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- The RvA is a signatory to the EA MLA.
- The RvA is a signatory to the ILAC MRA.
- The RvA is a signatory to the IAF MLA.

Assessment report No:
2289002.0503-RSM

ASSESSMENT REPORT
RF EXPOSURE - MPE

(*)	Identification of item to be assessed	UHF Long range RFID Reader
(*)	Trademark	Nedap
(*)	Model and /or type reference	NVR2002
(*)	Features, other identification of the product	UHF RFID FCC ID: CGDNVR2002 IC: 1444A-NVR2002
(*)	Derived model(s)	N/A
(*)	Applicant´s name / address	Nedap N.V. Parallelweg 2, 7141 DC Groenlo, The Netherlands.
	Assessment method requested, standard	FCC 47 CFR Part 2.1091 Radiofrequency radiation exposure evaluation: mobile devices. FCC 47 CFR Part 1.1307: Actions that may have a significant environmental effect, for which Environmental Assessments (EAs) must be prepared. FCC 47 CFR Part 1.1310: Radiofrequency radiation exposure limits.
	Verdict Summary	IN COMPLIANCE
	Assessment performed by (name / position & signature)	Jose Carlos Luque Technical Professional EMC&Wireless
	Approved by (name / position & signature)	Sedat Eser Technical Professional EMC&Wireless
	Date of issue	2024-11-07
	Report template No	TRF_RSM_MPE_FCC2.1091_dev_R2.0 (*) "Data provided by the applicant"

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COMPETENCES AND GUARANTEES

DEKRA is a testing laboratory competent to carry out the tests described in this report.

In order to assure the traceability to other national and international laboratories, DEKRA has a calibration and maintenance program for its measurement equipment.

DEKRA guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated in the report and it is based on the knowledge and technical facilities available at DEKRA at the time of performance of the test.

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The results presented in this Test Report apply only to the particular item under test established in this document.

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GENERAL CONDITIONS

1. This report is only referred to the item that has undergone the assessment.
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POSSIBLE ASSESSMENT CASE VERDICTS

Assessment case does not apply to test object	N/A
Assessment object does meet requirement	P (Pass) / PASS
Assessment object does not meet requirement	F (Fail) / FAIL

DEFINITION OF SYMBOLS USED IN THIS ASSESSMENT REPORT

☒ Indicates that the listed condition, standard or equipment is applicable for this report/Assessment/EUT.				
☐ Indicates that the listed condition, standard or equipment is not applicable for this report/Assessment/EUT.				
Decimal separator used in this report	☐	Comma (,)	☒	Point (.)

ABBREVIATIONS

For the purposes of the present document, the following abbreviations apply:

ASK	:	Amplitude Shift Keying
BER	:	Bit Error Rate
ERP/e.r.p.	:	effective radiated power
EMC	:	ElectroMagnetic Compatibility
EMF/emf	:	ElectroMagnetic Field
ERC	:	European Radiocommunications Committee
EUT / DUT	:	Equipment Under Test / Device Under Test
HF	:	High Frequency (range)
ISM	:	Industrial, Scientific and Medical
ITU-T	:	ITU-Telecommunication sector
LF	:	Low Frequency
NFC	:	Near Field Communication
OATS	:	Open Area Test Site
OBW	:	Occupied BandWidth
OFR	:	Operating Frequency Range
R&TTE	:	Radio and Telecommunications Terminal Equipment
RF	:	Radio Frequency
RFID	:	Radio Frequency Identification
RMS	:	Root Mean Square
RX	:	Receiver
SND	:	Signal, Noise and Distortion
SND/ND	:	Signal, Noise and Distortion over Noise and Distortion
SRD	:	Short Range Device
TR	:	Technical Report
TX	:	Transmitter
MS		Mobile Station

DATA PROVIDED BY THE APPLICANT

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item under evaluation", "Trademark", "Model and/or type reference", “General description of the device”, “Other identification of the product”).
2. Maximum output power, maximum antenna gain and use distance information → specifications declared by the client.
3. Information provided by the client in the form Application form - RF_Exposure Assessment v1.0.pdf

DEKRA Certification B.V. declines any responsibility with respect to the information provided by the applicant and that may affect the validity of results.

According to the manufacturer, during its normal use, the separation distance between the device and the body of nearby users will be greater than 20cm. In order to perform the assessment a conservative evaluation distance of 20 cm has been used.

The equipment specifications declared by the manufacturer for each supported technology is:

Technology / Mode	Operating Band	Frequency under evaluation (MHz)	Maximum Conducted Output Power (dBm)	Duty Cycle (%)	Time Averaged Conducted Power (dBm)	Antenna peak gain (dBd)	Cable loss (dB)	Maximum Averaged E.R.P (dBm)	Maximum Averaged E.R.P (mW)
SRD	900	902.75 – 927.25	26.55	13.00	17.69	7.30	0.00	24.99	315.46

Table: Equipment specifications

DOCUMENT HISTORY

Report nr.	Date	Description
2289002.0503-RSM	2024-11-07	First release.

CONCLUSION, REMARKS AND COMMENTS

The equipment under test (EUT) does meet the requirements of the applicable standard(s).

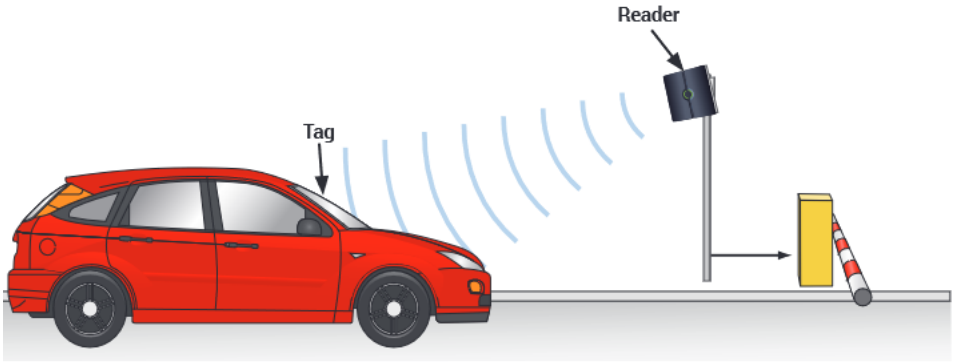
1. GENERAL INFORMATION

Description of the item.....:	UHF Long range RFID Reader
Model / Type number .....:	NVR2002
Serial number.....:	S718 A03 002
Trademark .....:	Nedap
Manufacturer.....:	Nedap N.V.

Operating frequency range(s) – Tx :	902.75 – 927.25 MHz
Operating frequency range(s) – Rx :	902.75 – 927.25 MHz
Type of Modulation.....:	PR-ASK
Number of channel.....:	50
Antenna type.....:	Circular polarized Patch Antenna
Antenna gain.....:	9.45dBi / 7.30dBd
Tlow.....:	-30°C
Thigh.....:	+60°C

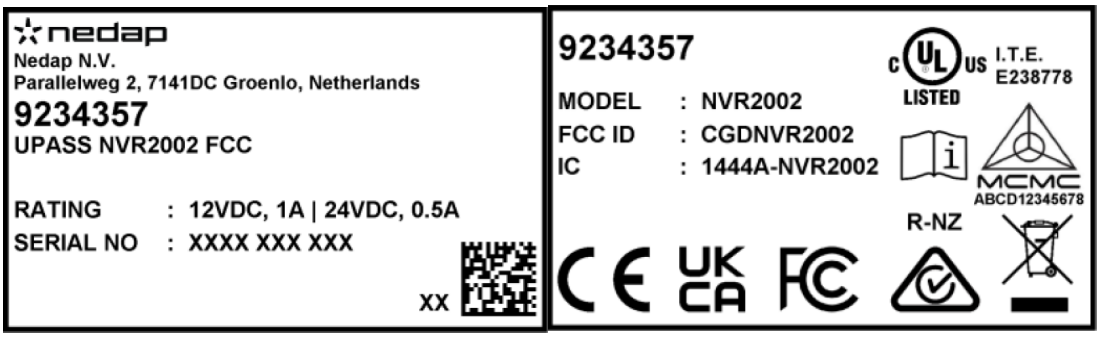
Rated power supply.....:	Voltage and Frequency		Power connection type				
			L1	L2	L3	N	PE
	☐	AC: 220 – 240 V, 50/60 Hz	☐	☐	☐	☐	☐
	☐	AC: 100 – 240 V, 50/60 Hz	☐	☐	☐	☐	☐
	☒	DC: 12 – 24 V					
	☐	Battery:					
Rated Power .....:	15W (24VDC, 0.5A or 12VDC, 1A)						
Clock frequencies.....:	64 MHz						
Other parameters.....:	UHF RFID						
Software version .....:	Main: 1.7 UHF: 2.00.00 LINUX: 0.2.0						
Hardware version.....:	NVR2002 A.02						
Dimensions in cm (W x H x D)....:	241 x 225 x 102						
Mounting position.....:	☐	*Table top equipment*					
	☒	*Wall/Ceiling mounted equipment*					
	☐	*Floor standing equipment*					
	☐	*Hand-held equipment*					
	☐	*Other: Vehicle*					

Intended use of the Equipment Under Test (EUT)
The NVR2002 RFID Transceiver is a transceiver for monitoring access control at the perimeter of a parking space for the purpose of vehicle identification. It operates at 865.7 – 867.5MHz at 33dBm E.R.P for ETSI regions and at 900 – 930MHz at 36dBm EIRP for FCC regions. The transceiver supports all UHF EPC Class 1 Gen 2 tags according to ISO18000-6C standard. Tags are detected at maximum 8m for seamless entry and exit of the parking space. The tagnumber is forwarded to the microcontroller and distributed to the Access control system (not part of the certification) via a communication interface of choice. (USB, RS485, Wiegand / magstripe, Ethernet TCP/IP)



No	Documents as provided by the applicant - Description	File name	Issue date
1	General information form	NVR2002 - 01 General information form v1.0SIGNED	2024-08-27
2	Antenna information	NVR2002 - Antenna information rev. 0.0	2024-03-06
3	Application form for RF Exposure	Application form - RF_Exposure Assessment v1.0	2024-09-05

Copy of marking plate:



2. RF Exposure Assessment result and verdict

RF Exposure Exemption evaluation:

Technology / Mode	Operating Band	Frequency under evaluation (MHz)	Distance (cm)	Maximum Averaged E.R.P (mW)	§1.1307(b)(3).i.(C) Exposure Limit (mW)	Verdict for exemption § 1.1307(b)(3).i
SRD	900	902.75 – 927.25	20.00	315.46	462.21	Pass

Table: FCC Exemption Evaluation Results

The computed value(s) are below the exemption limit(s), so these modes meet the requirements stated in FCC 47 CFR Part 1.1307.

3. ANNEX 1 - FCC RF Exposure Information

FCC RF Exposure determination of exemption

According to FCC 47 CFR §1.1307 (b)(3) Determination of exemption:

(i) For single RF sources (i.e., any single fixed RF source, mobile device, or portable device, as defined in paragraph (b)(2), a single RF source is exempt if:

(A) The available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption may not be used in conjunction with other exemption criteria other than those in paragraph (b)(3)(ii)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(ii)(A);

(B) Or the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold Pth (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). Pth is given by:

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

Where

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

and

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

d = the separation distance (cm);

(C) Or using Table 1 and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, R must be at least λ/2π, where λ is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of λ/4 or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	1920 R^2
1.34 – 30	3450 R^2/f^2
30 – 300	3.89 R^2
300 – 1500	0.0128 R^{2f}
1500 - 100000	19.2 R^2

Table 1 to §1.1307(b)(3)(i)(C)-Single RF Source Subject to Routine Environmental Evaluation

(ii) For multiple RF sources: Multiple RF sources are exempt if:

(A) The available maximum time-averaged power of each source is no more than 1 mW and there is a separation distance of two centimeters between any portion of a radiating structure operating and the nearest portion of any other radiating structure in the same device, except if the sum of multiple sources is less than 1 mW during the time-averaging period, in which case they may be treated as a single source (separation is not required). This exemption may not be used in conjunction with other exemption criteria other than those is paragraph (b)(3)(i)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(i)(A).

(B) in the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation.

$$\sum_{i=1}^{a} \frac{P_i}{P_{th,i}} + \sum_{j=1}^{b} \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^{c} \frac{Evaluated_k}{Exposure\ Limit_k} \leq 1$$

Where:

a = number of fixed, mobile, or portable RF sources claiming exemption using paragraph (b)(3)(i)(B) of this section for Pth, including existing exempt transmitters and those being added.

b = number of fixed, mobile, or portable RF sources claiming exemption using paragraph (b)(3)(i)(C) of this section for Threshold ERP, including existing exempt transmitters and those being added.

c = number of existing fixed, mobile, or portable RF sources with known evaluation for the specified minimum distance including existing evaluated transmitters.

Pi = the available maximum time-averaged power or the ERP, whichever is greater, for fixed, mobile, or portable RF source i at a distance between 0.5 cm and 40 cm (inclusive).

Pth,i = the exemption threshold power (Pth) according to paragraph (b)(3)(i)(B) of this section for fixed, mobile, or portable RF source i.

ERPj = the ERP of fixed, mobile, or portable RF source j.

ERPth,j = exemption threshold ERP for fixed, mobile, or portable RF source j, at a distance of at least λ/2π according to the applicable formula of paragraph (b)(3)(i)(C) of this section.

Evaluated,k = the maximum reported SAR or MPE of fixed, mobile, or portable RF source k either in the device or at the transmitter site from an existing evaluation at the location of exposure.

Exposure Limit,k = either the general population/uncontrolled maximum permissible exposure (MPE) or specific absorption rate (SAR) limit for each fixed, mobile, or portable RF source k, as applicable from §1.1310 of this chapter.

FCC RF Exposure evaluation

Limits for Maximum Permissible Exposure (MPE) for RF sources are defined in FCC 47 CFR "§1.1310 Radiation Exposure limits, paragraph (e)":

TABLE 1 TO §1.1310(E)(1)—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(i) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*(100)	≤6
3.0-30	1842/f	4.89/f	*($900/f^2$)	<6
30-300	61.4	0.163	1.0	<6
300-1,500			f/300	<6
1,500-100,000			5	<6
(ii) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	<30
1.34-30	824/f	2.19/f	*($180/f^2$)	<30
30-300	27.5	0.073	0.2	<30
300-1,500			f/1500	<30
1,500-100,000			1.0	<30

f = frequency in MHz. * = Plane-wave equivalent power density.

Each supported transmission technology will be evaluated to determine if it is in compliance with limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields.

In order to perform the assessment, the following equations have been used for the calculations; these equations are accurate in the far-field of an antenna and will over-predict power density in the near field, where they could be used for making a "worst-case" or conservative prediction:

Power density: $S[mW/cm^2] = \frac{P_{E.I.R.P.}[mW]}{4\Pi R[cm]^2}$

Where:

S = power density

$P_{E.I.R.P.}$ = Equivalent isotropically radiated power

R = distance to the center of radiation of the antenna (evaluation distance)

$P_{E.I.R.P.}$ = $P_T + G_T - L_C$

Where:

P_T= transmitter time-averaged output power (including Duty Cycle and tune-up tolerance, if applicable)

G_T= gain of the transmitting antenna

L_C = signal attenuation in the connecting cable between the transmitter and the antenna if applicable