 8.6-3: *FCC restricted frequency bands*

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
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	Above 38.6
13.36–13.41			

8.6.2 Test summary

Verdict	Pass		
Tested by	Andrey Adelberg	Test date	April 28, 2021

8.6.3 Observations, settings and special notes

- Radiated measurements up to 18 GHz were performed at a distance of 3 m, from 18 GHz and up to 40 GHz at 1 m, 30 cm above 40 GHz.
- All distance correction factors were included in the offsets of the plots. Correction factors were calculated using following formula: $20 \times \text{Log}_{10}$ (3 m / measurement distance).

Spectrum analyzer settings for frequencies below 1000 MHz:

Detector mode	Peak
Resolution bandwidth	100 kHz
Video bandwidth	300 kHz
Trace mode	Max Hold

Spectrum analyzer settings for peak measurements at the frequencies above 1000 MHz:

Detector mode	Peak
Resolution bandwidth	1 MHz
Video bandwidth	3 MHz
Trace mode	Max Hold

8.6.4 Test data

Table 8.6-4: *Spurious emissions measurement results*

Frequency, MHz	Emission field strength, dBµV/m	Field strength limit, dBµV/m	Margin, dB
10500	60.9 (peak)	74.0 (peak)	13.1
10500	51.2 (average)	54.0 (average)	3.8
10550	52.5[1] (peak)	54.0 (average)	2.5

Note: [1]Peak emission level was found below the average limit, therefore no additional average measurement was performed

Test data, continued

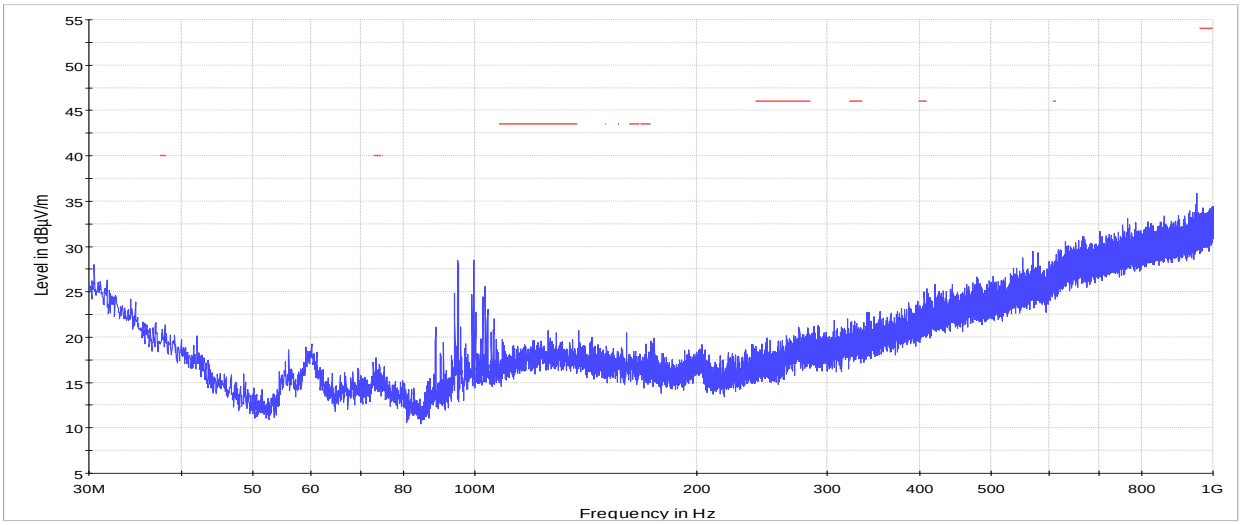
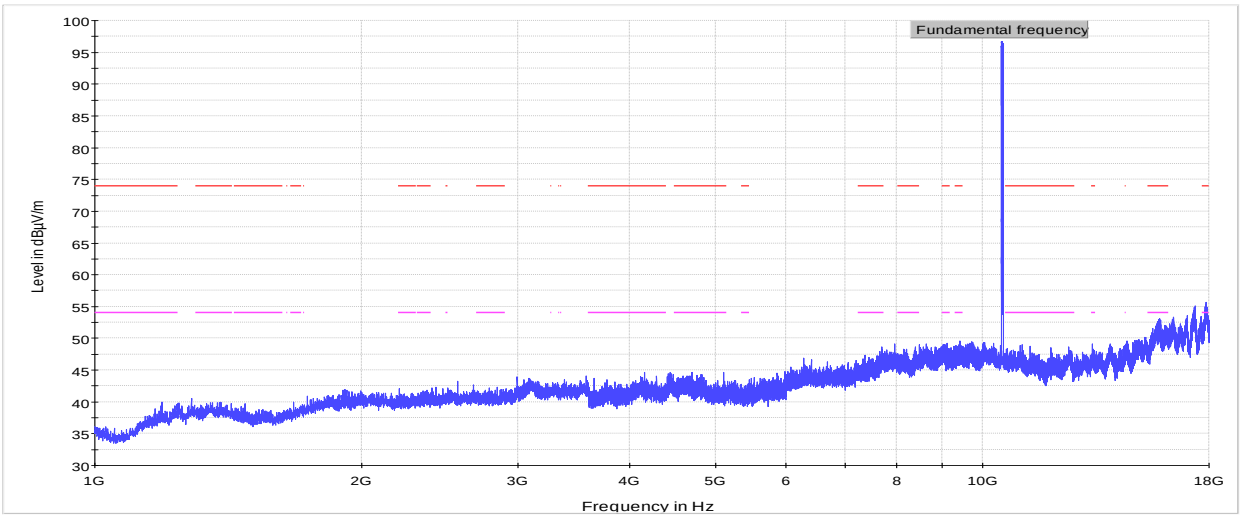


Figure 8.6-1: *Field strength of spurious emissions below 1000 MHz*



Note: It was verified that the emissions around 18 GHz that exceed the average limit line belong to the measurement equipment noise floor.

Figure 8.6-2: *Field strength of spurious emissions within 1–18 GHz*

Test data, continued

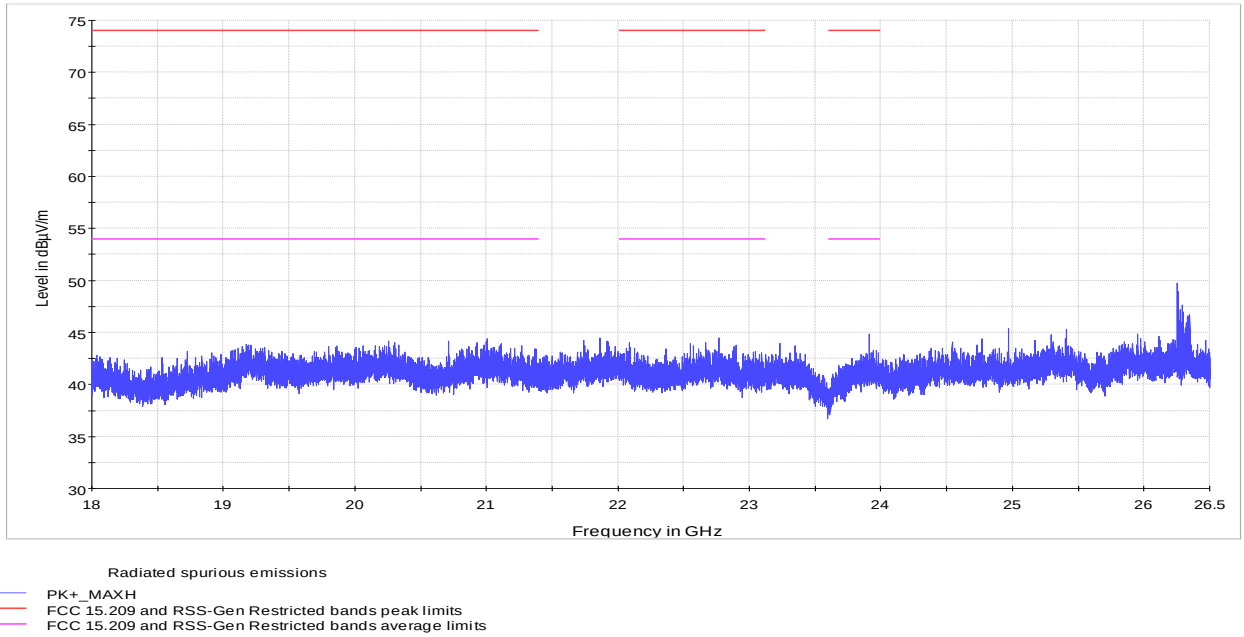


Figure 8.6-3: *Field strength of spurious emissions within18–26.5 GHz*

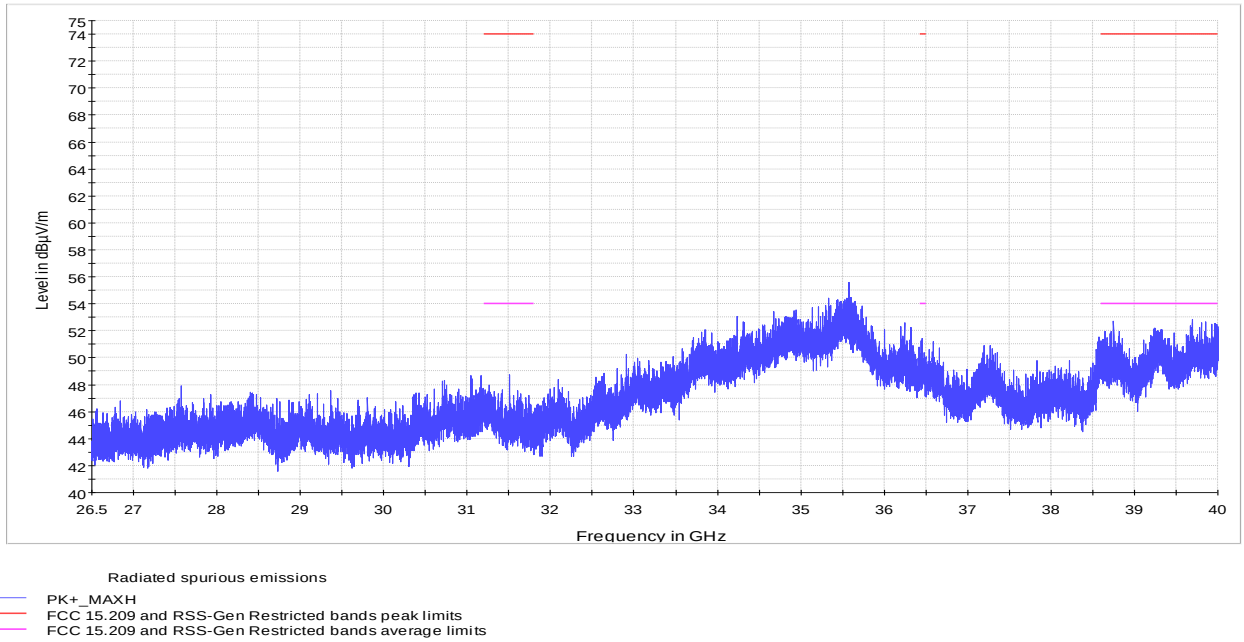
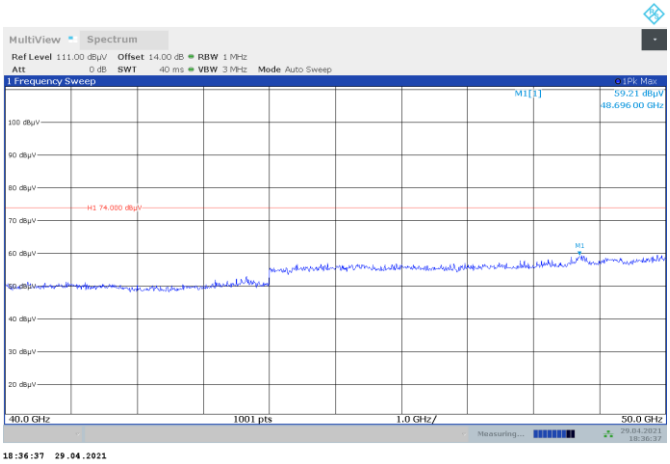


Figure 8.6-4: *Field strength of spurious emissions within26.5–40 GHz*

Test data, continued



Note: Highest peak was assessed with average detector to make sure spurious no emissions are buried under the measuring instrument noise floor.

Figure 8.6-5: *Field strength of spurious emissions above 40 GHz*

8.7 Frequency stability

8.7.1 Definitions and limits

RSS 210 Annex F.2.e

The carrier frequency stability shall be sufficient to ensure that the 40 dB bandwidth stays within the operating frequency band when tested at the temperature and supply voltage variations specified for the frequency stability measurement in RSS-Gen.

8.7.2 Test summary

Verdict	Pass		
Tested by	Andrey Adelberg	Test date	April 28, 2021

8.7.3 Observations, settings and special notes

One representative discrete step frequency was used for frequency stability measurement.

8.7.4 Test data

Table 8.7-1: *Frequency drift results*

Temperature Condition	Voltage Condition	Frequency, GHz	Frequency drift, kHz
+70 °C	Nominal	10.53207480	-19.470
+60 °C	Nominal	10.53205724	-1.908
+50 °C	Nominal	10.53205119	4.136
+40 °C	Nominal	10.53205189	3.437
+30 °C	Nominal	10.53205103	4.296
+20 °C	Nominal + 15%	10.53205655	-1.219
+20 °C	Nominal	10.53205533	*Reference*
+20 °C	Nominal – 15%	10.53205723	-1.898
+10 °C	Nominal	10.53208328	-27.951
±0 °C	Nominal	10.53211575	-60.419
−10 °C	Nominal	10.53215594	-100.607
−25 °C	Nominal	10.53218821	-132.875

Table 8.7-2: *Frequency stability results*

−40 dBc, GHz	Max drift, kHz	Drifted frequency, GHz	Limit, GHz	Margin, kHz
10.500939	-132.875	10.500806	10.500000	806.125
10.549970	4.296	10.549974	10.550000	25.704

Section 9 EUT photos

9.1 External photos

Figure 9.1-1: *Front view photo*

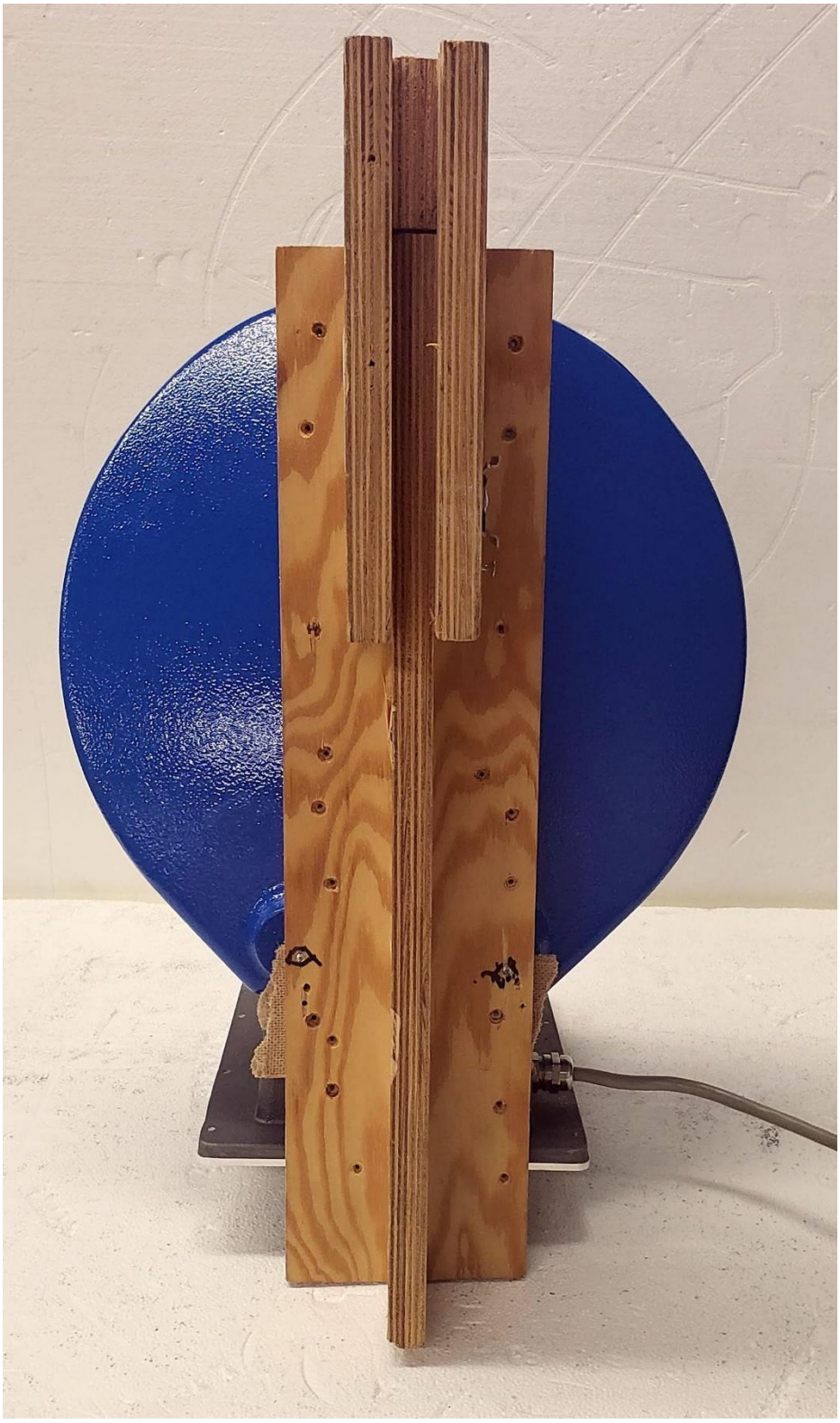


Figure 9.1-2: *Rear view photo*

Figure 9.1-3: *Side view photo*

Figure 9.1-4: *Side view photo*

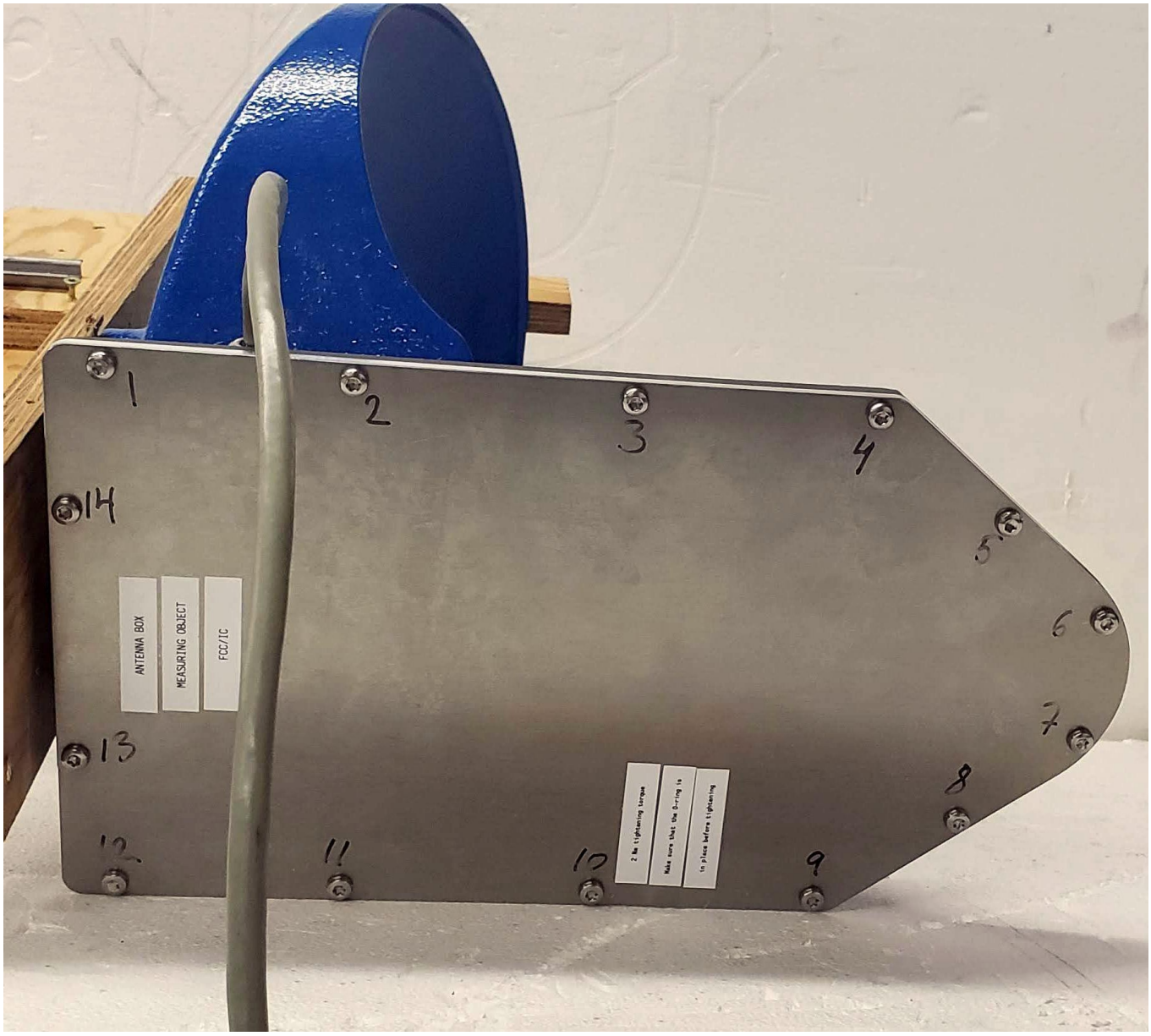


Figure 9.1-5: *Bottom view photo*

End of the test report