



HERMON LABORATORIES



Hermon Laboratories Ltd.  
P.O.Box 23  
Binyamina 30550, Israel  
Tel. +972 46288001  
Fax. +972 46288277  
e-mail: [mail@hermonlabs.com](mailto:mail@hermonlabs.com)

**Attachment to  
ELECTROMAGNETIC EMISSION TEST REPORT**

according to 47CFR Part 15, §15.249 and subpart B  
for

**Tadiran Telematics Ltd.**

EQUIPMENT UNDER TEST:

**TransMeter Water**

model: TMW-40D

FCC ID: NTAXMETER3

This report is in conformity with ISO/IEC 17025. The A2LA logo endorsement applies only to the test methods and the standards that are listed in the scope of Hermon Laboratories accreditation. The test results relate only to the items tested. **This test report must not be reproduced in any form except in full with the approval of Hermon Laboratories Ltd.**

Page 1 of 14

Document ID: Att to TADRAD\_FCC.15046\_2.doc  
Date of Issue: November 2002



## Contents

|          |   |           |
|----------|---|-----------|
| <b>1</b> | <b>Project information</b> .....                                      | <b>3</b>  |
| <b>2</b> | <b>Summary of tests</b> .....   | <b>4</b>  |
| <b>3</b> | <b>EUT description</b> .....  | <b>5</b>  |
| 3.1      | GENERAL DESCRIPTION.....  | 5         |
| 3.2      | EUT TEST CONFIGURATION .....  | 5         |
| 3.3      | TRANSMITTER DESCRIPTION.....  | 8         |
| <b>4</b> | <b>Test results</b> .....   | <b>9</b>  |
| 4.1      | FIELD STRENGTH OF FUNDAMENTAL ACCORDING TO § 15.249 (A), §15.35 ..... | 9         |
|          | <b>Appendix B Test equipment used for tests</b> .....                 | <b>12</b> |
|          | <b>Appendix C Test equipment correction factors</b> .....             | <b>13</b> |



## 1 Project information

### Description of equipment under test

Test items : TransMeter Water  
Manufacturer : Tadiran-Telematics Ltd  
Equipment serial number : 001188  
Types (Models) : TMW-40D  
Hardware revision : A1  
Software revision : A1  
Equipment FCC code<sup>1</sup> : DXX

### Applicant information

Applicant's responsible person : Mr. Uzi Erman  
Company : Tadiran-Telematics Ltd  
Address : 26, Hamelaha street  
Postal code : 58117  
City : Holon  
Country : Israel  
Telephone number : +972 (0) 3 5575755  
Telefax number : +972 (0) 3 5575753

### Test performance

Project Number: : 15046-2  
Location : Hermon Laboratories  
Receipt date : November 17, 2002  
Test performed : November 17, 2002  
Purpose of test : Apparatus compliance verification in accordance with emission requirements  
Test specification(s) : 47CFR Part 15, §15.249 and subpart B

<sup>1</sup> FCC Equipment codes – see Appendix D



## 2 Summary of tests

The test listed in the table below were performed.

| Parameter  | Subclause | C | NC | NT | NA | Tested by                       | Date tested          | Remarks |
|--|-----------|---|----|----|----|---------------------------------|----------------------|---------|
| <b>Transmitter characteristics</b>   |           |   |    |    |    |                                 |                      |         |
| Field strength of fundamental  | (a)       | C |    |    |    | Mr. Y. Neuman,<br>test engineer | November 17,<br>2002 |         |
| NOTE: C: The parameter is compliant with the requirements.<br>NC: The parameter is not compliant with the requirements.<br>NT: The parameter is not tested.<br>NA: The test of this parameter is not applicable. |           |   |    |    |    |                                 |                      |         |

**Test report prepared by:** Mrs. V. Mednikov, certification engineer

**Test report approved by:** Mr. A. Usoskin, QA manager



### 3 EUT description

#### 3.1 General description

The EUT, TMW-40D, is a water meter with a built-in 2-way RF communicator. The RF capabilities enable transmission of meter readings and some extra information to a collecting unit.

The TMW-40D consists of two parts: RF transceiver with integral antenna and a microcontroller.

The device is intended for installation with internal antenna in horizontal position and powered by two internal 3.6 V lithium batteries.

#### 3.2 EUT test configuration

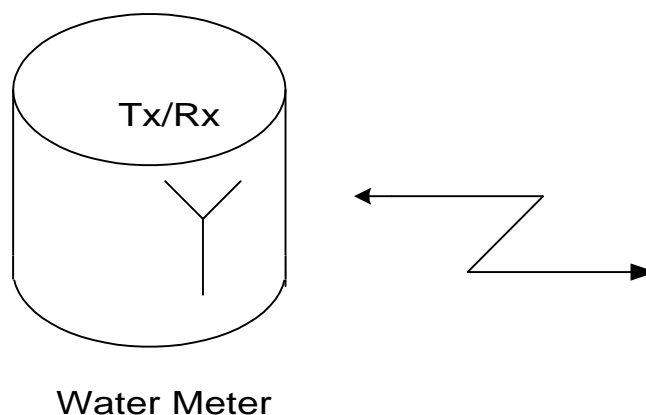
The EUT test configuration is shown in Figure 3.2.1, clock and oscillator frequencies are provided in Table 3.2.1.

The device (with adhesive sticker) was tested when installed in a plastic enclosure with plastic cover and plastic lid, in plastic enclosure with plastic cover without lid and in plastic enclosure with concrete cover and metal lid, as shown in Photographs 3.2.1 to 3.2.4.

Table 3.2.1 EUT operating frequencies

| Frequency   | Card Id |
|-------------|---------|
| 852.3 MHz   | LO1     |
| 53.3 MHz    | LO2     |
| 26.6353 MHz | clock1  |
| 32.768 kHz  | clock2  |

Figure 3.2.1

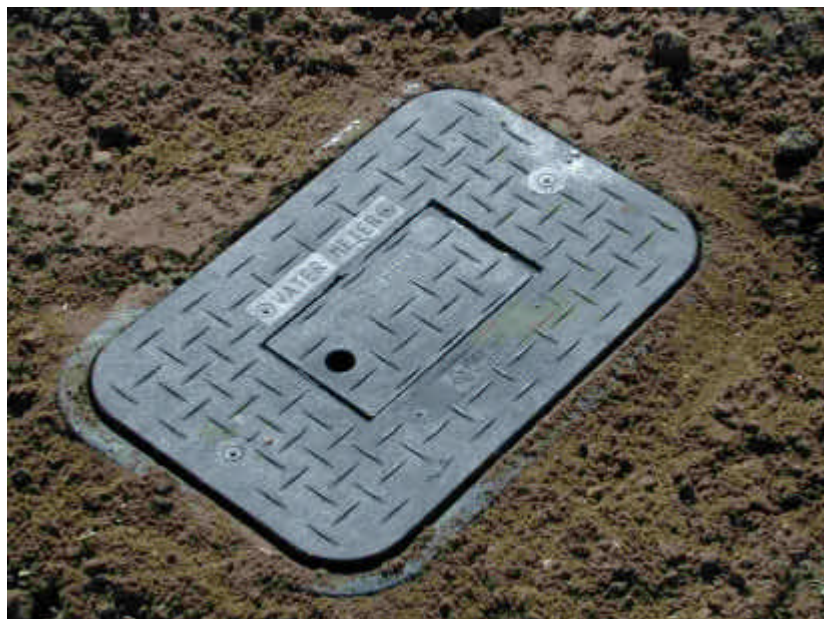




**Photograph 3.2.1**  
**The device with adhesive sticker**



**Photograph 3.2.2**  
**Plastic pit**  
**Plastic cover with plastic lid**





**Photograph 3.2.3**  
**Plastic pit**  
**Plastic cover without lid**



**Photograph 3.2.4**  
**Plastic pit**  
**Concrete cover with metal lid**





### 3.3 Transmitter description

| Type of equipment  |  |                                |   |
|--|--|--------------------------------|---|
| <input checked="" type="checkbox"/>                                  | Stand-alone (Equipment with or without its own control provisions)                                       |                                |   |
| <input type="checkbox"/>   | Combined equipment (Equipment where the radio part is fully integrated within another type of equipment) |                                |   |
| <input type="checkbox"/>   | Plug-in card (Equipment intended for a variety of host systems)  |                                |   |
| <input type="checkbox"/>   | Other:   |                                |   |
| Operating frequency  |  | 916.3 MHz                      |   |
| Transmitter aggregate data rate (bits per second)                    |  | 60 kBps                        |   |
| Normal test signal   |  | FSK modulated signal           |   |
| Maximum rated output power   |  |                                |   |
| At transmitter permanent external 50 Ω rf output connector (dBm)     |  |                                |   |
| Effective radiated power (for equipment with integral antenna) (dBm) |  | 18                             |   |
| Is transmitter output power variable?                                | <input checked="" type="checkbox"/>  | No                             |   |
|  | <input type="checkbox"/>   | Yes                            | continuous variable   |
|  | <input type="checkbox"/>   |                                | stepped variable  |
|  | <input type="checkbox"/>   |                                | stepsize (dB):.....   |
|  | <input type="checkbox"/>   |                                | minimum RF power (dBm):.....  |
| <input type="checkbox"/>   |  |                                | maximum RF power (dBm):.....  |
| Transmitter power source   |  |                                |   |
| <input type="checkbox"/>   | Battery  | Nominal rated voltage (VDC)    |   |
| <input type="checkbox"/>   | Nickel Cadmium   |                                |   |
| <input checked="" type="checkbox"/>                                  | Lithium  |                                |   |
| <input type="checkbox"/>   | Other  |                                |   |
| <input type="checkbox"/>   | DC   | Nominal rated voltage (VDC)    |   |
| <input type="checkbox"/>   | AC mains   | Nominal rated voltage (VAC)    |   |
| Is there common power source for transmitter and receiver            |  |                                | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| Antenna technical characteristics                                    |  |                                |   |
| Integral   | <input type="checkbox"/>   | with temporary RF connector    | Type<br>Planar  |
|  | <input checked="" type="checkbox"/>  | without temporary RF connector | inverted F  |
| External   |  |                                | Manufacturer<br>Arad Technologies                                   |
|  |  |                                | Model number<br>NA  |
|  |  |                                | Gain<br>2 dBi   |
| External antenna connection – NA                                     |  |                                |   |
| <input type="checkbox"/>   | standard connector SMA   |                                | unique coupling   |





## 4 Test results

### 4.1 Field strength of fundamental according to § 15.249 (a), §15.35

|                           |                   |
|---------------------------|-------------------|
| METHOD OF MEASUREMENTS    | ANSI 63.4 §13.1.4 |
| DATE:                     | November 17, 2002 |
| RELATIVE HUMIDITY:        | 41%               |
| AMBIENT TEMPERATURE:      | 28°C              |
| TEST PERFORMED IN:        | On site testing   |
| TEST DISTANCE             | 3 m               |
| OPERATING FREQUENCY RANGE | 902-928 MHz       |
| PULSE DURATION            | 3.5 ms            |
| RBW                       | 120 kHz           |

#### Quasi-peak detector (pulse repetition period 46 ms)

| Type of soil                | Configuration                  | Azimuth*, (°) | Antenna height, m | Field strength, dB(mV/m) | Specified limit, dB(mV/m) | Margin, dB | Pass / Fail |
|-----------------------------|--------------------------------|---------------|-------------------|--------------------------|---------------------------|------------|-------------|
| black                       | plastic cover with plastic lid | 335           | 1.8               | <b>90.5</b>              | 94                        | 3.5        | Pass        |
| red                         | plastic cover with plastic lid | 0             | 1.5               | <b>88.1</b>              | 94                        | 5.9        | Pass        |
| sand                        | plastic cover with plastic lid | 90            | 1.0               | <b>93.2</b>              | 94                        | 0.8        | Pass        |
| black                       | plastic cover without lid      | 335           | 1.8               | <b>90.5</b>              | 94                        | 3.5        | Pass        |
| red                         | plastic cover without lid      | 0             | 1.5               | <b>88.1</b>              | 94                        | 5.9        | Pass        |
| sand                        | plastic cover without lid      | 90            | 1.0               | <b>93.2</b>              | 94                        | 0.8        | Pass        |
| black                       | concrete cover with metal lid  | 0             | 1                 | <b>86.9</b>              | 94                        | 7.1        | Pass        |
| red                         | concrete cover with metal lid  | 340           | 1.3               | <b>86.7</b>              | 94                        | 7.3        | Pass        |
| sand                        | concrete cover with metal lid  | 150           | 1                 | <b>87.5</b>              | 94                        | 6.5        | Pass        |
| Measurement uncertainty, dB |                                |               |                   |                          | +5.71 dB/-5.56 dB         |            |             |

The 0° axis corresponds to the direction of the pipe, to which the water meter is attached.

**Test results recorded in the table were obtained throughout the testing with the measurement antenna in vertical polarization (worst case).**



**TEST EQUIPMENT USED:**

|         |         |         |  |  |  |  |
|---------|---------|---------|--|--|--|--|
| HL 0026 | HL 0034 | HL 1538 |  |  |  |  |
|---------|---------|---------|--|--|--|--|

**LIMIT**

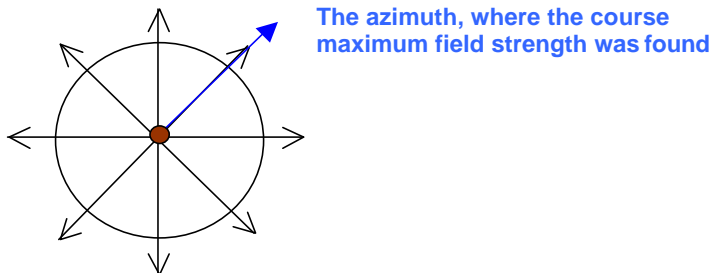
| Operating frequency range, MHz | Field strength of fundamental, dB(mV/m) |
|--------------------------------|---|
| 902-928                        | 94                                      |
| 2400-2483.5                    | 94                                      |
| 5275-5850                      | 94                                      |
| 24000-24250                    | 107.95                                  |

**TEST PROCEDURE**

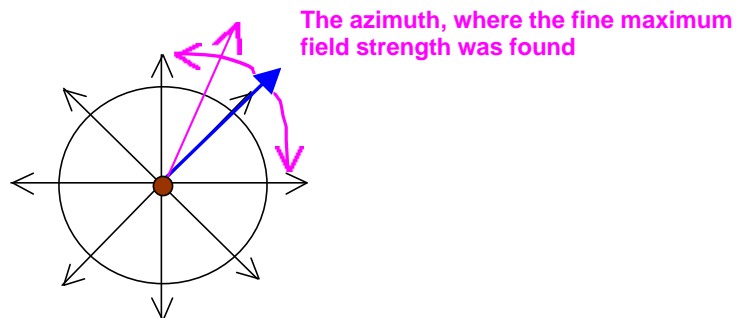
The EUT was tested at three different installations; in black soil, red soil and sand, and in three different pits (metallic, concrete, plastic) in turn.

Each test was conducted as follows:

- 1) field strength measurements were performed at 8 different azimuths (with 45 degrees step, at 3 m test distance, with antenna in vertical polarization at 1 m height). The azimuth, at which the course maximum field strength was found, was recorded.

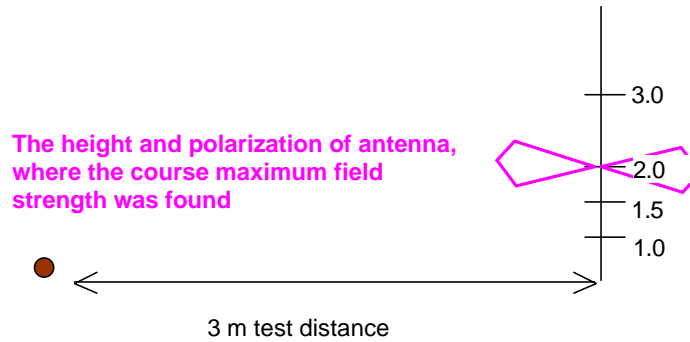


- 2) field strength measurements were continued at azimuths varying around the above recorded azimuth (at 3 m test distance). The azimuth, where the fine maximum field strength was found, was recorded in the test report.

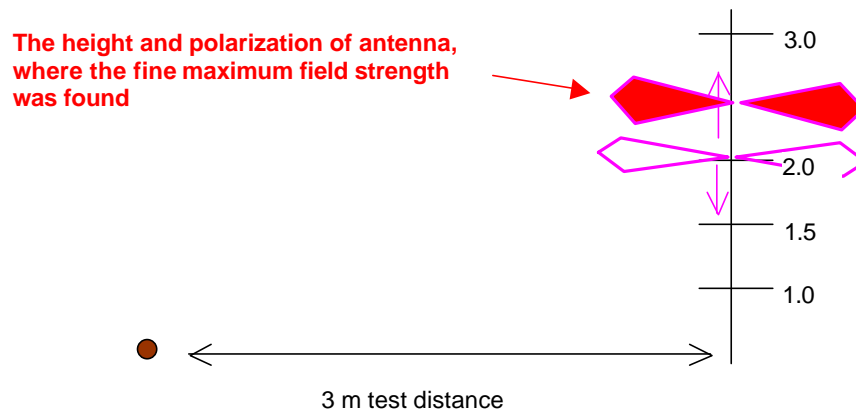




- 3) at the recorded azimuth, the measurements were continued at 1; 1.5; 2 and 3 m antenna heights, with antenna in horizontal and vertical polarizations in turn. The height and polarization of antenna, where the course maximum field strength is found, was recorded.



- 4) the measurements were continued with antenna height varying around the above recorded position in recorded polarization. The fine maximum field strength, which was found during these measurements, was recorded in the test report.





## Appendix B Test equipment used for tests

| HL<br>Serial<br>No. | Description                             | Manufacturer information |           |            | Due<br>Calibr.<br>Month/ year |
|---------------------|---|--------------------------|-----------|------------|-------------------------------|
|                     |   | Name                     | Model No. | Serial No. |                               |
| 0026                | Spectrum analyzer,<br>100 Hz-2.2 GHz    | Anritsu                  | MS 2601A  | 3460       | 9/03                          |
| 0034                | Log periodic antenna,<br>200 - 1000 MHz | Electro-Metrics          | LPA 25/30 | 1988       | 1/03                          |
| 1538                | Cable RF, 5.0 m                         | Alpha wire               | RG-213    | NA         | 9/03                          |



## Appendix C Test equipment correction factors

Antenna factor, 3 m test distance  
Log periodic antenna  
Electro-Metrics, model LPA-25/30  
Ser.No.1988

| Frequency MHz | Antenna Factor dB(1/m) | Frequency MHz | Antenna Factor dB(1/m) |
|---------------|------------------------|---------------|------------------------|
| 200           | 12.6                   | 625           | 20.4                   |
| 225           | 12.2                   | 650           | 20.9                   |
| 250           | 13.4                   | 675           | 22.0                   |
| 275           | 14.3                   | 700           | 22.2                   |
| 300           | 15.2                   | 725           | 22.7                   |
| 325           | 15.7                   | 750           | 22.5                   |
| 350           | 15.9                   | 775           | 22.7                   |
| 375           | 16.4                   | 800           | 22.8                   |
| 400           | 17.0                   | 825           | 23.2                   |
| 425           | 17.4                   | 850           | 23.5                   |
| 450           | 17.9                   | 875           | 23.9                   |
| 475           | 18.6                   | 900           | 24.0                   |
| 500           | 19.1                   | 925           | 24.0                   |
| 525           | 19.3                   | 950           | 24.2                   |
| 550           | 19.6                   | 975           | 24.7                   |
| 575           | 19.8                   | 1000          | 25.1                   |
| 600           | 20.0                   |               |                        |

Antenna factor is to be added to receiver meter reading in dB( $\mu$ V) to convert to field intensity in dB( $\mu$ V/meter)



**Cable loss**  
**Cable RF, 5 m, model RG-213 (HL 1538)**

**Calibration Data**

| No. | Frequency | Measured attenuation | Measurement uncertainty |
|-----|-----------|----------------------|-------------------------|
| 1   | 10 MHz    | 0.10 dB              | ±0.05 dB                |
| 2   | 20 MHz    | 0.19 dB              | ±0.05 dB                |
| 3   | 30 MHz    | 0.18 dB              | ±0.05 dB                |
| 4   | 40 MHz    | 0.23 dB              | ±0.05 dB                |
| 5   | 50 MHz    | 0.28 dB              | ±0.05 dB                |
| 6   | 60 MHz    | 0.30 dB              | ±0.05 dB                |
| 7   | 70 MHz    | 0.34 dB              | ±0.05 dB                |
| 8   | 80 MHz    | 0.41 dB              | ±0.05 dB                |
| 9   | 90 MHz    | 0.40 dB              | ±0.05 dB                |
| 10  | 100 MHz   | 0.45 dB              | ±0.05 dB                |
| 11  | 200 MHz   | 0.64 dB              | ±0.05 dB                |
| 12  | 300 MHz   | 0.83 dB              | ±0.05 dB                |
| 13  | 400 MHz   | 0.99 dB              | ±0.05 dB                |
| 14  | 500 MHz   | 1.10 dB              | ±0.05 dB                |
| 15  | 600 MHz   | 1.26 dB              | ±0.05 dB                |
| 16  | 700 MHz   | 1.43 dB              | ±0.05 dB                |
| 17  | 800 MHz   | 1.56 dB              | ±0.05 dB                |
| 18  | 900 MHz   | 1.71 dB              | ±0.05 dB                |
| 19  | 1000 MHz  | 1.78 dB              | ±0.05 dB                |
| 20  | 1500 MHz  | 2.13 dB              | ±0.05 dB                |
| 21  | 2000 MHz  | 2.54 dB              | ±0.05 dB                |