DEKRA Certification B.V.
Meander 1051, 6825 MJ Arnhem P.O. Box 5185, 6802 ED Arnhem, The Netherlands
T +31 88 96 83000 F +31 88 96 83100
www.dekra-certification.com Company registration 09085396

- FCC Registration Number: NL0002 / 375449

Assessment report No:
2291293.0528-RSM

ASSESSMENT REPORT
RF EXPOSURE - MPE

(*)	Identification of item to be assessed	Manure Cleaning Robots
(*)	Trademark	JOZ B.V.
(*)	Model and /or type reference	Nano
(*)	Features, other identification of the product	RFID 134 kHz and Zigbee 2.4 GHz FCC ID: 2BGQ2-NANO IC: 32602-NANO Contains FCC MCQ-XBS2C Contains IC:1846A-XBS2C
(*)	Derived model(s)	N/A
(*)	Applicant´s name / address	JOZ B.V. Industrieweg 5, 1617KK, Westwoud, 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. ANSI C63.10-2020/Cor 1-2023
	Verdict Summary	IN COMPLIANCE
	Assessment performed by (name / position & signature)	Jose Carlos Luque Technical Professional EMC&Wireless
	Approved by (name / position & signature)	Sedat Eser Operational Manager EMC&Wireless
	Date of issue	2025-05-27
	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.

DEKRA is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

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

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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 200cm. 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 technologies are:

Technology / Mode	Operating Band	Frequency under evaluation (MHz)	Maximum Conducted Output Power (dBm)	TX time for a 30 min period (s)	Time Averaged Conducted Power (dBm)	Antenna peak gain (dBi)	Cable loss (dBi)	Maximum Averaged E.R.P (dBm)	Maximum Averaged E.R.P (mW)	Maximum Averaged E.I.R.P (dBm)	Maximum Averaged E.I.R.P (mW)
802.15.4	2.4 GHz	2402 - 2480	8,32	900	5,31	1,60	0,00	4,76	2,99	6,91	4,91

Table 1 Equipment specification of 802.15.4

Technology / Mode	Band	Frequency (MHz)	Maximum H-field strength (dBµA/m) measured at 3 m	Maximum E-field strength (dBµV/m) measured at 3 m
“RF E&H Field Measured RFID”	LF	0,1346	46,36	89,29

Table 2 E/H of RFID LF.

Simultaneous Transmission Conditions:

The device supports the following simultaneous transmissions modes:

- 802.15.4 + RFID LF (134KHz)

DOCUMENT HISTORY

Report nr.	Date	Description
2291293.0528-RSM	2025-05-27	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.....:	Manure cleaning Robots
Model / Type number .....:	NANO
Serial number.....:	500010041
Trademark .....:	JOZ B.V.
Manufacturer.....:	JOZ B.V.
Address .....:	Industrieweg 5, 1617KK, Westwoud, The Netherlands

Operating frequency range(s) – Tx :	134,6 kHz
Operating frequency range(s) – Rx :	134,6 kHz
Type of Modulation.....:	Unmodulated sinus wave
Antenna type.....:	Loop antenna
Tlow.....:	-10°C
Thigh.....:	+55°C

Operating frequency range(s) – Tx :	2405-2480 MHz
Operating frequency range(s) – Rx :	2405-2480 MHz
Type of Modulation.....:	Zigbee: QPSK
Number of channel.....:	Zigbee: 16
Antenna type.....:	Dipole
Antenna gain.....:	1,6 dBi

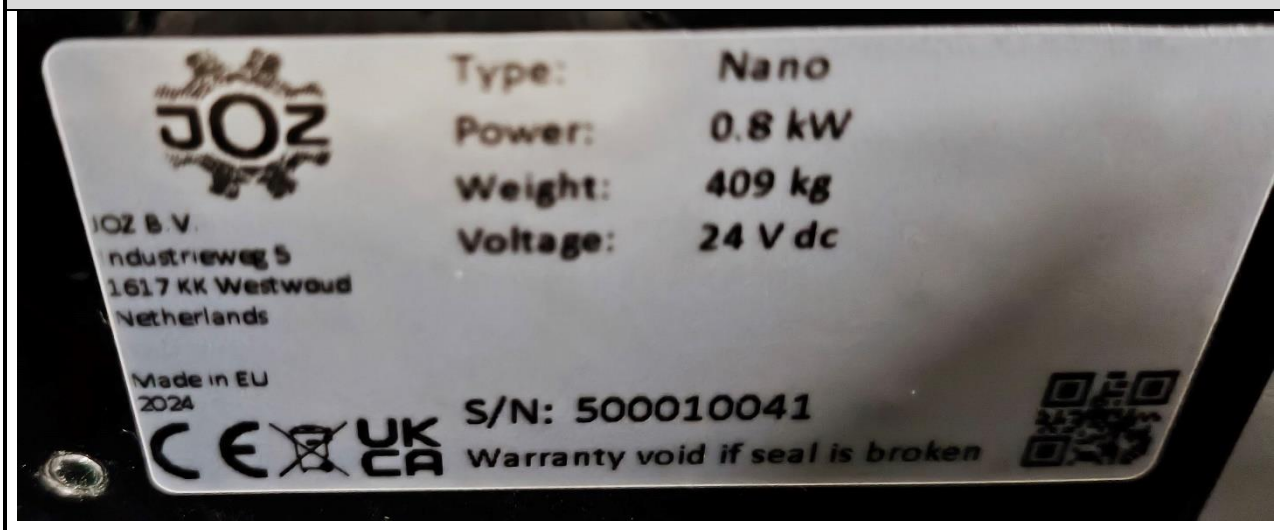
Rated power supply.....:	Voltage and Frequency		Power connection type				
			L1	L2	L3	N	PE
	☐	AC:	☐	☐	☐	☐	☐
	☒	Battery: 2x12V 110Ah AgM series 24Volts, 2x12V 80Ah Lead carbon series 24V					
Rated Power .....:	0,8 kW						
Clock frequencies.....:	24 MHz						
Other parameters.....:	RFID 134 kHz, Zigbee 2,4 GHz						
Software version .....:	3.4.197						
Hardware version.....:	V8.3						
Dimensions in cm (W x H x D)....:	219 x 155 x 68						
Mounting position.....:	☐	*Table top equipment*					
	☐	*Wall/Ceiling mounted equipment*					
	☒	*Floor standing equipment*					
	☐	*Hand-held equipment*					
	☐	*Other:*					

Intended use of the Equipment Under Test (EUT)
The product is used in the cow barn to push the feed towards the cow.

No	Module/parts of test item	Type	Manufacturer
1	Water pump	8075-192-319	Pentair
2	ECU	V8.3	JOZ
3	Drive Motor	80BLF3A 160-220 12	BEGE
4			
5			

No	Documents as provided by the applicant - Description	File name	Issue date
1	General information form	01 General information form v1.1	2024-10-14
2	Application form	AFRM_RF_Exposure_Rev-1.0	2024-10-09

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
802.15.4	2,4 GHz	2402 - 2480	20,00	2,99	768,00	Pass

Table 3: FCC Exemption Evaluation Result of 802.15.4

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

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
RFID	LF	0,1346	20,00	N/A	N/A	MPE required

Table 4: FCC Exemption Evaluation Result of RFID LF

The device fails to comply with applicable 1.1307(b)(3).i exemption limits, so Mamimum Permisible Exposure (MPE) evaluation is necessary to demonstrate compliance.

RF Exposure MPE Evaluation:

For RFID LF, compliance is determined through maximum measured E&H values which are stated into DEKRA Certification, B.V.. test report num. 2291293.0501-RSM and 2291293.0505-RSM and extrapolated using the Annex 2:

Technology / Mode	Operating Band	Frequency under evaluation (MHz)	Distance (cm)	Maximum E-field (V/m)	Maximum H-field (A/m)	FCC Occupation control Exposure Limit (A/m) (V/m)	Verdict
"RF E&H Field Measured RFID"	LF	0,1346	20,00	6,554	0,04678	1,63 A/m 614 V/m	Pass

Table 5: MPE Evaluation result

Simultaneous transmission assessment:

The device under evaluation is able to transmit simultaneously using 802.5.4 and RFID LF transmitters, therefore the most conservative approach for the evaluation of the simultaneous transmission will be:

Simultaneous technologies and modes	Result (∑ of Pout/Pmax ratios)	Verdict (∑ ≤ 1)
802.15.4 + RFID LF	0,03259	Pass

Table 6: Simultaneous Transmission assessment

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).

TABLE 1 TO §1.1307(b)(3)(i)(C)—SINGLE RF SOURCES SUBJECT TO ROUTINE ENVIRONMENTAL EVALUATION

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.

(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

Output power values corresponding to RFID LF technology shown in Table 1 of "General description of the device under evaluation" section are calculated from maximum measured field strength values stated into DEKRA Certification B.V. test report num. 2291293.0501-RSM and 2291293.0505-RSM (see table below) following the calculation described below:

Operation Mode	Frequency (MHz)	Maximum H-field strength (dBµA/m) measured at 3 m	Maximum E-field strength (dBµV/m) measured at 3 m
RFID	0,1346	46,36	89,29

Table 7: Measurement Results

The relation between H-field and E-Field can be expressed with the following equation:

$$FS_{power}\,(dB\mu V/m) = FS_{max}\,(dB\mu A/m) + 20\log(Z_0)$$

Where:

FS_{power} is the calculation of field strength, expressed in dBµV/m
FS_{max} is the measured field strength, expressed in dBµV/m
Z_0 free space conditions impedance

According to ANSI C63.10-2020/Cor 1-2023, section 6.4.4.2:

If the Maximum E-field strength measured is at a distance greater than λ/2π, then extrapolation to the limit distance shall be calculated using the following equation:

$$FS_{\text{limit}} = FS_{\text{max}} - 20\log\left(\frac{d_{\text{limit}}}{d_{\text{measure}}}\right)$$

If both the Maximum E-field strength measured and the limit distance are equal to or closer to the EUT than λ/2π the extrapolation to the limit distance shall be calculated using the following equation:

$$FS_{\text{limit}} = FS_{\text{max}} - 40\log\left(\frac{d_{\text{limit}}}{d_{\text{measure}}}\right)$$

Where:

FS_{limit} is the calculation of field strength at the limit distance, expressed in dBµV/m

FS_{max} is the measured field strength, expressed in dBµV/m

$d_{measured}$ is the distance of the measurement point from the EUT

d_{limit} is the reference distance or the distance of the λ/2π point.