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Applicant:

Narda Safety Test Solutions GmbH
Sandwiesenstr. 7
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Test report no.:

220041-AU03+W03

for:

Narda Safety Test Solutions GmbH
Broadband Field meter
NBP Fieldman

according to:

47 CFR Part 2
RSS-102

ilac-MRA DAkkS Deutsche Akkreditierungsstelle D-PL-12155-01-04

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Accreditation:

FCC test firm accreditation expiration date: 2023-04-06
MRA US-EU, FCC designation number: DE0010
Test firm registration number: 997268
FCC Registration Number (FRN): 0032245045
BnetzA-CAB-02/21-02/6 Valid until 2023-11-26

Recognized until 2023-03-16 by the
Department of Innovation, Science and Economic Development Canada (ISED)
as a recognized testing laboratory
CAB identifier: DE0011
Company number: 3472A

Location of Testing:

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The technical accuracy is guaranteed through the quality management of Element Materials Technology Straubing GmbH.

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1.2 IC standard

IC standard	*Requirement*	*Page*	*Result*
RSS-102 Issue 5, section 2.5.1	SAR test exclusion, except 3 kHz – 10 MHz	12	Passed

Straubing, August 04, 2022

Tested by
Jennifer Riedel B. Eng.
Radio Test Engineer

Approved by
Konrad Graßl
Department Manager Radio

2 Test regulations

2.1 FCC standards

Standard	*Title*
OET Bulletin 65, 65A, 65B Edition 97-01, August 1997	Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields
Part 1, Subpart I, Section 1.1310 October 2021	Radiofrequency radiation exposure limits
Part 1, Subpart 2, Section 2.1093 October 2021	Radiofrequency radiation exposure evaluation: portable devices.
KDB 447498 D01 v06	Mobile and portable devices RF Exposure procedures and equipment authorization policies, October 23, 2015.
KDB 447498 D04 v01 November 29, 2021	RF Exposure Procedures and Equipment Authorization Policies for Mobile and Portable Devices
KDB 865664 D01 v01r04 August 7, 2015	SAR Measurement requirements for 100 MHz to 6 GHz
ANSI C96.1: 2005	IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz

2.2 IC standards

Standard	*Title*
RSS-102 Issue 5 (March 19, 2015) Amendment 1 (February 2, 2021)	Spectrum Management and Telecommunications Radio Standards Specification Radio Frequency (RF) Exposure Compliance of Radio communication Apparatus (All Frequency Bands)

3 Equipment under Test

3.1 General information

Product type:	Broadband Field meter	
Model Name:	NBP Fieldman	
Serial number:	PT-0065	
Manufacturer:	Narda Safety Test Solutions GmbH	
Version:	Hardware:	A-Serie
	Software:	V0.9.0
Short description:	EUT is a broadband field meter with a WLAN module operating in the 2.4 GHz band. The EUT also employs BT classic.	
FCC ID:	2A77Y-246001A	
IC certification number:	28882-246001A	
Technology 1:	WLAN	
Application frequency band:	2400 MHz to 2483.5 MHz	
Antenna types:	Chip antenna	
	☐ detachable	☒ not detachable
Technology 2:	Bluetooth classic	
Application frequency band:	2400 MHz to 2483.5 MHz	
Antenna types:	Chip antenna	
	☐ detachable	☒ not detachable
Power supply:	DC supply Nominal voltage: 5 V	
Exposure tier:	☐	Head
	☐	Body
	☒	Limbs
	☐	other
	☐	See appropriate results
Separation distance:	☒	≤ 20 cm
	☐	> 20 cm
	☐	See appropriate results
Evaluated against exposure limits:	☒	General public use
	☐	Controlled use

3.2 Photographs of EUT

See Annex B of test report 220041-AU03+W01 of test laboratory Element Materials Technology Straubing GmbH.

4 Test results

This clause gives details about the test results as collected in the summary of test results on page 4.

4.1 FCC

4.1.1 SAR test exclusion, except WPT

Requirement:	Part 2, §2.1093
Reference:	KDB 447498 D01 v06

Performed by:	Jennifer Riedel B. Eng.	Date of test:	August 4, 2022
Result:	☒ Limits kept	☐ Limits not kept	

4.1.1.1 Requirements and limits for separation distance ≤ 20 cm

This estimation follows the general guidelines for RF Exposure according to clause 4.3.1 of the KDB 447498.

According to §2.1093(b):
For purposes of this section, the definitions in §1.1307(b)(2) of this chapter shall apply. A portable device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that the RF source's radiating structure(s) is/are within 20 centimeters of the body of the user.

According to §2.1093(c)(1):
Evaluation of compliance with the exposure limits in §1.1310 of this chapter, and preparation of an EA if the limits are exceeded, is necessary for portable devices having single RF sources with more than an available maximum time-averaged power of 1 mW, more than the ERP listed in Table 1 to §1.1307(b)(3)(i)(C), or more than the P_{th} in the following formula, whichever is greater. The following formula shall only be used in conjunction with portable devices not exempt by §1.1307(b)(3)(i)(C) at distances from 0.5 centimeters to 20 centimeters and frequencies from 0.3 GHz to 6 GHz.

$$P_{th}\ (\text{mW}) = \begin{cases} ERP_{20\ cm}(d/20\ \text{cm})^{x} & d \le 20\ \text{cm} \\ ERP_{20\ cm} & 20\ \text{cm} < d \le 40\ \text{cm} \end{cases}$$

Where

$$x = -\log_{10}\left(\frac{60}{ERP_{20\ cm}\sqrt{f}}\right) \text{ and f is in GHz;}$$

$$ERP_{20\ cm}\ (\text{mW}) = \begin{cases} 2040f & 0.3\ \text{GHz} \le f < 1.5\ \text{GHz} \\ 3060 & 1.5\ \text{GHz} \le f \le 6\ \text{GHz} \end{cases}$$

d = the minimum separation distance (cm) in any direction from any part of the device antenna(s) or radiating structure(s) to the body of the device user.

According to §2.1093 (d)(1):
The SAR limits specified in §1.1310(a) through (c) of this chapter shall be used for evaluation of portable devices transmitting in the frequency range from 100 kHz to 6 GHz. Portable devices that transmit at frequencies above 6 GHz shall be evaluated in terms of the MPE limits specified in Table 1 to §1.1310(e)(1) of this chapter. A minimum separation distance applicable to the operating configurations and exposure conditions of the device shall be used for the evaluation. In general, maximum time-averaged power levels must be used for evaluation. All unlicensed personal communications service (PCS) devices and unlicensed NII devices shall be subject to the limits for general population/uncontrolled exposure.

RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	1,920 R^2.
1.34-30	3,450 R^2/f^2.
30-300	3.83 R^2.
300-1,500	0.0128 R^2f.
1,500-100,000	19.2R^2.

Table 1: Table 1 to §1.1307(b)(3)(i)(C)—Single RF Sources Subject to Routine Environmental Evaluation

According to §1.1310 (a):
Specific absorption rate (SAR) shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in §1.1307(b) of this part within the frequency range of 100 kHz to 6 GHz (inclusive).

According to §1.1310 (b):
The SAR limits for occupational/controlled exposure are 0.4 W/kg, as averaged over the whole body, and a peak spatial-average SAR of 8 W/kg, averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the parts of the human body treated as extremities, such as hands, wrists, feet, ankles, and pinnae, where the peak spatial-average SAR limit for occupational/controlled exposure is 20 W/kg, averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube). Exposure may be averaged over a time period not to exceed 6 minutes to determine compliance with occupational/controlled SAR limits.

According to §1.1310 (c):
The SAR limits for general population/uncontrolled exposure are 0.08 W/kg, as averaged over the whole body, and a peak spatial-average SAR of 1.6 W/kg, averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the parts of the human body treated as extremities, such as hands, wrists, feet, ankles, and pinnae, where the peak spatial-average SAR limit is 4 W/kg, averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube). Exposure may be averaged over a time period not to exceed 30 minutes to determine compliance with general population/uncontrolled SAR limits.

4.1.1.2 Process to Determine RF Exposure Compliance

According to Appendix A of KDB 447498 D04 Interim General RF Exposure Guidance V01:
Generally, the sequence to apply for single portable RF sources includes the following steps:

1) Determination of 1 mW blanket exemption under § 1.1307(b)(3)(i)(A)
2) Determination of exemption under the MPE-based § 1.1307(b)(3)(i)(C) if 1) is not met
3) Determination of exemption under the SAR-based § 1.1307(b)(3)(i)(B) if both 1) and 2) are not met

4.1.1.3 Results

Note(s):
1. The determination according to point 3 in clause 4.1.1.2 was used for evaluation.

RF technology 1:
The following data are based on applicants document: Test report 220041-AU03+W01 of the test laboratory Element Materials Technology Straubing GmbH

Application:	WLAN
Operation frequency range:	2400 MHz – 2483.5 MHz
Antenna model	Chip antenna
Antenna connector:	none
Antenna type:	internal
	not detachable
Antenna gain:	2.2 dBi
Maximum conducted output power:	24.28 dBm at 2412 MHz in modulation IEEE 802.11 g 24.43 dBm at 2437 MHz in modulation IEEE 802.11 g 23.71 dBm at 2462 MHz in modulation IEEE 802.11 g

Information related to Exposure:

Tune-up tolerance (according to the manufacturer):	1.56 dB
Separation distance:	100 mm
Exposure tier:	general public
Power averaging over time:	not applied

Separation distance (mm)	*Channel Frequency (MHz)*	*ERP + tolerance (dBm)*	*P_{th} (mW)*	*Limit P_{th} (mW)*	*Ratio of limit*	*Result*
100	2412	25.89	388.15	820.61	0.47	Passed
100	2437	26.04	401.79	819.34	0.49	Passed
100	2462	25.32	340.41	818.08	0.42	Passed

Table 2: Result of SAR test exclusion

Note(s):
1. The determination according to point 3 in clause 4.1.1.2 was used for evaluation.

RF technology 2:
The following data are based on applicants document: Test report 220041-AU03+W02 of the test laboratory Element Materials Technology Straubing GmbH

Application:	BT classic
Operation frequency range:	2400 MHz – 2483.5 MHz
Antenna model	Chip antenna
Antenna connector:	none
Antenna type:	internal
	not detachable
Antenna gain:	2.2 dBi
Maximum conducted output power:	-5.41 dBm at 2402 MHz (data rate ACL-B DH1) -5.82 dBm at 2442 MHz (data rate ACL-B DH1) -6.50 dBm at 2480 MHz (data rate ACL-B DH1)

Information related to Exposure:

Tune-up tolerance (according to the manufacturer):	1.56 dB
Separation distance:	100 mm
Exposure tier:	general public
Power averaging over time:	not applied

Separation distance (mm)	*Channel Frequency (MHz)*	*ERP + tolerance (dBm)*	*P_{th} (mW)*	*Limit P_{th} (mW)*	*Ratio of limit*	*Result*
100	2402	-3.80	0.42	821.13	0.0005	Passed
100	2442	-4.21	0.38	819.09	0.0005	Passed
100	2480	-4.89	0.32	817.19	0.0004	Passed

Table 3: Result of SAR test exclusion

4.2 Canada

4.2.1 SAR test exclusion, except 3 kHz – 10 MHz

Requirement:	RSS-102 Issue 5, section 2.5.1
Reference:	n/a

Performed by:	Jennifer Riedel B. Eng.	Date of test:	August 4, 2022
Result:	☒ Limits kept	☐ Limits not kept	

4.2.1.1 Exemption Limits for Routine Evaluation – SAR Evaluation

According RSS 102 clause 2.5.1:
SAR evaluation is required if the separation distance between the user and/or bystander and the antenna and/or radiating element of the device is less than or equal to 20 cm, except when the device operates at or below the applicable output power level (adjusted for tune-up tolerance) for the specified separation distance defined in Table 1.

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of ≤5 mm	At separation distance of 10 mm	At separation distance of 15 mm	At separation distance of 20 mm	At separation distance of 25 mm
≤300	71 mW	101 mW	132 mW	162 mW	193 mW
450	52 mW	70 mW	88 mW	106 mW	123 mW
835	17 mW	30 mW	42 mW	55 mW	67 mW
1900	7 mW	10 mW	18 mW	34 mW	60 mW
2450	4 mW	7 mW	15 mW	30 mW	52 mW
3500	2 mW	6 mW	16 mW	32 mW	55 mW
5800	1 mW	6 mW	15 mW	27 mW	41 mW

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of 30 mm	At separation distance of 35 mm	At separation distance of 40 mm	At separation distance of 45 mm	At separation distance of ≥50 mm
≤300	223 mW	254 mW	284 mW	315 mW	345 mW
450	141 mW	159 mW	177 mW	195 mW	213 mW
835	80 mW	92 mW	105 mW	117 mW	130 mW
1900	99 mW	153 mW	225 mW	316 mW	431 mW
2450	83 mW	123 mW	173 mW	235 mW	309 mW
3500	86 mW	124 mW	170 mW	225 mW	290 mW
5800	56 mW	71 mW	85 mW	97 mW	106 mW

4 The exemption limits in Table 1 are based on measurements and simulations of half-wave dipole antennas at separation distances of 5 mm to 25 mm from a flat phantom, providing a SAR value of approximately 0.4 W/kg for 1 g of tissue. For low frequencies (300 MHz to 835 MHz), the exemption limits are derived from a linear fit. For high frequencies (1900 MHz and above), the exemption limits are derived from a third order polynomial fit.

5 Transmitters operating between 0.003-10 MHz, meeting the exemption from routine SAR evaluation, shall demonstrate compliance to the instantaneous limits in Section 4.

Output power level shall be the higher of the maximum conducted or equivalent isotropically radiated power (e.i.r.p.) source-based, time-averaged output power. For controlled use devices where the 8 W/kg for 1 gram of tissue applies, the exemption limits for routine evaluation in Table 1 are multiplied by a factor of 5. For limb-worn devices where the 10 gram value applies, the exemption limits for routine evaluation in Table 1 are multiplied by a factor of 2.5. If the operating frequency of the device is between two frequencies located in Table 1, linear interpolation shall be applied for the applicable separation distance. For test separation distance less than 5 mm, the exemption limits for a separation distance of 5 mm can be applied to determine if a routine evaluation is required.
For medical implants devices, the exemption limit for routine evaluation is set at 1 mW. The output power of a medical implants device is defined as the higher of the conducted or e.i.r.p to determine whether the device is exempt from the SAR evaluation.

4.2.1.2 Results

RF technology 1:
The following data are based on applicants document: Test report 220041-AU03+W01 of the test laboratory Element Materials Technology Straubing GmbH

Application:	WLAN
Operation frequency range:	2400 MHz – 2483.5 MHz
Antenna model	Chip antenna
Antenna connector:	none
Antenna type:	internal
	not detachable
Antenna gain:	2.2 dBi
Maximum conducted output power:	24.28 dBm at 2412 MHz in modulation IEEE 802.11 g 24.43 dBm at 2437 MHz in modulation IEEE 802.11 g 23.71 dBm at 2462 MHz in modulation IEEE 802.11 g

Information related to Exposure:

Tune-up tolerance (according to the manufacturer):	1.56 dB
Separation distance:	100 mm
Exposure tier:	general public
Power averaging over time:	not applied

Separation distance (mm)	*Channel frequency (MHz)*	*EIRP + tolerance (dBm)*	*EIRP + tolerance (mW)*	*Limit 10-g SAR (mW)*	*Ratio of limit*	*Result*
100	2412	28.04	636.80	772.5	0.82	Passed
100	2437	28.19	659.17	772.5	0.85	Passed
100	2462	27.47	558.47	772.5	0.72	Passed

Table 4: Result of SAR test exclusion, exposure to the limbs

RF technology 2:
The following data are based on applicants document: Test report 220041-AU03+W02 of the test laboratory Element Materials Technology Straubing GmbH

Application:	BT classic
Operation frequency range:	2400 MHz – 2483.5 MHz
Antenna model	Chip antenna
Antenna connector:	none
Antenna type:	internal
	not detachable
Antenna gain:	2.2 dBi
Maximum conducted output power:	-5.41 dBm at 2402 MHz (data rate ACL-B DH1) -5.82 dBm at 2442 MHz (data rate ACL-B DH1) -6.50 dBm at 2480 MHz (data rate ACL-B DH1)

Information related to Exposure:

Tune-up tolerance (according to the manufacturer):	1.56 dB
Separation distance:	100 mm
Exposure tier:	general public
Power averaging over time:	not applied

Separation distance (mm)	*Channel frequency (MHz)*	*EIRP + tolerance (dBm)*	*EIRP + tolerance (mW)*	*Limit 10-g SAR (mW)*	*Ratio of limit*	*Result*
100	2402	-1.65	0.68	772.5	0.0009	Passed
100	2442	-2.06	0.62	772.5	0.0008	Passed
100	2480	-2.74	0.53	772.5	0.0007	Passed

Table 5: Result of SAR test exclusion, exposure to the limbs

5 Revision history

Revision	*Date*	*Issued by*	*Description of modifications*
0	2022-08-04	Jennifer Riedel B. Eng.	First edition

Template: RF_FCC_IC_Human Exposure_V1.5