TEST REPORT

EN 62311

Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz – 300 GHz)

Report Reference No.....:	344088TRFEMF	
Tested by (name, function and signature).....:	D. Guarnone	(project handler)
Approved by (name, function and signature).....:	P. Barbieri	(verifier)
Date of issue.....:	2018-04-09	
Testing Laboratory.....:	**Nemko Spa**	
Address.....:	Via del Carroccio, 4 – 20853 Biassono (MB) – Italy	
Testing location	Nemko Spa	
Address.....:	Via del Carroccio, 4 – 20853 Biassono (MB) – Italy	
Applicant's name.....:	**Energy Team Spa**	
Address.....:	Via della Repubblica 9 20090 Trezzano Sul Naviglio MI - Italy	
Test specification:		
Standard .....:	EN 62311:2008	
	Full application of the standards	☒
	Partial application of the standards	☐
Test procedure.....:	Nemko WM L0077, WM L0177 and WM L1002	
Test Report Form No.....:	62311TRFEMF	
TRF Originator.....:	Nemko Spa	
Master TRF.....:	2017-10	

Test item description ..... :	Gateway Radio device
Trade Mark .....:	EnergyTeam S.p.A.
Manufacturer.....:	**Energy Team Spa**
Address of manufacturer .....:	Via della Repubblica 9 20090 Trezzano Sul Naviglio MI - Italy
Model .....:	NG-W169
Ratings.....:	1,5 W / 24-120 VDC / 100-240 VAC 50-60 Hz

The test report merely corresponds to the tested sample.
The phase of sampling / collection of equipment under test is carried out by the customer.

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Short description of the EuT	Copy of marking plate
Gateway Radio device: equipment to receive and acquire measurement concerning environmental parameters from various measuring instruments as: Temperature, Humidity, etc. The data acquired can be processed and sent via RS-485 to one or more server set for energetic measurement publication. RF connectivity to the sensors at 169MHz.	

Number of tested samples:	1
Serial number:	161213GR153832
Receiver categories:	--
Operational Frequency band:	169.4 MHz to 169.475 MHz
Nominal Operating Frequency:	169.40625 MHz, 169.41875 MHz, 169.43125 MHz, 169.44375 MHz, 169.45625 MHz, 169.46875 MHz, 169.4375 MHz
Operating Channel Width (OCW):	25 kHz and 50 KHz (169.4375 MHz)
Equipment classification:	Fixed
Accessories and detachable parts included:	antenna

Testing

Date of receipt of test sample:	2018-01-29
Testing commenced on:	2018-01-29
Testing concluded on:	2018-03-30

Possible test case verdicts:

test case does not apply to the test object:	N (Not applicable)
test object does meet the requirement:	P (Pass)
test object does not meet the requirement:	F (Fail)

Symbols used in this test report

☒ The crossed square indicates that the listed condition or equipment is applicable for this report.

☐ The empty square indicates that the listed condition or equipment is not applicable for this report.

Throughout this report point is used as decimal separator.

The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.

Verdict according to the standards on page 5:	**Pass**

PROJECT HISTORY		
Report number	**Modification to the report / comments**	**Date**
344088TRFEMF	First release	2018-04-09
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REMARKS		

PRODUCT VARIANTS		
Variant model	**Difference against the main model**	**Test performed**
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REMARKS		

Contents

1 TEST STANDARDS

The tests were performed according to following standards and procedures.

NEMKO WM L0177: General routines for using instruments at Nemko

NEMKO WM L1002: Measurement Uncertainty - Policy and Statement

NEMKO WM L0077: General routines to perform EMC tests

[1] Council Recommendation 1999/519/EC of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz)

[2] EN 62311:2008
Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz – 300 GHz)

The main standard above contain references to other standards, which are listed below.

[3] EN 50383:2010
Basic standard for the calculation and measurement of electromagnetic field strength and SAR related to human exposure from radio base stations and fixed terminal stations for wireless telecommunication systems (110 MHz - 40 GHz)”

2 EQUIPMENT UNDER TEST

2.1 Power supply system utilised

Power supply voltage:	☒	230V/50 Hz / 1ϕ	☐	115V/60Hz / 1ϕ
	☐	400V/50 Hz 3PE	☐	400V/50 Hz 3NP
	☐	4.5 V DC	☐	12.0 V DC

2.2 EuT specifications

Extreme temperature range	: -10 °C ÷ +65 °C
Extreme test source voltages	: 90÷250 Vac
TX frequency	169.40625 MHz, 169.41875 MHz, 169.43125 MHz, 169.44375 MHz, 169.45625 MHz, 169.46875 MHz, 169.4375 MHz
TX Antenna type	:
Modulation	: GMSK, GFSK, 4GFSK (169.46875 MHz)
Frequency Band	: 169.4 MHz to 169.475 MHz
Testing frequency	: 169.40625 MHz, 169.41875 MHz, 169.43125 MHz, 169.44375 MHz, 169.45625 MHz, 169.46875 MHz, 169.4375 MHz
Number of channels	: 7
RX frequency	: --

2.3 EuT operation modes

Mode	Description
1	TX mode

2.4 EuT Configuration modes

The EuT was configured to measure its highest possible radiation level. The test modes selected are according to EuT instruction manual.

The EuT was configured to have its highest possible susceptibility against tested phenomena. The test modes selected are according to EuT instruction manual.

Mode	Description
1	EUT has been tested supplied by its AC mains power supply

2.5 Input/Output Ports

Port	Name	Type*	Cable Max. >3m	Cable Shielded	Description
0	Enclosure	N/E	—	—	—
1	Power supply	AC/DC	☐	☐	Two wires
2	RS485	I/O	☐	☐	Two wires
3	Antenna	RF	☐	☐	Sma

*Note:

AC = AC Power Port DC = DC Power Port N/E = Non-Electrical

I/O = Signal/Control Input or Output Port TP = Telecommunication Ports

2.6 Equipment Used During Test

Use*	Product Type	Manufacturer	Model	Comments
—	—	—	—	—

Note: * Use

EUT - Equipment Under Test

AE - Auxiliary/Associated Equipment (Not Subjected to Test)

SIM - Simulator (Not Subjected to Test)

3 TEST ENVIRONMENT

3.1 Address of the test laboratory

Nemko Spa
Via del Carroccio, 4
20853 Biassono (MB) – Italy

Tests site/benches are in accordance with applicable standard/s, and have been utilized by Nemko Spa testing engineer(s).

3.2 Environmental conditions

Unless different values are declared in the test case, following ambient conditions apply for the tests:

Ambient temperature:	18÷33 °C
Relative Humidity:	30÷60 %
Atmospheric pressure:	980÷1060 hPa

3.3 Test equipment used for the monitoring of the environmental conditions

Equipment	Manufacturer	Model	Serial N°
Thermohygrometer data loggers	Testo	175-H2	20012380/305
Thermohygrometer data loggers	Testo	175-H2	38203337/703
Barometer	MSR	MSR145B	330080

3.4 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report according to CISPR 16-4-2 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements“ and is documented in the Nemko Spa Technical Procedure WML1002. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device. Hereafter the best measurement capability for Nemko Spa laboratory is reported:

Test	Range	Measurement Uncertainty	Notes
Induced current	20 kHz ÷ 10 MHz	26 %	(1)

NOTES:
(1) The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$ which has been derived from the assumed normal probability distribution with infinite degrees of freedom and for a coverage probability of 95 %.

4 TEST CONDITIONS AND RESULTS

4.1 MPE calculation

4.1.1 Test limits

The device shall comply with the relevant limits for general public exposure specified in [1] as basic restrictions or reference levels:

Frequency range	E-field strength (V/m)	H-field strength (A/m)	B-field (μT)	Equivalent plane wave power density S_{eq} (W/m²)
0-1 Hz	—	$3{,}2 \times 10^4$	4×10^4	—
1-8 Hz	10 000	$3{,}2 \times 10^4/f^2$	$4 \times 10^4/f^2$	—
8-25 Hz	10 000	4 000/f	5 000/f	—
0,025-0,8 kHz	250/f	4/f	5/f	—
0,8-3 kHz	250/f	5	6,25	—
3-150 kHz	87	5	6,25	—
0,15-1 MHz	87	0,73/f	0,92/f	—
1-10 MHz	$87/f^{1/2}$	0,73/f	0,92/f	—
10-400 MHz	28	0,073	0,092	2
400-2 000 MHz	$1{,}375\ f^{1/2}$	$0{,}0037\ f^{1/2}$	$0{,}0046\ f^{1/2}$	f/200
2-300 GHz	61	0,16	0,20	10

Table 1 - Reference levels for electric, magnetic and electromagnetic fields
(0 Hz to 300 GHz, unperturbed rms values)

4.1.2 Calculation method

The power flux density at a distance r from a transmitting antenna in a far-field region is calculated applying the following formula ([3], § 8.3.2):

$$S = \frac{PG}{4\pi r^2}$$

S = power flux density at the distance r, in watts per square meter (W/m2)
P = input power of the antenna, in watts (W)
G = antenna gain (numeric) relative to an isotropic antenna
r = distance from the antenna to the point of investigation, in meters (m)

To calculate the shorter distance to meet the limit of Table 1, the above formula can be rewritten as follow:

$$r = \sqrt{\frac{PG}{4\pi S}}$$

4.1.3 Evaluation

Power density evaluated at a distance of 20 cm (0.2 m):

(for the max measured EIRP value see test report no 344088-1TRFWL issued by Nemko S.p.A. the 2018-03-30).

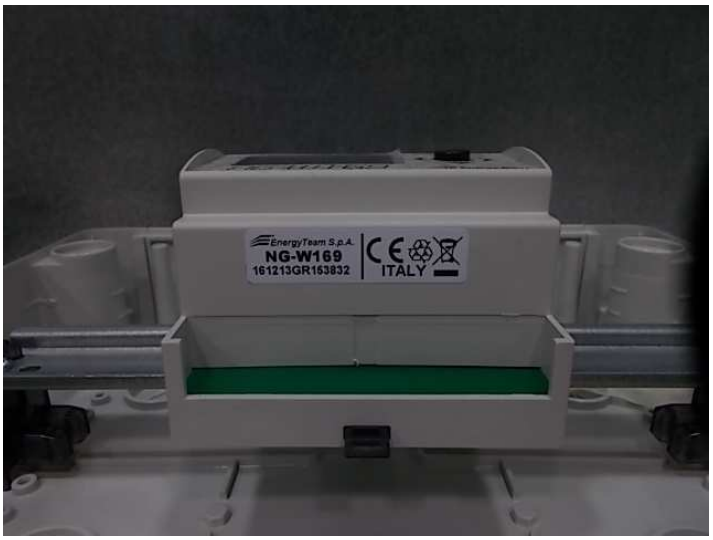
Radio module	Max measured P_{EIRP} (dBm)	Max measured EIRP (W)	Distance (m)	Power density (W/m^2)	MPE limit [1] (W/m^2)	Verdict
		$= 10^{\frac{P_{EIRP}}{10}} \cdot 10^{-3}$		$= \frac{PG}{4\pi r^2}$	10-400 MHz → 2 W/m^2 400-2000 MHz → $\frac{f}{100}$ W/m^2 2-300 GHz →10 W/m^2	
169 MHz	17.3	0.0537	0.2	0.11	2	P

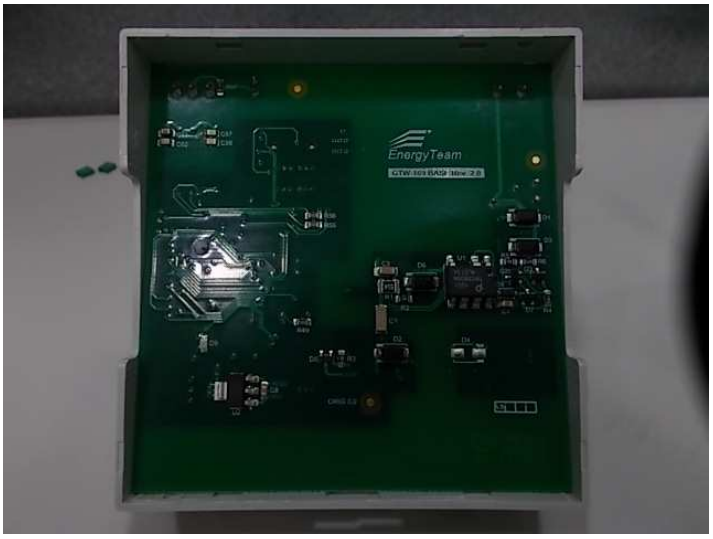
(1) MPE = Maximum Permissible Exposure

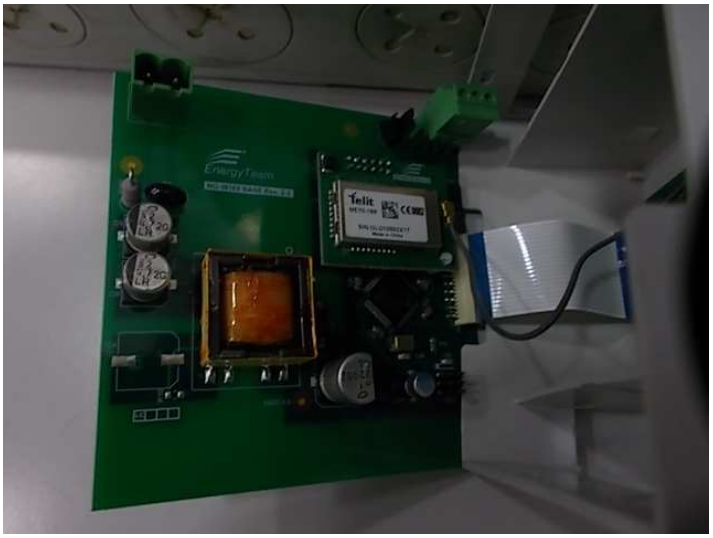
4.1.4 Result

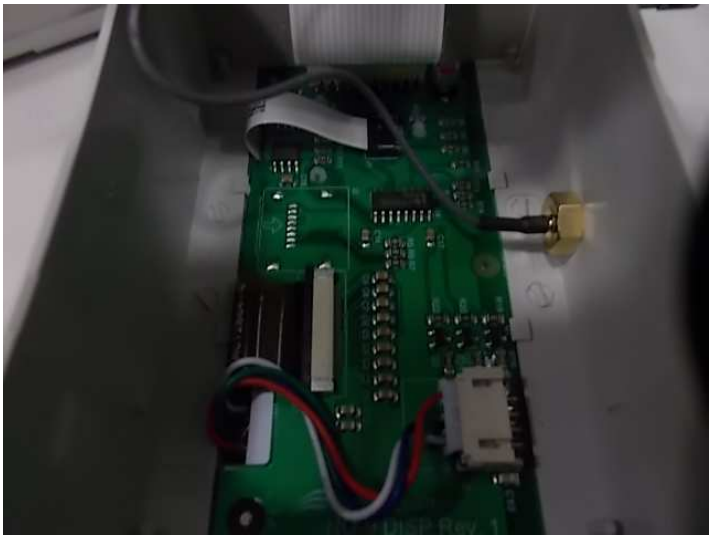
The highest power density estimated at distance of 20 cm (0.2 m) from the transmitting antenna is 0.2 W/m^2. The Recommendation [1] fixes the limit to 2 W/m2; therefore the device demonstrate own conformity at that distance. In addition, it should be take in duly consideration that the above limits are for continuous operating; so the present evaluation is to be considered adequately conservative. Installation instruction shall be report a notice to final users so that a minimal distance of 0.05 m from the radiator (antenna) is maintained in every direction. The limit of the Recommendation [1] is also satisfied with a simultaneous transmission of four radio modules set in the worst configuration.

5 EUT PHOTOS









End of report