

RADIO TEST REPORT – 484077-1TRFWL

Type of assessment:

Final product testing

Applicant:

Kongsberg Inc

Model (HVIN):

1001317030

Product:

Dess Post RFID Gen3

HMN:

1001316154, 1001316155

FCC ID:

2ACER1001317030

ISED certification number:

12006A-1001317030

Specifications:

- ◆ FCC 47 CFR Part 15 Subpart C, §15.225
- ◆ RSS-210, Issue 10, December 2019, Annex B.6

Date of issue: November 9, 2022

Atefeh Beiginezhad, EMC/RF Specialist

Tested by



Signature

Kevin Rose, EMC/RF Specialist

Reviewed by



Signature

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SCC File Number: 15064 (Ottawa/Almonte); 151100 (Montreal); 151097 (Cambridge)



Lab locations

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Test site identifier	Organization FCC: ISED:	Ottawa/Almonte CA2040 2040A-4	Montreal CA2041 2040G-5	Cambridge CA0101 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.

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Section 1 Report summary

1.1 Test specifications

FCC 47 CFR Part 15, Subpart C, Clause 15.225	Operation within the band 13.110–14.010 MHz.
RSS-210, Issue 10, Dec 2019, Annex B.6	Licence-Exempt Radio Apparatus: Category I Equipment. Devices operating in frequency bands for any application Band 13.110–14.010 MHz

1.2 Test methods

ANSI C63.10 v2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
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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.

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	November 9, 2022	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

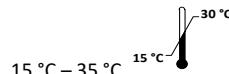
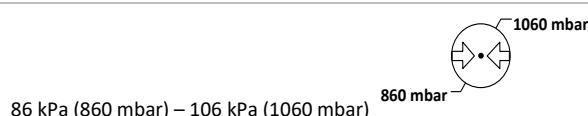
None

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 $\pm 5\%$, 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, \pm dB
All antenna port measurements	0.55
Occupied bandwidth	4.45
Conducted spurious emissions	1.13
Radiated spurious emissions	3.78
AC power line conducted emissions	3.55

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/Manufacturer

Name	Kongsberg inc.
Address	90, 28e Rue, C.P. 10034, Shawinigan, Québec, Canada G9T 5K7

5.3 EUT information

Product	Dess Post RFID Gen3
Model	1001317030
HMN	1001316154 and 1001316155
Serial number	832A25222001
Part number	710008832
Power supply requirements	Battery: 12 V _{DC}
Product description and theory of operation	The EUT contains POST and a key. The POST detects the presence of the key and allows the vehicle to operate. Without the key, the vehicle cannot start and if the key is removed during the vehicle is in operation the engine is shut off. The EUT uses DTS for transmission and includes 13.56 MHz RFID.

5.4 Radio technical information

Frequency band	13.553–13.567 MHz
Frequency Min (MHz)	13.56
Frequency Max (MHz)	13.56
RF power Max (W)	N/A
Field strength, dB μ V/m @ 3 m	64.27 dB μ V/m @ 3 m at 13.56 MHz
Measured BW (kHz), 99% OBW	2.26 kHz
Type of modulation	AM
Emission classification	K1D
Transmitter spurious, dB μ V/m @ 3 m	44.38 dB μ V/m @ 3 m at 569.522 MHz in QP detector
Antenna information	The EUT uses a non-detachable antenna (Built-in) to the intentional radiator. The maximum gain is -13.6 dBi

5.5 EUT setup details

5.5.1 Radio exercise details

Operating conditions	EUT was configured per client's instruction and set up with client's test firmware, continuous transmit mode was configured during transmitter tests.
Software details	Diagnostic engineering tool (Cadet software) 3.0.5.2.V1
Description of how the exercise the transmitter	In Cadet Software, in Test tab section , set Unit in debug mode, turn On the transmitter in section transmitter, Transmitter set in to continuous mode.

Table 5.5-1: EUT sub assemblies

Description	Brand name	Model, Part number, Serial number, Revision level
Dess Post RFID Gen3	Kongsberg	HMN: 1001316154 and 1001316155, PN: 710008832, SN: 832A25222001

Table 5.5-2: EUT interface ports

Description	Qty.
Main harness port	1

Table 5.5-3: Support equipment

Description	Brand name	Model, Part number, Serial number, Revision level
Load box	Kongsberg	None
Laptop Computer	DELL	SN: 87RBPQ2
RFID Key	Kongsberg	None
USB-to-CAN V2 adapter	IXXAT	PN: HW594449, MN: USB-to-CAN V2 compact
DC Power Supply	Sorensen	MN: SGA80X125C-AAA

Table 5.5-4: Inter-connection cables

Cable description	From	To	Length (m)
Main harness	EUT	Load box	2
2 Power Wires	Load box	DC Power Supply	1
USB cable	Laptop Computer	Load box	1



Figure 5.5-1: Testing block diagram

Section 6 Summary of test results

6.1 Testing location

Test location (s)	Montreal
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6.2 Testing period

Test start date	September 15, 2022	Test end date	September 16, 2022
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6.3 Sample information

Receipt date	September 14, 2022	Nemko sample ID number(s)	4840770001
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6.4 FCC Part 15 Subpart A and C, general requirements test results

Table 6.4-1: FCC general requirements results

Part	Test description	Verdict
§15.207(a)	Conducted limits	Not applicable ¹
§15.31(e)	Variation of power source	Pass ²
§15.31(m)	Number of tested frequencies	Pass ⁴
§15.203	Antenna requirement	Pass ³

Notes: ¹EUT is an DC battery powered.

² EUT tested with fresh battery

³ The antennas are located within the enclosure of EUT and not user accessible.

⁴ The EUT is not channelized, fixed at single frequency.

6.5 FCC Part §15.225 test results

Table 6.5-1: FCC §15.225 requirements results

Part	Test description	Verdict
§15.225(a)	Field strength within 13.553–13.567 MHz band	Pass
§15.225(b)	Field strength within 13.410–13.553 MHz and 13.567–13.710 MHz bands	Pass
§15.225(c)	Field strength within 13.110–13.410 MHz and 13.710–14.010 MHz bands	Pass
§15.225(d)	Field strength outside 13.110–14.010 MHz band	Pass
§15.225(e)	Frequency tolerance of carrier signal	Pass

Notes None

6.6 ISED RSS-Gen, Issue 5, test results

Table 6.6-1: RSS-Gen requirements results

Clause	Test description	Verdict
7.3	Receiver radiated emission limits	Not applicable
7.4	Receiver conducted emission limits	Not applicable
6.9	Operating bands and selection of test frequencies	Pass
8.8	AC power-line conducted emissions limits	Not applicable

Notes: ¹According 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 battery operated device, the testing was performed using fresh batteries.

6.7 ISED RSS-210, Issue 10, test results

Table 6.7-1: ISED RSS-247 requirements results

Section	Test description	Verdict
Annex B.6 (a)(i)	The field strength within the band 13.553–13.567 MHz	Pass
Annex B.6 (a)(ii)	The field strength within the bands 13.410–13.553 MHz and 13.567–13.710 MHz	Pass
Annex B.6 (a)(iii)	The field strength within the bands 13.110–13.410 MHz and 13.710–14.010 MHz	Pass
Annex B.6 (a)(iv)	The field strength outside the band 13.110–14.010 MHz	Pass
Annex B.6 (b)	Carrier frequency stability	Pass

Notes: None

Section 7 Test equipment

7.1 Test equipment list

Table 7.1-1: Equipment list

Equipment	Manufacturer	Model no.	Asset no/SN	Cal cycle	Next cal.
3 m EMI test chamber (Emissions)	TDK	SAC-3	FA002532e	1 year	April 1, 2023
Flush mount turntable	Sunol	FM2022	FA002550	—	NCR
Controller	Sunol	SC104V	FA002551	—	NCR
Antenna mast	Sunol	TLT2	FA002552	—	NCR
Receiver/spectrum analyzer	Rohde & Schwarz	ESU 40	FA002071	1 year	March 3, 2023
Spectrum analyzer	Rohde & Schwarz	FSV 40	FA002731	101394	1 year
Bilog antenna (20–2000 MHz)	Sunol	JB1	FA002517	1 year	March 24, 2023
Active loop antenna (0.01–30 MHz)	Com-Power	AL-130	FA002722	1 year	March 11, 2023
Controller	Sunol	SC104V	FA002551	0	—
20 dB attenuator	Narda	766-20	FA001873a	401218	—
Temperature chamber	Thermotron	S-4	FA002453	1 year	August 1, 2023

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

Section 8 Testing data

8.1 Antenna requirement

8.1.1 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.

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.

8.1.2 Test summary

Verdict	Pass
Tested by	Atefeh Beiginezhad

Test date

September 22, 2022

8.1.3 Observations, settings and special notes

None

8.1.4 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

Table 8.1-1: Antenna information

Antenna type	Manufacturer	Model number	Maximum gain	Connector type
Built in	Kongsberg	N/A	-13.6 dBi	N/A

8.2 Occupied bandwidth

8.2.1 References, definitions and limits

FCC Part §15.215:

Additional provisions to the general radiated emission limitations:

(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.

ANSI C63.10-2013, Clause 6.9.3:

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission.

RSS-Gen, Clause 6.7:

For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).

8.2.2 Test summary

Verdict	Pass
Tested by	Atefeh Beiginezhad

Test date

September 15, 2022

8.2.3 Observations, settings and special notes

The emission bandwidth was tested per ANSI C63.10, Clause 6.9.3. Spectrum analyzer settings:

Resolution bandwidth:	1 kHz
Video bandwidth:	3 kHz
Detector mode:	Peak
Trace mode:	Max Hold

8.2.4 Test data

Table 8.2-1: 99% bandwidth results

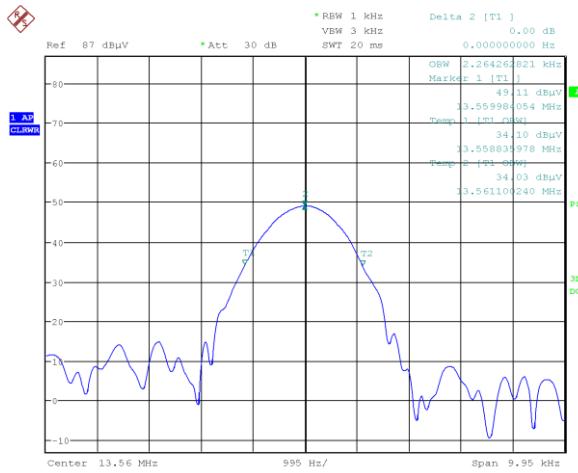
Frequency, MHz	99% bandwidth, kHz
13.56	2.26

Table 8.2-2: Lower 20 dBc frequency cross result

Fundamental frequency, MHz	Lower 20 dBc frequency cross, MHz	Limit, MHz	Margin, kHz
13.560	13.558	13.553	5

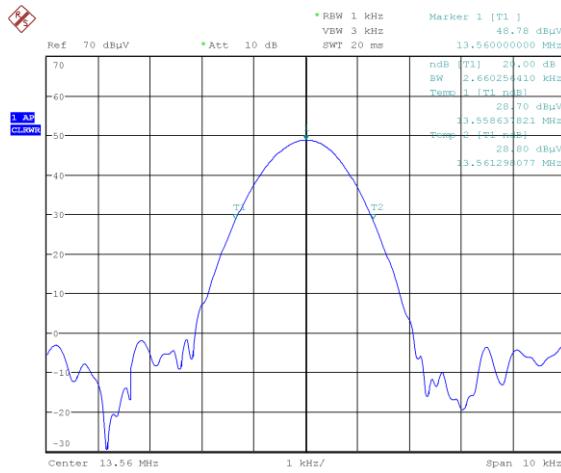
Table 8.2-3: Upper 20 dBc frequency cross result

Fundamental frequency, MHz	Upper 20 dBc frequency cross, MHz	Limit, MHz	Margin, kHz
13.560	13.561	13.567	6



Date: 15.SEP.2022 10:34:03

Figure 8.2-1: 99% bandwidth



Date: 15.SEP.2022 10:39:46

Figure 8.2-2: 20 dB bandwidth

8.3 Field strength within 13.110–14.010 MHz band

8.3.1 References, definitions and limits

FCC §15.225:

- (a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15848 μ V/m (84 dB μ V/m) at 30 meters.
- (b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 μ V/m (50.5 dB μ V/m) at 30 meters.
- (c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 μ V/m (40.5 dB μ V/m) at 30 meters.

RSS-210, Annex B.6:

Devices shall comply with the following requirements:

- a. the field strength of any emission shall not exceed the following limits:
 - i. 15.848 mV/m (84 dB μ V/m) at 30 m, within the band 13.553–13.567 MHz
 - ii. 334 μ V/m (50.5 dB μ V/m) at 30 m, within the bands 13.410–13.553 MHz and 13.567–13.710 MHz
 - iii. 106 μ V/m (40.5 dB μ V/m) at 30 m, within the bands 13.110–13.410 MHz and 13.710–14.010 MHz

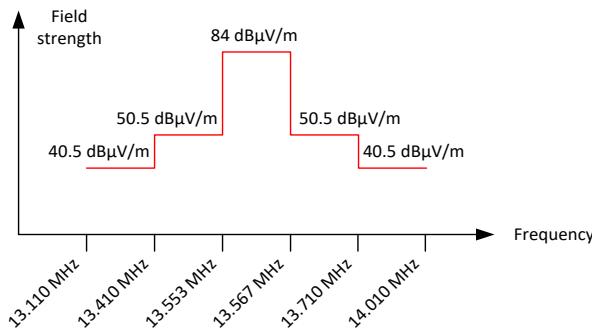


Figure 8.3-1: In-band spurious emissions limit at 30 m

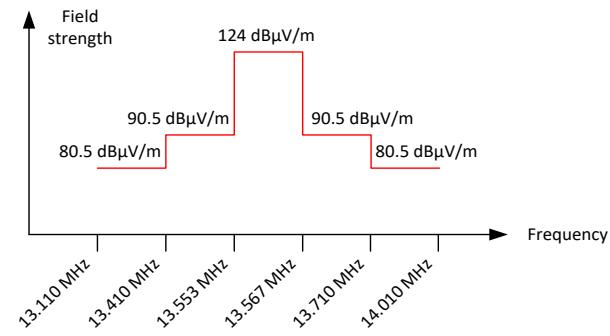


Figure 8.3-2: In-band spurious emissions limit at 3 m

8.3.2 Test summary

Verdict	Pass		
Tested by	Atefeh Beiginezhad	Test date	September 15, 2022

8.3.3 Observations, settings and special notes

The measurements were performed at the distance of 3 m. 40 dB distance correction factor* was applied to the measurement result in order to comply with 30 m limits.

* 30 m to 3 m distance correction factor calculation (for 13 MHz band):

$$40 \times \log_{10} (3 \text{ m}/30 \text{ m}) = 40 \times \log_{10} (0.1) = -40 \text{ dB}$$

- EUT was set to transmit with 100 % duty cycle.
- Radiated measurements were performed at a distance of 3 m.
- The spurious emission was tested per ANSI C63.10, Clause 6.4.

Spectrum analyser settings:

Resolution bandwidth:	10 kHz
Video bandwidth:	30 kHz
Detector mode:	Peak
Trace mode:	Max Hold

8.3.4 Test data

Table 8.3-1: Field strength measurements results

Frequency range, MHz	Frequency, MHz	Field strength at 3 m, dB μ V/m	Calculated field strength at 30 m, dB μ V/m	Limit, dB μ V/m	Margin, dB
13.553–13.567	13.560	64.3	24.3	84.00	59.7

Note: Calculated field strength at 30 m = Measured field strength at 3 m – 40 dB

Test data, continued

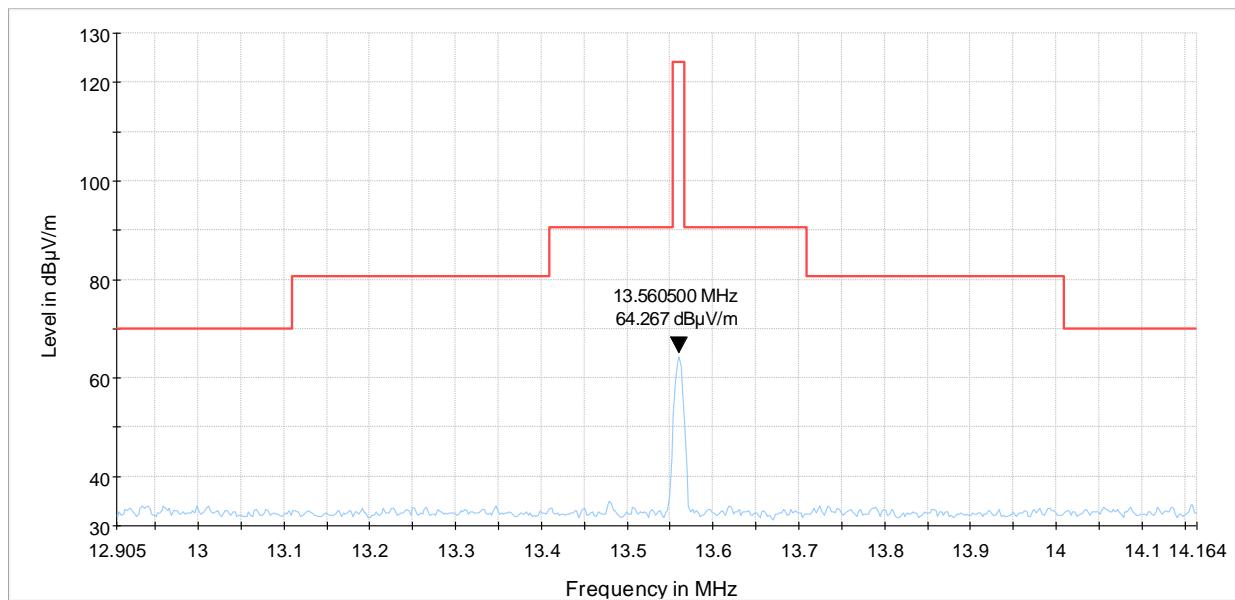


Figure 8.3-3: Field strength within 13.56 MHz mask

8.4 Field strength outside 13.110–14.010 MHz band

8.4.1 References, definitions and limits

FCC §15.225:

(d) The field strength of any emissions appearing outside of the 13.110–14.010 MHz band shall not exceed the general radiated emission limits in §15.209.

RSS-210, Annex B.6:

Devices shall comply with the following requirements:

- a. the field strength of any emission shall not exceed the following limits:
- iv. RSS-Gen general field strength limits for frequencies outside the band 13.110–14.010 MHz

Table 8.4-1: FCC §15.209 and RSS-Gen – Radiated emission limits

Field strength of emissions			
Frequency, MHz	µV/m	dBµV/m	Measurement distance, m
0.009–0.490	2400/F	67.6 – 20 × log ₁₀ (F)	300
0.490–1.705	24000/F	87.6 – 20 × log ₁₀ (F)	30
1.705–30.0	30	29.5	30
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.

References, definitions and limits, continued

Table 8.4-2: 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	
8.41425–8.41475	167.72–173.2	3500–4400	
12.29–12.293	240–285	4500–5150	Above 38.6
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 8.4-3: 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			

8.4.2 Test summary

Verdict	Pass
Tested by	Atefeh Beiginezhad

Test date

September 15, 2022

8.4.3 Observations, settings and special notes

- The spectrum was searched from 9 kHz to 1 GHz.
- EUT was set to transmit with 100 % duty cycle.
- Radiated measurements were performed at a distance of 3 m.
- The spurious emission was tested per ANSI C63.10, Clause 6.4 and 6.5.

Spectrum analyser settings for measurements below 150 kHz:

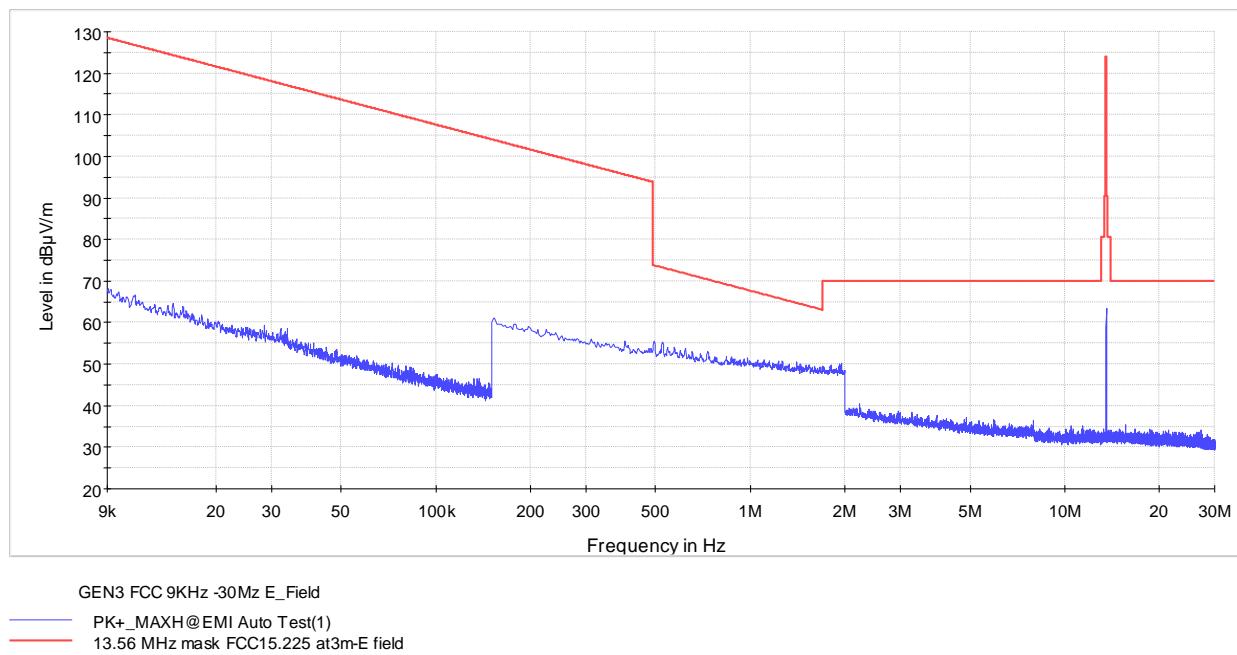
Resolution bandwidth:	300 Hz
Video bandwidth:	9 kHz
Detector mode:	Quasi-Peak
Trace mode:	Max Hold

Spectrum analyser settings for measurements below 30 MHz:

Resolution bandwidth:	9 kHz
Video bandwidth:	30 kHz
Detector mode:	Quasi-Peak
Trace mode:	Max Hold

Spectrum analyser settings for measurements below 1 GHz:

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

8.4.4 Test data**Figure 8.4-1: Field strength of spurious emissions below 30 MHz**

Test data continued

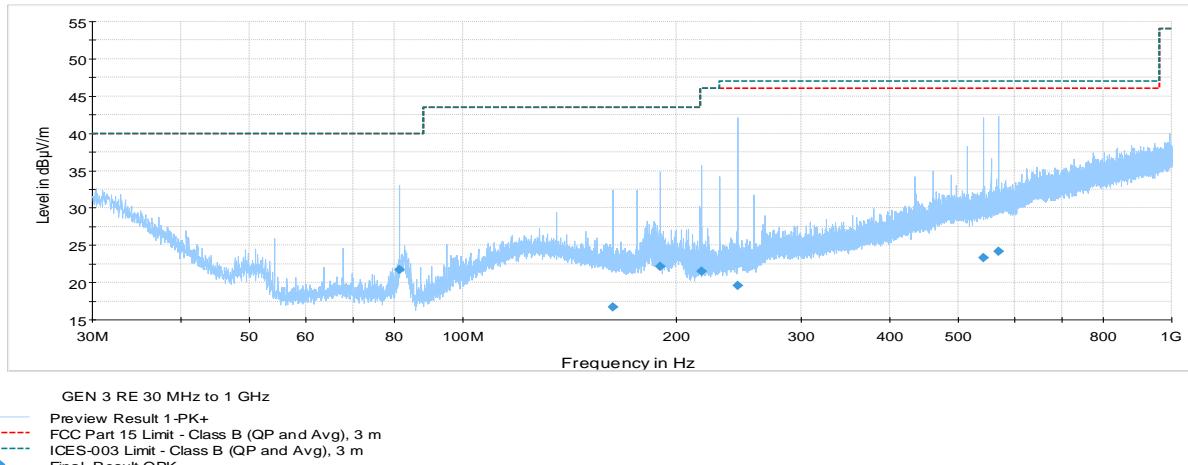


Figure 8.4-2: Field strength of spurious emissions above 30 MHz

Table 8.4-4: Radiated emissions (Quasi-Peak) results

Frequency, MHz	Quasi-Peak result, dB μ V	Quasi-Peak limit, dB μ V	Quasi-Peak margin, dB	Correction factor, dB
135.568	37.6	43.5	5.9	18.9
162.687	34.4	43.5	9.1	17.6
244.046	41.2	46.0	4.8	17.5
406.804	34.4	46.0	11.6	22.1
542.402	42.9	46.0	3.1	2.8
569.522	44.4	46.0	1.6	2.9

Notes: ¹Field strength (dB μ V/m) = receiver/spectrum analyzer value (dB μ V) + correction factor (dB)

²Correction factor = antenna factor ACF (dB) + cable loss (dB)

³Emissions 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.

Sample calculation: 32.2 dB μ V/m (field strength) = 9.0 dB μ V (receiver reading) + 23.2 dB (Correction factor)

8.5 Frequency stability

8.5.1 References, definitions and limits

FCC §15.225:

(e) The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency over a temperature variation of -30 degrees to + 50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

RSS-210, Annex B.6:

Devices shall comply with the following requirements:

- the carrier frequency stability shall not exceed ± 100 ppm

8.5.2 Test summary

Verdict	Pass
Tested by	Atefeh Beiginezhad
Test date	September 16, 2022

8.5.3 Observations, settings and special notes

$$\text{Frequency drift (ppm)} = ((F_{\text{measured}} - F_{\text{reference}}) \div F_{\text{reference}}) \times 1 \times 10^6$$

Frequency stability test was performed as per ANSI C63.10, Clause 6.8. Spectrum analyser settings:

Resolution bandwidth:	1 Hz
Video bandwidth:	3 Hz
Detector mode:	Peak
Trace mode:	Max Hold

8.5.4 Test data

Table 8.5-1: Frequency drift measurement

Test conditions	Frequency, MHz	Drift, Hz	Limit, ppm	Margin
+50 °C, Nominal	13.56012	140	100	89.68
+40 °C, Nominal	13.56012	140	100	89.68
+30 °C, Nominal	13.56012	140	100	89.68
+20 °C, +15 %	13.56016	180	100	86.73
+20 °C, Nominal	13.55998	Reference	Reference	Reference
+20 °C, -15 %	13.56012	140	100	89.68
+10 °C, Nominal	13.56015	170	100	87.47
0 °C, Nominal	13.56015	170	100	87.47
-10 °C, Nominal	13.56017	190	100	85.99
-20 °C, Nominal	13.56017	190	100	85.99
-30 °C, Nominal	13.56012	140	100	89.68

Section 9 EUT photo

9.1 External photo



Figure 9.1-1: product view

End of the test report