

# **Electromagnetic Compatibility Test Report**

*Prepared in accordance with*

**FCC Part 15C and ANSI C63.10 and RSS-210**

On

**Wireless Tri-Tech Motion Detector**

**ISW-ZDL1-WP11G**

Bosch Security Systems




130 Perinton Parkway

Fairport, NY 14450

Prepared by:

**TUV Rheinland of North America, Inc.**

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|  |   |  |
|--|---|--|
| <b>Client:</b>   | Bosch Security Systems<br>130 Perinton Parkway<br>Fairport, NY 14450  | Peter Namisnak<br>585-223-4060 / 585-678-3263<br>peter.namisnak@us.bosch.com |
| <b>Identification:</b>   | Wireless Tri-Tech Motion Detector   | <b>Serial No.:</b> TS-1  |
| <b>Test item:</b>  | ISW-ZDL1-WP11G  | <b>Date tested:</b> 5/12/2014  |
| <b>Testing location:</b>   | TUV Rheinland of North America<br>336 Initiative Drive<br>Rochester, NY 14624<br>U.S.A.   | Tel: (585) 426-5555<br>Fax: (585)-568-8338                                   |
| <b>Test specification:</b>   | Emissions: FCC Part 15 subpart C,<br>FCC Part 15.209(a) FCC Part 15.205(a), & RSS-210 Issue 8<br>FCC Part 15.245(a) & RSS-210 Issue 8, FCC Part 15.215(c)<br>FCC Part 2.1093 and RSS-102 Issue 4, |  |
| <b>Test Result:</b>  | The above product was found to be Compliant to the above test standard(s)   |  |
| <b>tested by:</b> Randall Masline  |   | <b>reviewed by:</b> Cecil Gittens  |
| <u>10 July 2014</u><br><b>Date</b> <b>Name</b> <b>Signature</b>  |   | <u>10 July 2014</u><br><b>Date</b> <b>Name</b> <b>Signature</b>              |
| <b>Other Aspects:</b>  | None  |  |
| Abbreviations: OK, Pass, Compliant, Complies = passed<br>Fail, Not Compliant, Does Not Comply = failed<br>N/A = not applicable |   |  |
|   |                             | Industry<br>Canada   |
| US5253   | Testing Cert.# 3331.04  | VCCI<br>BSMI   |
|  |   | 3466C-1<br>A-0037<br>SL2-IN-E-050R   |

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## Manufacturer's statement - attestation

The manufacturer; Bosch Security Systems, as the responsible party for the equipment tested, hereby affirms:

- a) That they have reviewed and concurs that the test shown in this report are reflective of the operational characteristics of the device for which certification is sought;
- b) That the device in this test report will be representative of production units;
- c) That all changes (in hardware and software/firmware) to the subject device will be reviewed.
- d) That any changes impacting the attributes, functionality or operational characteristics documented in this report will be communicated to the body responsible for approving (certifying) the subject equipment.

**Peter J. Namisnak**

Printed name of official

Signature of official

**130 Perinton Parkway****Fairport, NY 14450**

Address

**5 -12-2014**

Date

**585-678-3462**

Telephone number

**Peter.namisnak@us.bosch.com**

Email address of official

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## 1 General Information

### 1.1 Scope

This report is intended to document the status of conformance with the requirements of the FCC Part 15C and ANSI C63.10 and RSS-210 based on the results of testing performed on 5/12/2014 on the Wireless Tri-Tech Motion Detector, Model No. ISW-ZDL1-WP11G, manufactured by Bosch Security Systems. This report only applies to the specific samples tested under the stated test conditions. It is the responsibility of the manufacturer to assure that additional production units of this model are manufactured with identical or EMI equivalent electrical and mechanical components. This report is further intended to document changes and modifications to the EUT throughout its life cycle. All documentation will be included as a supplement.

### 1.2 Purpose

Testing was performed to evaluate the performance of the EUT (Equipment Under Test) in accordance with the applicable requirements, procedures, and criteria defined in the application of regulations and application of standards listed in this report.

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### 1.3 Summary of Test Results

|  |  |  |                 |                 |                             |
|--|--|--|-----------------|-----------------|-----------------------------|
| <b>Applicant</b>   | Bosch Security Systems<br>130 Perinton Parkway<br>Fairport, NY 14450                                       | <b>Tel</b>   | 585-223-4060    | <b>Contact</b>  | Peter Namisnak              |
|  |  | <b>Fax</b>   | 585-678-3263    | <b>e-mail</b>   | peter.namisnak@us.bosch.com |
| <b>Description</b>                                       | Wireless Tri-Tech Motion Detector  | <b>Model Number</b>                                      | ISW-ZDL1-WP11G  |                 |                             |
| <b>Serial Number</b>                                     | TS-1   | <b>Test Voltage/Freq.</b>                                | Battery         |                 |                             |
| <b>Test Date Completed:</b>                              | 5/12/2014  | <b>Test Engineer</b>                                     | Randall Masline |                 |                             |
| <b>Standards</b>   | <b>Description</b>   | <b>Severity Level or Limit</b>                           |                 | <b>Criteria</b> | <b>Test Result</b>          |
| FCC Part 15 subpart C Standard                           | Radio Frequency Devices - Subpart C: Intentional Radiators   | See called out parts below                               |                 | See Below       | <b>Complies</b>             |
| FCC Part 15.209(a) FCC Part 15.205(a), & RSS-210 Issue 8 | Radiated Emissions Restricted Bands  | Class B, 30 - 1000 MHz                                   |                 | Limit           | <b>Complies</b>             |
| FCC Part 15.245(a) & RSS-210 Issue 8                     | Operation within the bands 902-928 MHz, 2435-2465 MHz, 5785-5815 MHz, 10500 – 10550MHz and 24075-24175 MHz | 2500mv/m Fundamental at 10.525 GHz<br>25.0mv/m Harmonics |                 | Limit           | <b>Complies</b>             |
| FCC Part 15.215(c)                                       | Band Edge Requirements   | Per Section 15.215(c) of the standard                    |                 | Limit           | <b>Complies</b>             |
| FCC Part 15.245 and RSS-210 A1.3 Issue 8                 | 99% Occupied Bandwidth   | Contained within the Frequency Band                      |                 | Below Limit     | <b>Complies</b>             |
| FCC Part 2.1093 and RSS-102 Issue 4                      | RF Exposure  | MPE or SAR Requirements (Mobile)                         |                 | Limit           | <b>Complies</b>             |
| FCC Part 15.203  | Antenna Requirement  | Antenna is a PCB type that is permanently mounted        |                 |                 | <b>Complies</b>             |

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## Laboratory Information

### 1.1 Accreditations & Endorsements

#### 1.1.1 US Federal Communications Commission

TUV Rheinland of North America located at, 336 Initiative Drive, Rochester, NY 14624-6217 is accredited by the commission for performing testing services for the general public on a fee basis. This laboratory test facilities have been fully described in reports submitted to and accepted by the FCC (Registration No 90575). The laboratory scope of accreditation includes: Title 47 CFR Part 15, and 18. The accreditation is updated every 3 years.

#### 1.1.2 A2LA

This is a program which is administered under the auspices of the National Institute of Standards and Technology. The laboratory has been assessed and accredited in accordance with ISO Standard 17025:2005 (Certificate Number: 3331.04). The scope of laboratory accreditation includes emission and immunity testing. The accreditation is updated annually.

#### 1.1.3 VCCI

VCCI Accredited test lab. Registration numbers A-0037, R-3673, C-4113, C-4114, C-4115, T-1158, T-1159 G429.

#### 1.1.4 Industry Canada

(Registration No.: 3466C-1) The OATS has been accepted by Industry Canada to perform testing to 3 and to 10m, based on the test procedures described in ANSI C63.4-2009.

#### 1.1.5 BSMI

Registration No.: SL2-IN-E-050R. The BSMI accreditation was obtained by NIST MRA with the BSMI.

#### 1.1.6 Korea

Recognized by Radio Research Agency as an accredited Conformity Assessment Body (CAB) under the terms of Phase I of the APEC TEL.

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### 1.1.7 Sample Calculation – radiated & conducted emissions

The field strength is calculated by subtracting the Amplifier Gain and adding the Cable Loss and Antenna Correction Factor to the measured reading. The basic equation is as follows:

$$\text{Field Strength (dB}\mu\text{V/m)} = \text{RAW} - \text{AMP} + \text{CBL} + \text{ACF}$$

Where: RAW = Measured level before correction (dB $\mu$ V)

AMP = Amplifier Gain (dB)

CBL = Cable Loss (dB)

ACF = Antenna Correction Factor (dB/m)

$$\mu\text{V/m} = 10^{\frac{\text{dB}\mu\text{V} / \text{m}}{20}}$$

Sample radiated emissions calculation @ 30 MHz

**Measurement +Antenna Factor–Amplifier Gain+Cable loss=Radiated Emissions (dB $\mu$ V/m)**

$$25 \text{ dB}\mu\text{V/m} + 17.5 \text{ dB} - 20 \text{ dB} + 1.0 \text{ dB} = 23.5 \text{ dB}\mu\text{V/m}$$

## 1.2 Measurement Uncertainty Emissions

| Measurement                                    | <i>U<sub>lab</sub></i> | <i>U<sub>cispr</sub></i> |
|--|------------------------|--------------------------|
| <b>Radiated Disturbance @ 10m</b>              |                        |                          |
| 30 MHz – 1000 MHz                              | 4.57 dB                | 5.2 dB                   |
| <b>Conducted Disturbance @ Mains Terminals</b> |                        |                          |
| 150 kHz – 30 MHz                               | 2.62 dB                | 3.6 dB                   |
| <b>Disturbance Power</b>                       |                        |                          |
| 30 MHz – 300 MHz                               | 3.88 dB                | 4.5 dB                   |

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### Measurement Uncertainty Immunity

|   |
|---|
| The estimated combined standard uncertainty for radiated emissions measurements is $\pm 1.6$ dB.  |
| The estimated combined standard uncertainty for conducted emissions measurements is $\pm 1.2$ dB. |

The expanded uncertainty at a level of 95% confidence is obtained by multiplying the combined standard uncertainty by a coverage factor of 2. Compliance criteria are not based on measurement uncertainty.

### 1.3 Calibration Traceability

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Measurement method complies with ANSI/NCSL Z540-1-1994 and ISO Standard 17025:2005. Equipment calibration records are kept on file at the test facility.

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## 1.4 Measurement Equipment Used

| Equipment                              | Manufacturer       | Model #   | Ref. | Serial #   | Last Cal<br>dd/mm/yy | Next Cal<br>dd/mm/yy | Test |
|--|--------------------|-----------|------|------------|----------------------|----------------------|------|
| Radiated Emissions                     |                    |           |      |            |                      |                      |      |
| BiLog                                  | Chase              | CBL6111   | C041 | 1170       | 12-Sept-12           | 12-Sept-14           | RE   |
| Horn                                   | EMCO               | 3115      | C025 | 9512-4630  | 14-Apr-14            | 14-Apr-16            | RE   |
| Horn                                   | EMCO               | 3115      | C031 | 9812-5635  | 14-Apr-14            | 14-Apr-16            | RE   |
| Analyzer w RF Filter<br>Section 85460A | HP                 | 8546A     |      | 3325A00134 | 28-Aug-13            | 28-Aug-14            | RE   |
| Receiver (20Hz-40GHz)                  | Rohde & Schwarz    | ESI(B) 40 | C320 | 839283/005 | 28-Aug-13            | 28-Aug-14            | RE   |
| Amplifier (1-26.5 GHz.)                | Agilent            | 8449B     | C438 | 3008A01842 | 27-Aug-13            | 27-Aug-16            | RE   |
| Amplifier 1 - 18GHz                    | Rohde & Schwarz    | TS-PR18   | C439 | 122002/001 | 27-Aug-13            | 27-Aug-16            | RE   |
| Amplifier (18-26.5GHz)                 | Rohde & Schwarz    | TS-PR26   | C443 | 100005     | 27-Aug-13            | 27-Aug-16            | RE   |
| ATM Horn and amp<br>26.5 – 40 GHz      | ATM                |           |      |            | 27-Aug-13            | 27-Aug-16            | RE   |
| Multimeter                             | Fluke              | 83        | C437 | 48162892   | 28-Aug-13            | 28-Aug-14            | RE   |
| BiLog                                  | Chase              | CBL6111B  | C448 | 2081       | 14-Apr-14            | 14-Apr-16            | RE   |
| Field Monitor                          | Amplifier Research | FM5004    |      | 308114     | N/A                  | N/A                  | RI   |
| General Laboratory Equipment           |                    |           |      |            |                      |                      |      |
| Multimeter                             | Fluke              | 87        | C445 | 59890224   | 28-Aug-13            | 28-Aug-14            |      |
| Multimeter                             | Fluke              | 8062A     | C452 | 4715199    | 28-Aug-13            | 28-Aug-14            |      |
| Pressure/Temperature/RH                | Extech             | SD700     | C481 | Q668884    | 28-Aug-13            | 28-Aug-14            |      |

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## **2 Product Information**

### **2.1 Product Description**

See Appendix A

### **2.2 Equipment Modifications**

No modifications were needed to bring product into compliance.

### **2.3 Test Plan**

The EUT product information, test configuration, mode of operation, test types, test procedures, test levels, pass/failure criteria, in this report were carried out per the product test plan located in appendix A of this report

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**Figure 1 – External Photo of EUT**

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### 3 Emissions

#### 3.1 Radiated Emissions

This test measures the electromagnetic levels of spurious signals generated by the EUT that radiated from the EUT and may affect the performance of other nearby electronic equipment.

##### 3.1.1 Over View of Test

|                 |  |      |      |                    |         |                      |           |  |
|-----------------|--|------|------|--------------------|---------|----------------------|-----------|--|
| Results         | Complies (as tested per this report)   |      |      |                    |         | Date                 | 5/12/2014 |  |
| Standard        | FCC Part 15.209(a) FCC Part 15.205(a), & RSS-210 Issue 8                             |      |      |                    |         |                      |           |  |
| Product Model   | ISW-ZDL1-WP11G   |      |      |                    | Serial# | TS-1                 |           |  |
| Configuration   | See test plan for details  |      |      |                    |         |                      |           |  |
| Test Set-up     | Tested on 10m O.A.T.S. at 3 meters, placed on turn-table, see test plans for details |      |      |                    |         |                      |           |  |
| EUT Powered By  | Battery  | Temp | 22°C | Humidity           | 47%     | Pressure             | 1026mbar  |  |
| Frequency Range | 30 - 1000 MHz @ 10m  |      |      |                    |         |                      |           |  |
| Perf. Criteria  | Class B. (Below Limit)   |      |      | Perf. Verification |         | Readings Under Limit |           |  |
| Mod. to EUT     | None   |      |      | Test Performed By  |         | Randall Masline      |           |  |

##### 3.1.2 Test Procedure

Radiated and FCC emissions tests were performed using the procedures of ANSI C63.10 including methods for signal maximizations and EUT configuration. The photos included with the report show the EUT in its maximized configuration.

The frequency range from 30 - 1000 MHz was investigated for radiated emissions.

Radiated emission testing was first performed at a distance of 3 meters in the semi-anechoic chamber in order to identify the specific frequencies for which these measurements will be made on the 10 m OATS.

##### 3.1.3 Deviations

There were no deviations from the test methodology listed in the test plan for the radiated emission test.

##### 3.1.4 Final Test

All final radiated emissions measurements were below (in compliance) the limits.

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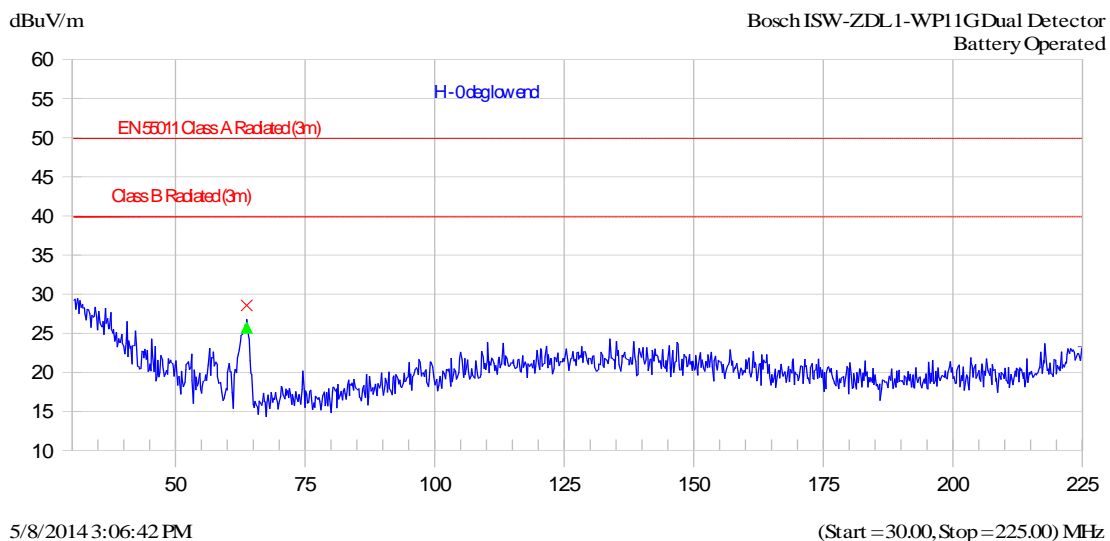
## 3.1.5 Final Graphs

## NOTES:

## Radiated Emissions Prescan

Vertical / Horizontal

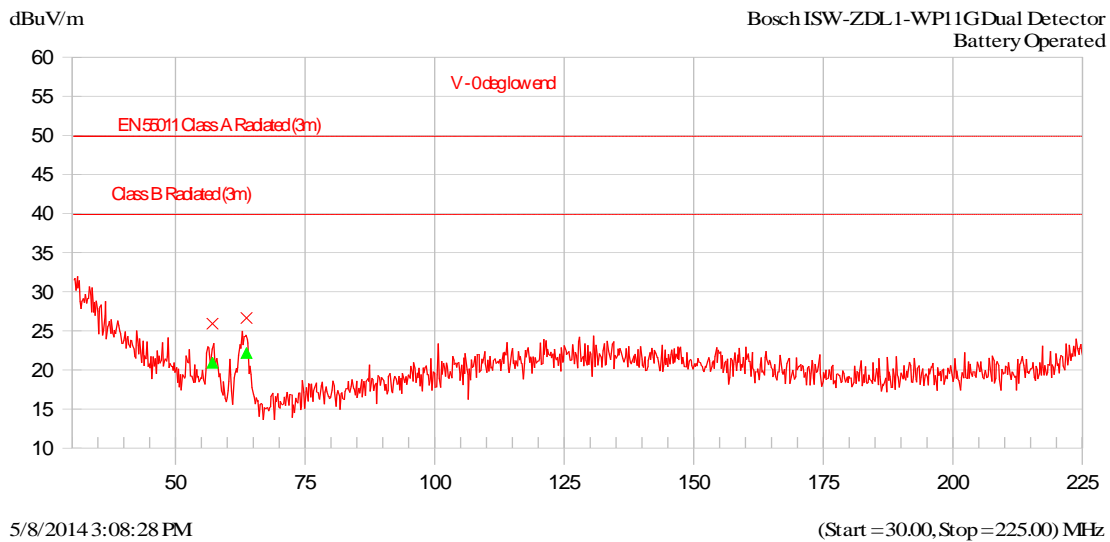
## H - 0 deg low end



| Frequency | Peak   | QP     | Class B-QP | Class A-QP | Trace Name        |
|-----------|--------|--------|------------|------------|-------------------|
| MHz       | dBuV/m | dBuV/m | dB         | dB         |                   |
| 63.384    | 28.7   | 25.8   | -14.2      | -24.2      | H - 0 deg low end |

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## NOTES:

**Radiated Emissions Prescan****Vertical / Horizontal****V - 0 deg low end**

| Frequency | Peak   | QP     | Class B-QP | Class A-QP | Trace Name        |
|-----------|--------|--------|------------|------------|-------------------|
| MHz       | dBuV/m | dBuV/m | dB         | dB         |                   |
| 56.778    | 26.0   | 21.0   | -19.0      | -29.0      | V - 0 deg low end |
| 63.349    | 26.8   | 22.3   | -17.7      | -27.7      | V - 0 deg low end |

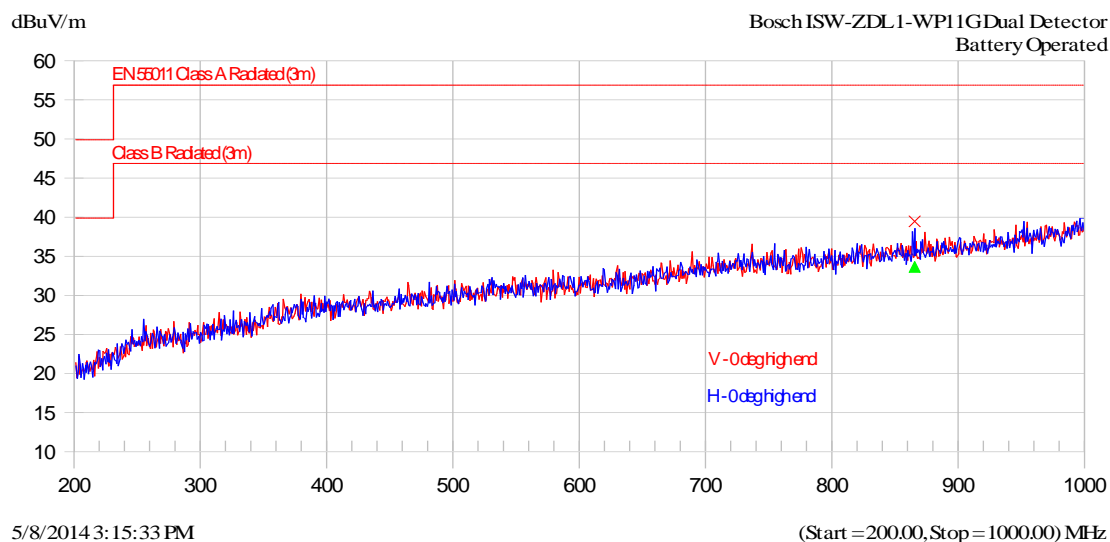
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## NOTES:

## Radiated Emissions Prescan

Vertical / Horizontal

## High end



| Frequency | Peak   | QP     | Class B-QP | Class A-QP | Trace Name         |
|-----------|--------|--------|------------|------------|--------------------|
| MHz       | dBuV/m | dBuV/m | dB         | dB         |                    |
| 864.187   | 39.6   | 33.7   | -13.3      | -23.3      | H - 0 deg high end |

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### 3.1.6 Final Tabulated Data

| <b>Radiated Emissions Measurements</b> |                  |       |         |            |        |           |        |          |              |                 |                         |
|--|------------------|-------|---------|------------|--------|-----------|--------|----------|--------------|-----------------|-------------------------|
| <b>Standard:</b>                       | 47 CFR 15.209(a) |       |         |            |        |           |        | Final    |              | <b>Date:</b>    | 5/8/2014                |
| <b>Device Tested:</b>                  | Bosch            |       |         |            |        |           |        | 3.0m     |              |                 |                         |
|  | Measured Level   |       |         |            |        |           |        |          |              |                 |                         |
| Meas #                                 | Freq (MHz)       | Peak  | Average | Peak Limit | Peak Δ | Avg Limit | Avg Δ  | Result   | Polarization | Angle (degrees) | Antenna Height (meters) |
| 1                                      | 63.3840          | 28.70 | 24.60   | 74.00      | -45.30 | 54.00     | -29.40 | Complied | Horizontal   | 0               | 1.00                    |
| 2                                      | 864.1870         | 39.60 | 32.30   | 74.00      | -34.40 | 54.00     | -21.70 | Complied | Horizontal   | 0               | 1.00                    |
| 3                                      | 6933.8000        | 50.89 | 42.80   | 74.00      | -23.11 | 54.00     | -11.20 | Complied | Horizontal   | 0               | 1.00                    |
| 4                                      | 18000.0000       | 50.16 | 41.70   | 74.00      | -23.84 | 54.00     | -12.30 | Complied | Horizontal   | 0               | 1.00                    |
| 5                                      | 39943.8870       | 38.88 | 32.50   | 74.00      | -35.12 | 54.00     | -21.50 | Complied | Horizontal   | 0               | 1.00                    |
| 6                                      | 22136.2720       | 25.05 | 21.80   | 74.00      | -48.95 | 54.00     | -32.20 | Complied | Vertical     | 0               | 1.00                    |

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### 3.2 Field Strength of Fundamental and Harmonic Emissions

This test measures the electromagnetic levels of fundamental and spurious signals generated by the EUT that radiated from the EUT.

#### 3.2.1 Test Over View

|                |                                      |      |                     |                    |         |                           |           |  |
|----------------|--------------------------------------|------|---------------------|--------------------|---------|---------------------------|-----------|--|
| Results        | Complies (as tested per this report) |      |                     |                    |         | Date                      | 5/12/2014 |  |
| Standard       | FCC Part 15.245(a) & RSS-210 Issue 8 |      |                     |                    |         |                           |           |  |
| Product Model  | ISW-ZDL1-WP11G                       |      |                     |                    | Serial# | TS-1                      |           |  |
| Configuration  | See test plan for details            |      |                     |                    |         |                           |           |  |
| Test Set-up    | Tested at O.A.T.S.                   |      | EUT placed on table |                    |         | See test plan for details |           |  |
| EUT Powered By | Battery                              | Temp | 22° C               | Humidity           | 47%     | Pressure                  | 1026mbar  |  |
| Perf. Criteria | 2500mv/m (Below Limit)               |      |                     | Perf. Verification |         | Readings under Limit      |           |  |
| Mod to EUT     | None                                 |      |                     | Test Performed By  |         | Randall Masline           |           |  |

#### 3.2.2 Test Procedure

Field Strength and FCC emissions tests were performed using the procedures of ANSI C63.10 including methods for signal maximizations and EUT configuration. The photos included with the report show the EUT in its maximized configuration.

Radiated emission testing measurements will be made on the 10 m OATS, at a 3m distance.

#### 3.2.3 Deviations

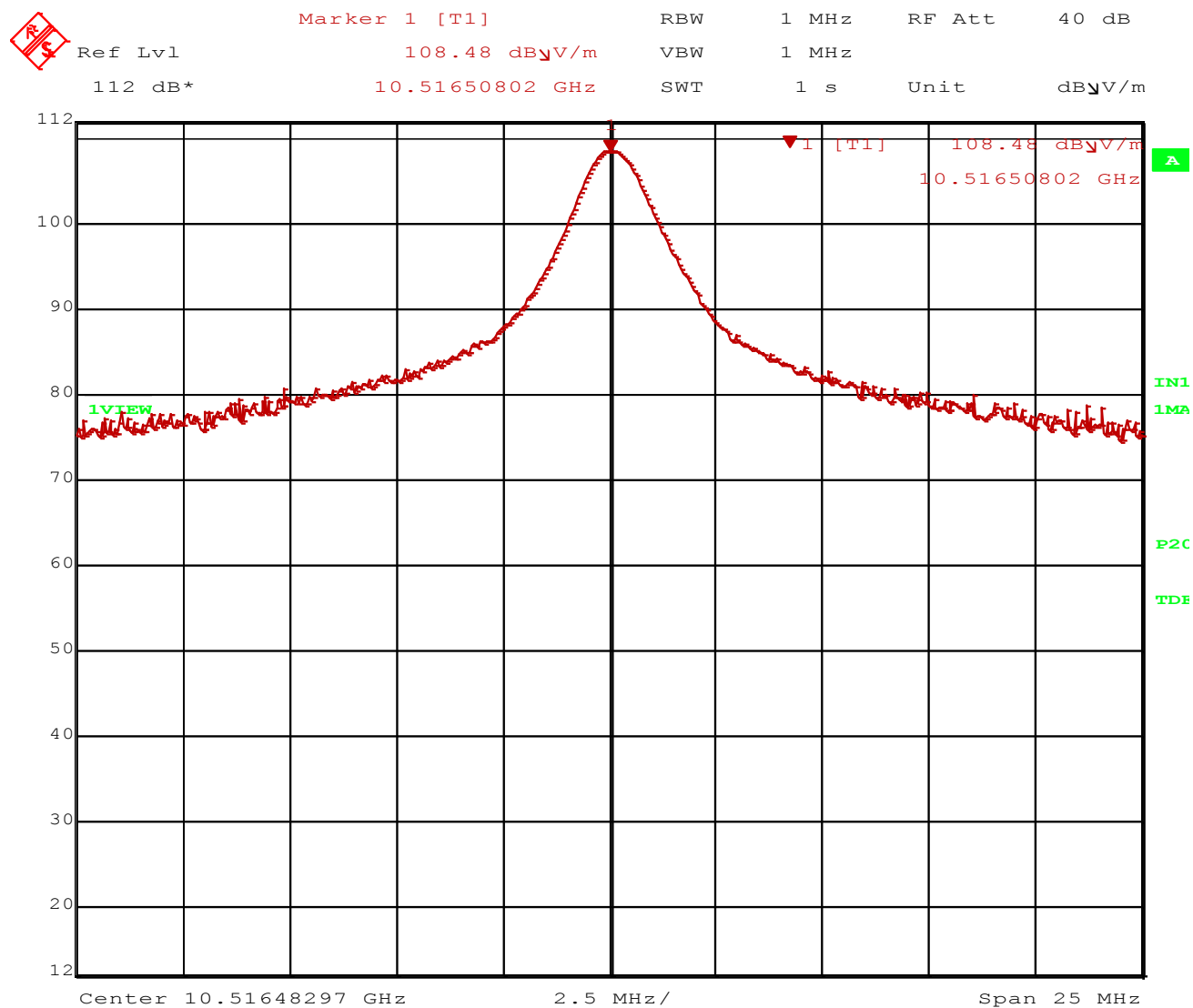
There were no deviations from the test methodology listed in the test plan for the radiated emission test.

#### 3.2.4 Final Test

All final radiated emissions measurements were below (in compliance) the limits.

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## 3.2.5 Final Data



Date: 9.MAY.2014 13:43:42

Figure 2 – Field Strength of EUT Fundamental at 3 m distance from Antenna - Horizontal

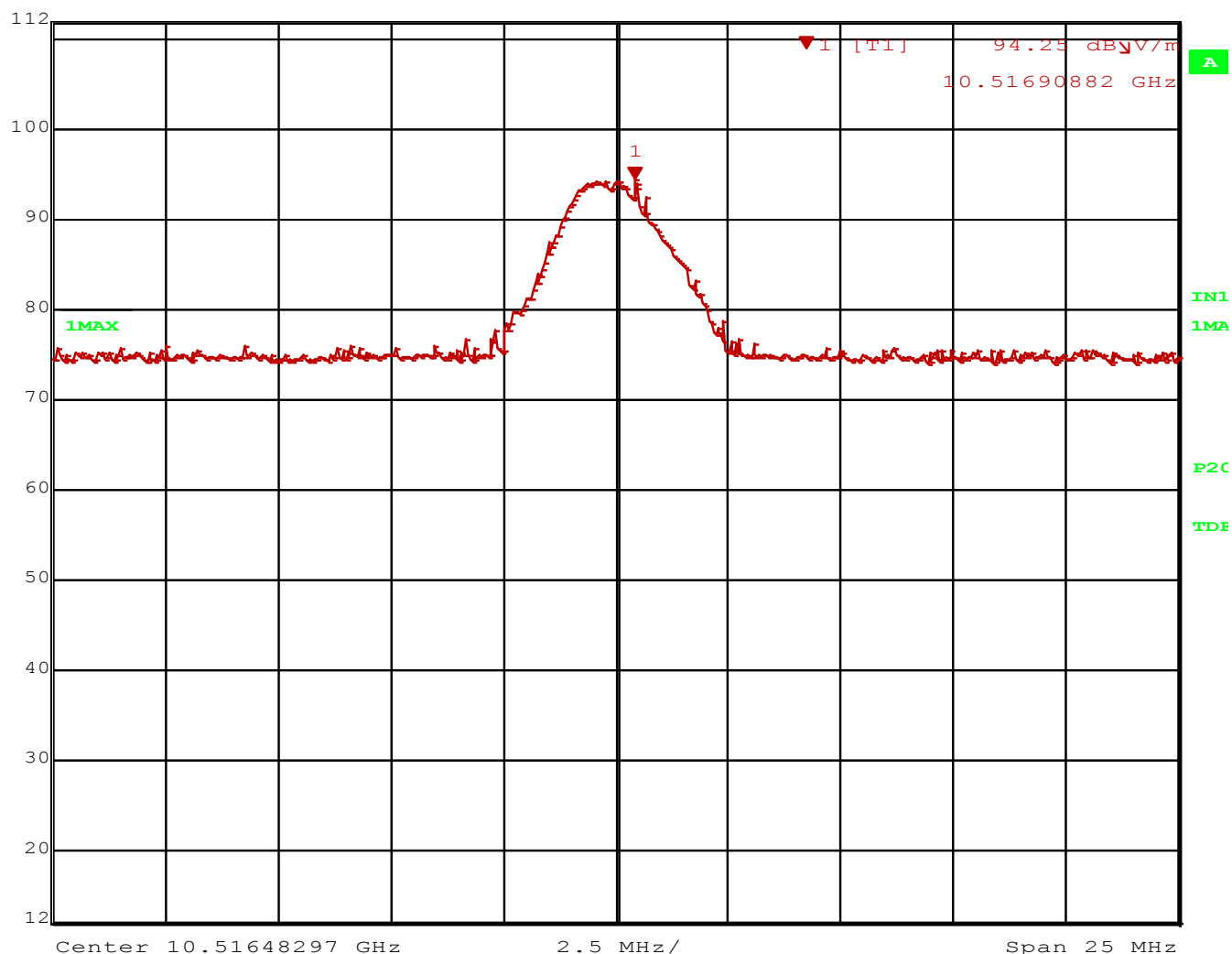
Horizontal was determined highest Emission 108.48dBuV/m

Limit is 127.5 dBuV

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Marker 1 [T1] RBW 1 MHz RF Att 40 dB  
Ref Lvl 94.25 dB $\mu$ V/m VBW 1 MHz  
112 dB\* 10.51690882 GHz SWT 1 s Unit dB $\mu$ V/m



Date: 9.MAY.2014 13:42:58

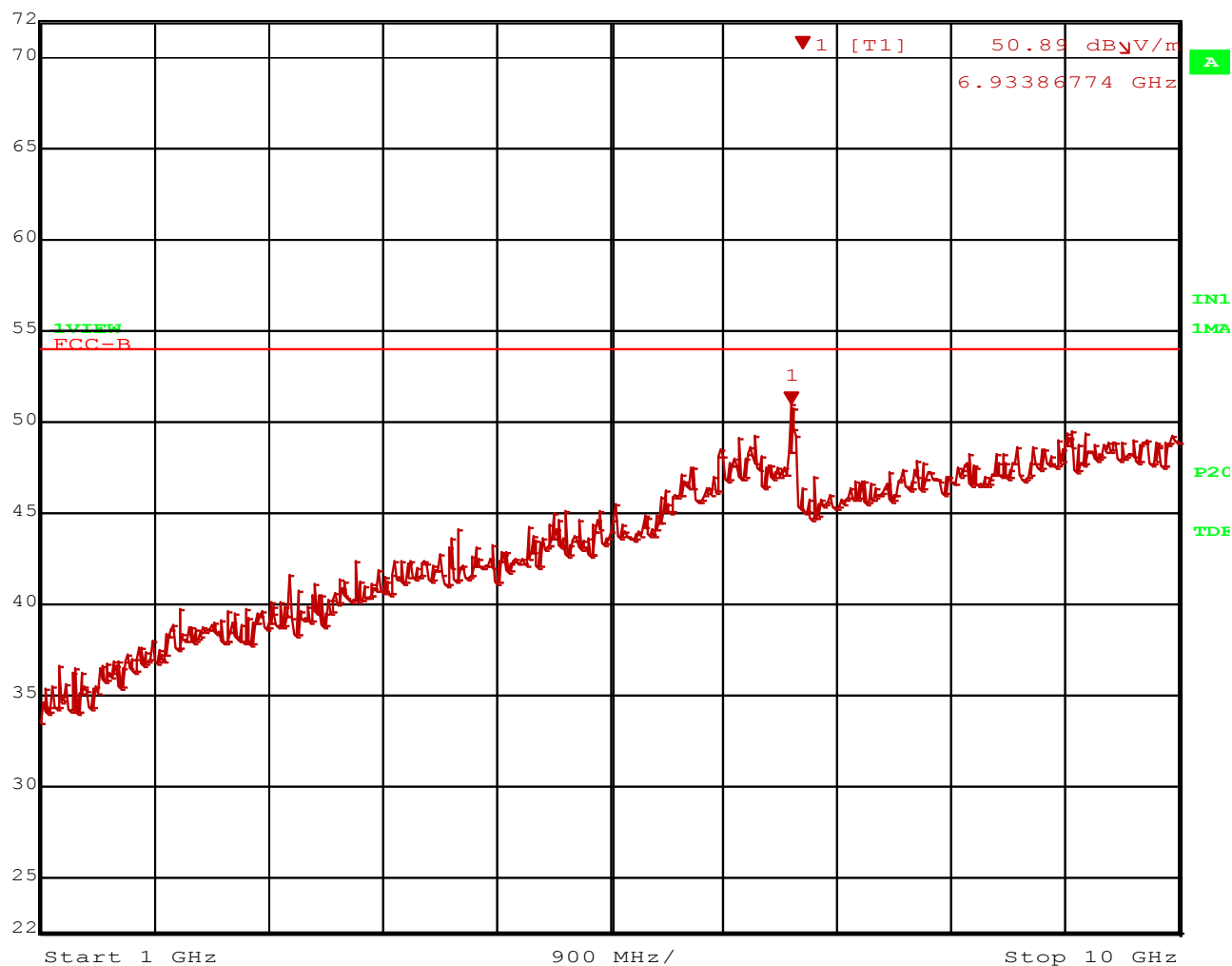
Figure 3 – Field Strength of EUT Fundamental at 3 m distance from Antenna - Vertical

Limit is 127.5 dB $\mu$ V

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Marker 1 [T1] RBW 1 MHz RF Att 10 dB  
Ref Lvl 50.89 dB $\mu$ V/m VBW 1 MHz  
72 dB\* 6.93386774 GHz SWT 1 s Unit dB $\mu$ V/m



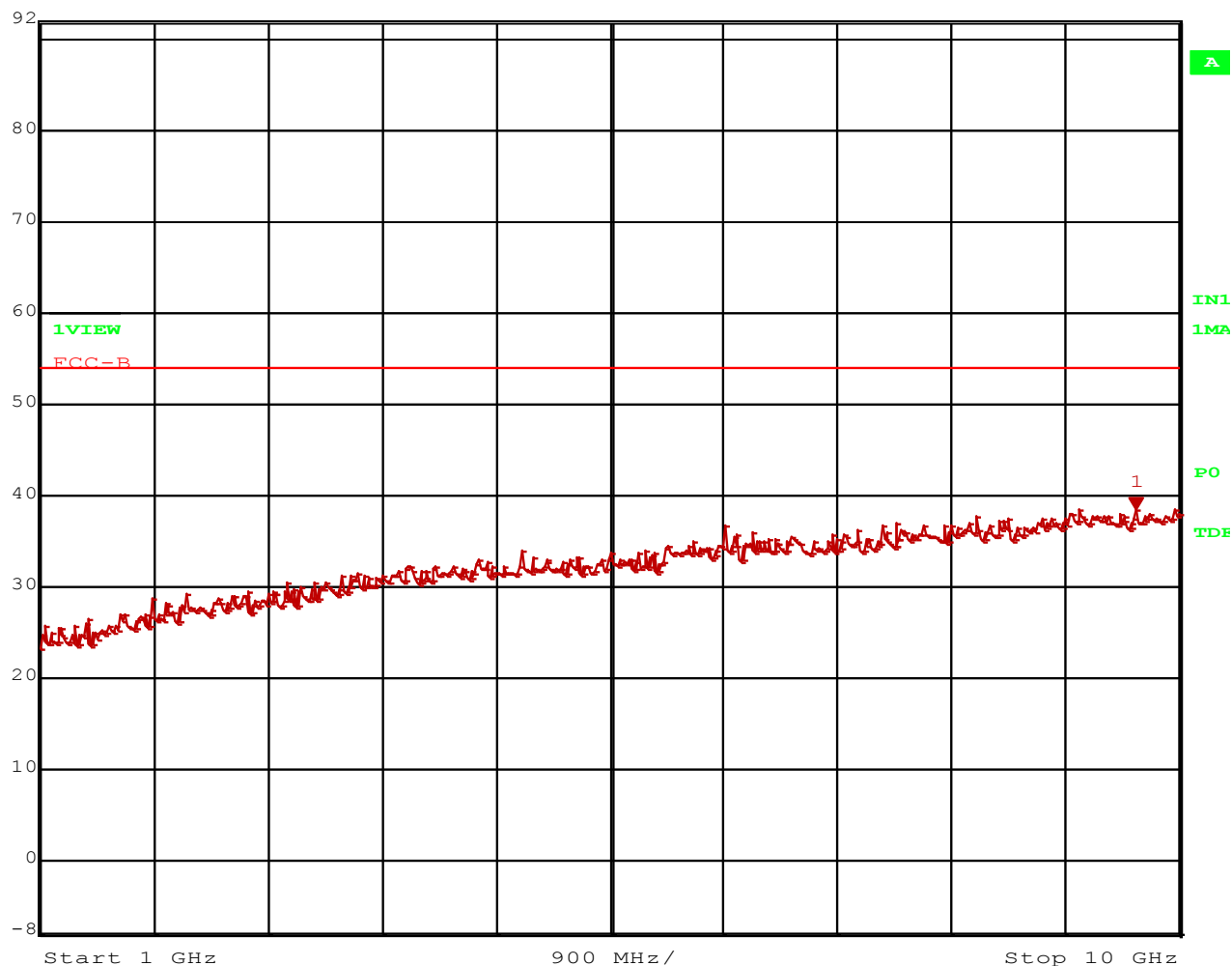
Date: 9.MAY.2014 14:10:35

Figure 4 – Field strength of Harmonic Emissions 1-10 GHz Horizontal

The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself does not constitute authorization for the use of any TÜV Rheinland test mark. The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.



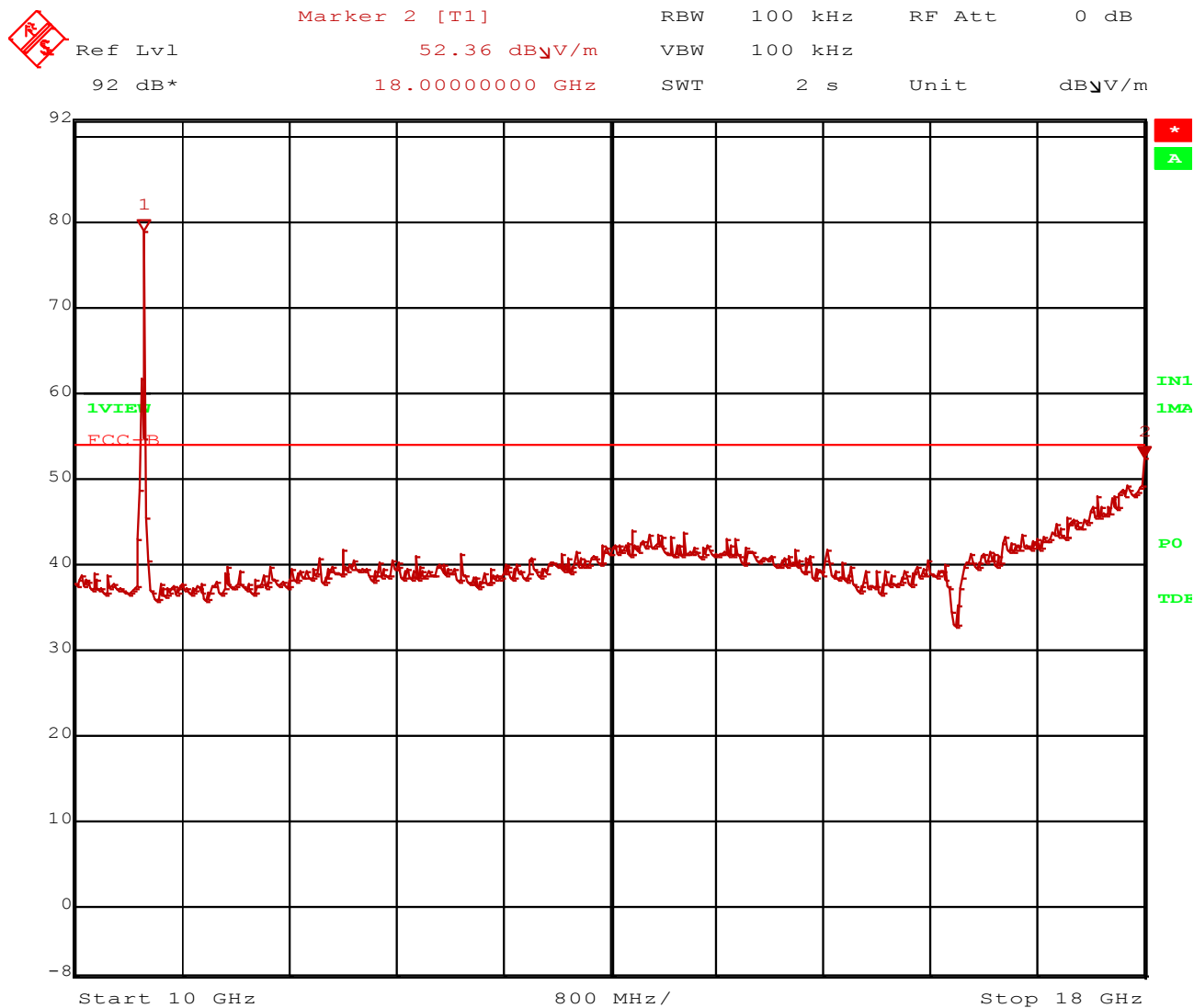
Marker 1 [T1] RBW 100 kHz RF Att 0 dB  
 Ref Lvl 38.40 dBV/m VBW 100 kHz  
 92 dB\* 9.65731463 GHz SWT 2.25 s Unit dBV/m



Date: 9.MAY.2014 14:39:57

Figure 5 – Field strength of Harmonic Emissions 1-10 GHz Vertical

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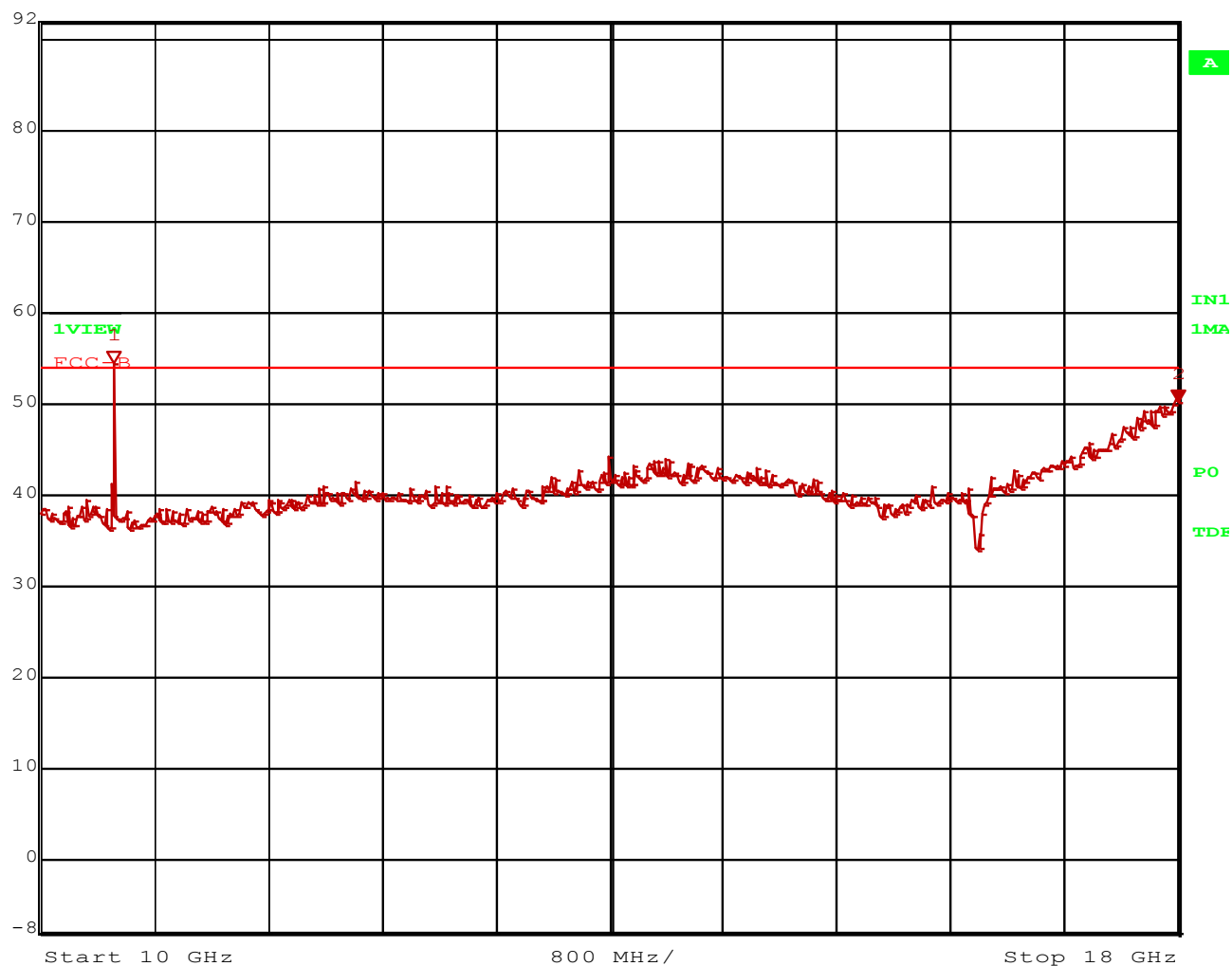
Date: 9.MAY.2014 14:38:29

Figure 6 – Field strength of Harmonic Emissions 10 - 18 GHz – Horizontal

The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself does not constitute authorization for the use of any TÜV Rheinland test mark. The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.



Marker 2 [T1] RBW 100 kHz RF Att 0 dB  
Ref Lvl 50.16 dB $\mu$ V/m VBW 100 kHz  
92 dB\* 18.00000000 GHz SWT 2 s Unit dB $\mu$ V/m

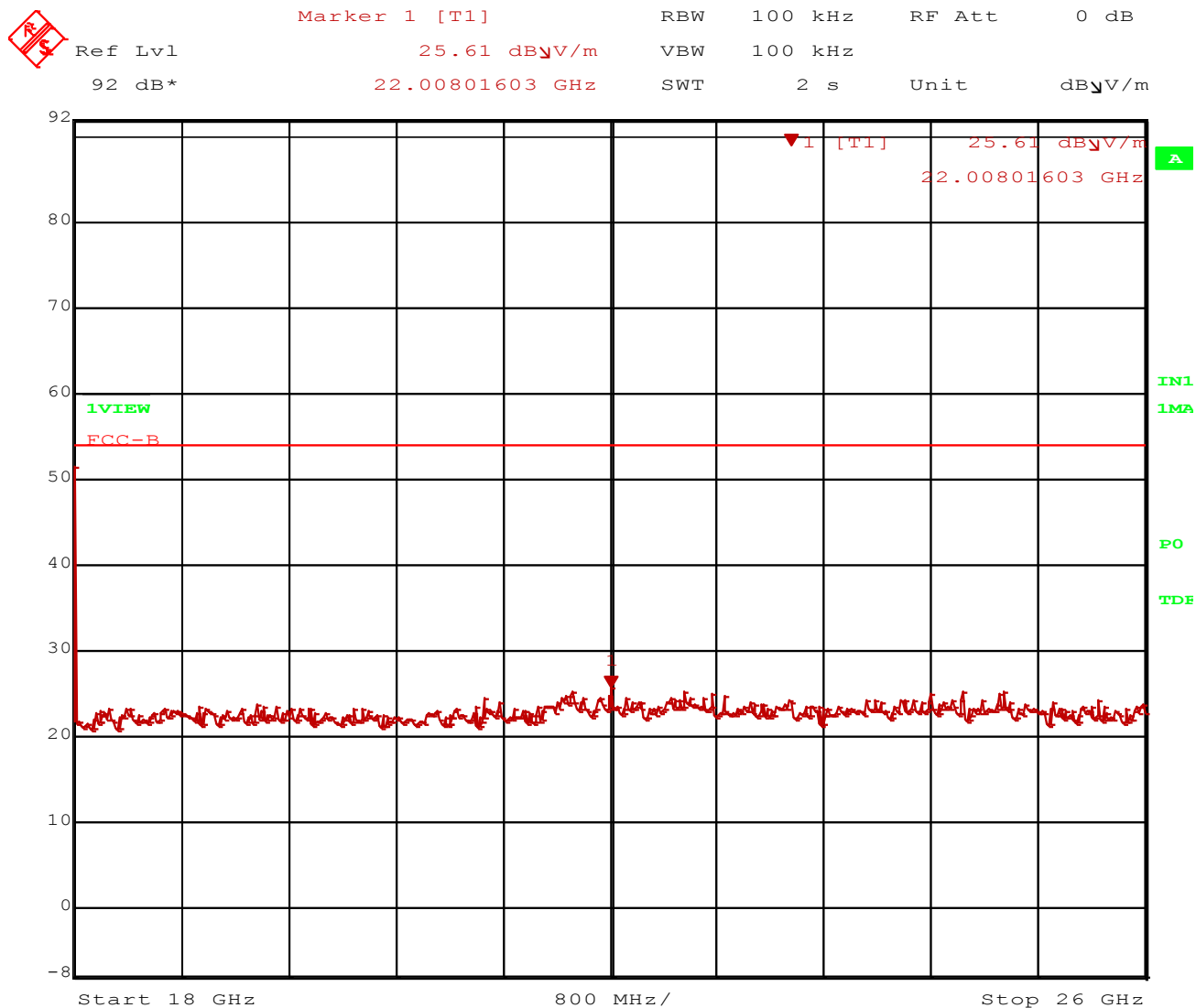


Date: 9.MAY.2014 14:39:10

Figure 7 – Field strength of Harmonic Emissions 10 - 18 GHz - Vertical

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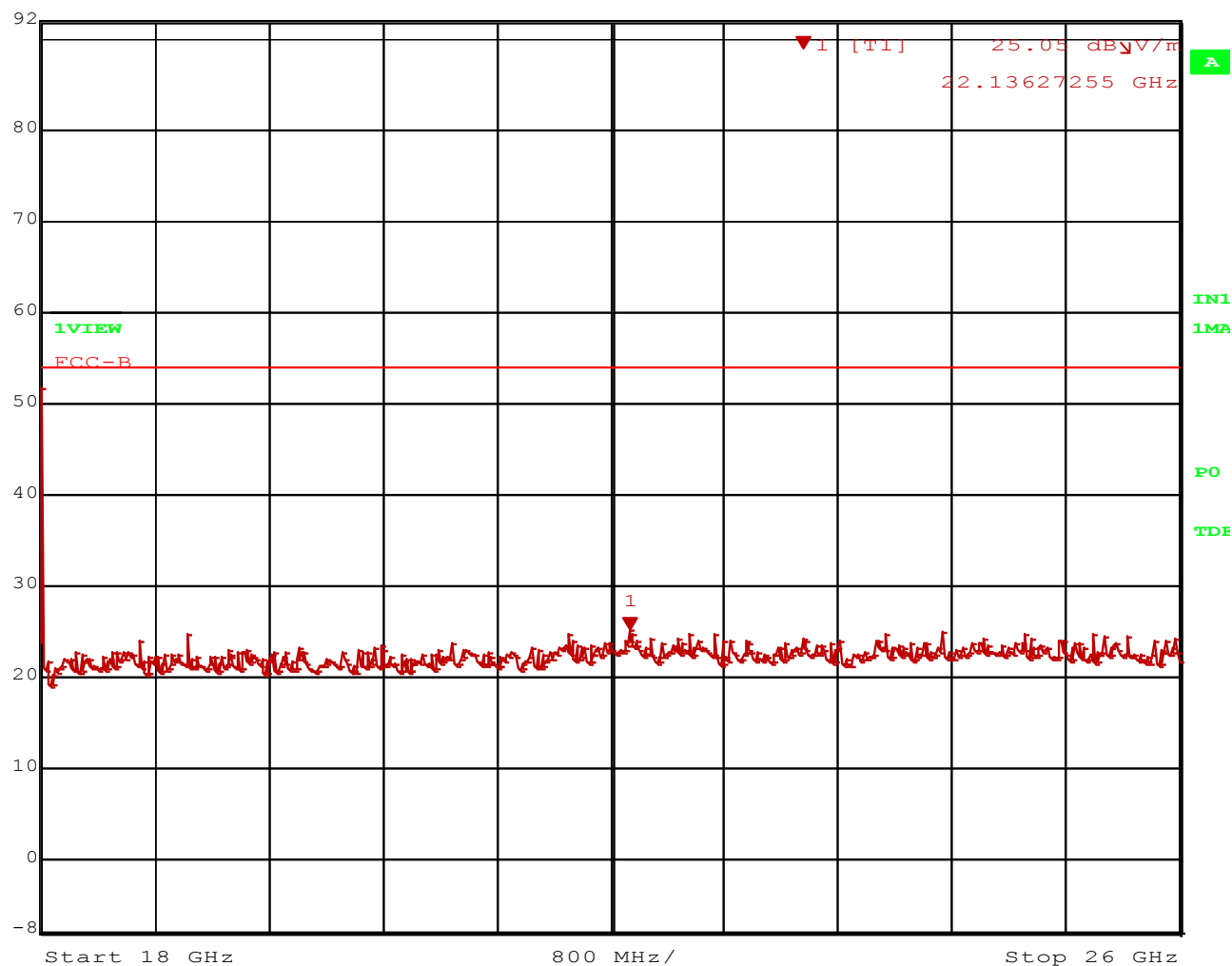
Date: 9.MAY.2014 15:17:25

Figure 8 – Field strength of Harmonic Emissions 18 - 26.5 GHz – Horizontal

The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself does not constitute authorization for the use of any TÜV Rheinland test mark. The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.



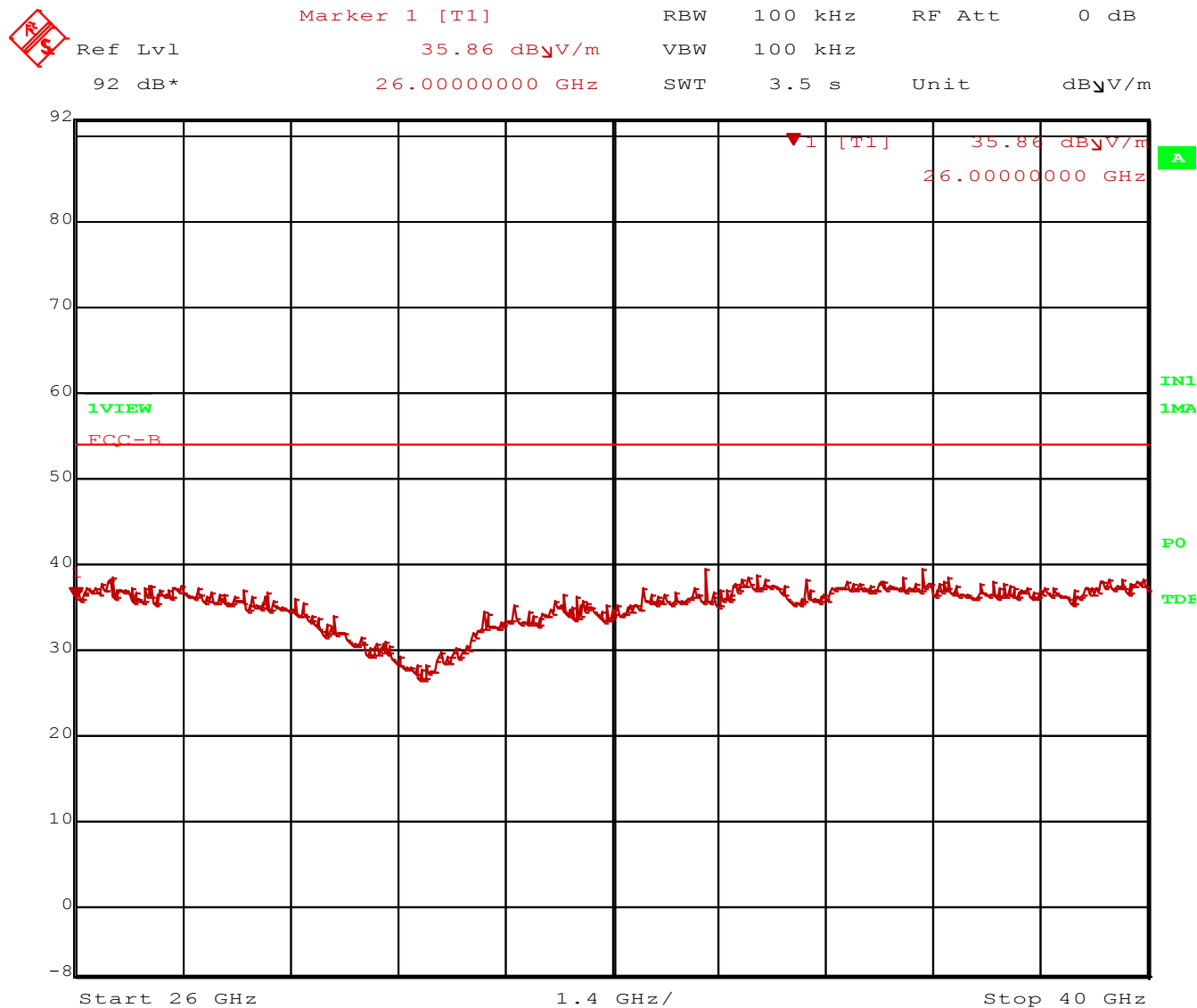
Marker 1 [T1] RBW 100 kHz RF Att 0 dB  
Ref Lvl 25.05 dBV/m VBW 100 kHz  
92 dB\* 22.13627255 GHz SWT 2 s Unit dBV/m



Date: 9.MAY.2014 15:16:29

Figure 9 – Field strength of Harmonic Emissions 18 - 26.5 GHz - Vertical

The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself does not constitute authorization for the use of any TÜV Rheinland test mark. The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.



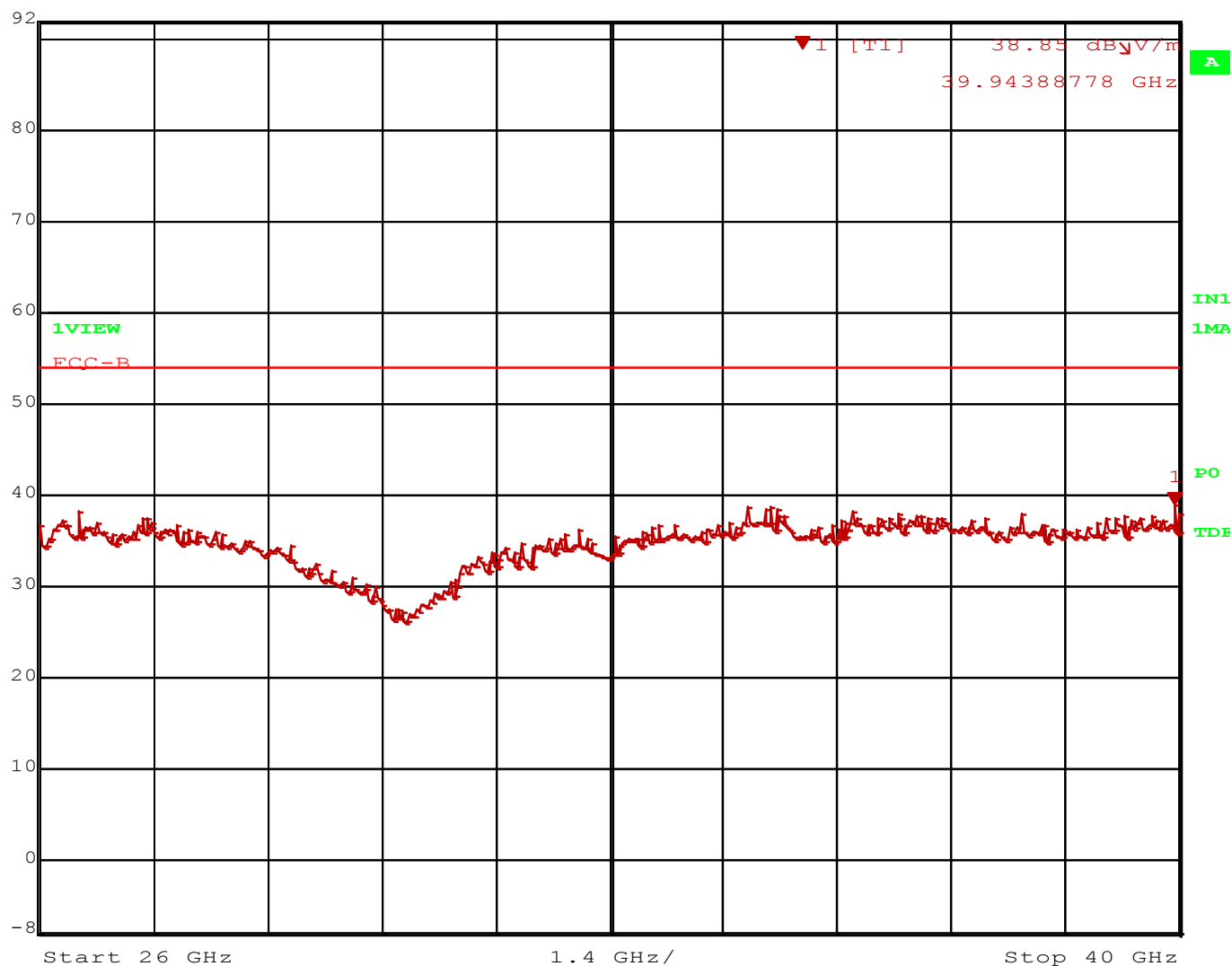
Date: 9.MAY.2014 15:35:58

Figure 10 – Field strength of Harmonic Emissions 26.5 - 40 GHz - Horizontal

The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself does not constitute authorization for the use of any TÜV Rheinland test mark. The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.



Marker 1 [T1] RBW 100 kHz RF Att 0 dB  
Ref Lvl 38.85 dB $\mu$ V/m VBW 100 kHz  
92 dB\* 39.94388778 GHz SWT 3.5 s Unit dB $\mu$ V/m



Date: 9.MAY.2014 15:36:35

Figure 11 – Field strength of Harmonic Emissions 26.5 - 40 GHz - Vertical

The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself does not constitute authorization for the use of any TÜV Rheinland test mark. The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

### 3.3 Band Edge Requirements

The requirement is to ensure the 20dB bandwidth of the emission, or whatever bandwidth may otherwise be specified, is contained within the frequency band designated in the rule section under which the equipment is operated. The designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperatures and supply voltage.

#### 3.3.1 Test Over View

|                |   |      |       |                    |         |                                    |           |  |
|----------------|---|------|-------|--------------------|---------|------------------------------------|-----------|--|
| Results        | Complies (as tested per this report)                                      |      |       |                    |         | Date                               | 5/12/2014 |  |
| Standard       | FCC Part 15.215(c)  |      |       |                    |         |                                    |           |  |
| Product Model  | ISW-ZDL1-WP11G  |      |       |                    | Serial# | TS-1                               |           |  |
| Configuration  | See test plan for details   |      |       |                    |         |                                    |           |  |
| Test Set-up    | Tested in shielded room   EUT placed on table   See test plan for details |      |       |                    |         |                                    |           |  |
| EUT Powered By | Battery   | Temp | 22° C | Humidity           | 47%     | Pressure                           | 1026mbar  |  |
| Perf. Criteria | Per Section 15.215(c) of the standard                                     |      |       | Perf. Verification |         | Readings within the permitted band |           |  |
| Mod to EUT     | None  |      |       | Test Performed By  |         | Randall Masline                    |           |  |

#### 3.3.2 Test Procedure

The measurement will be made using guidance from ANSI C63.10.

#### 3.3.3 Deviations

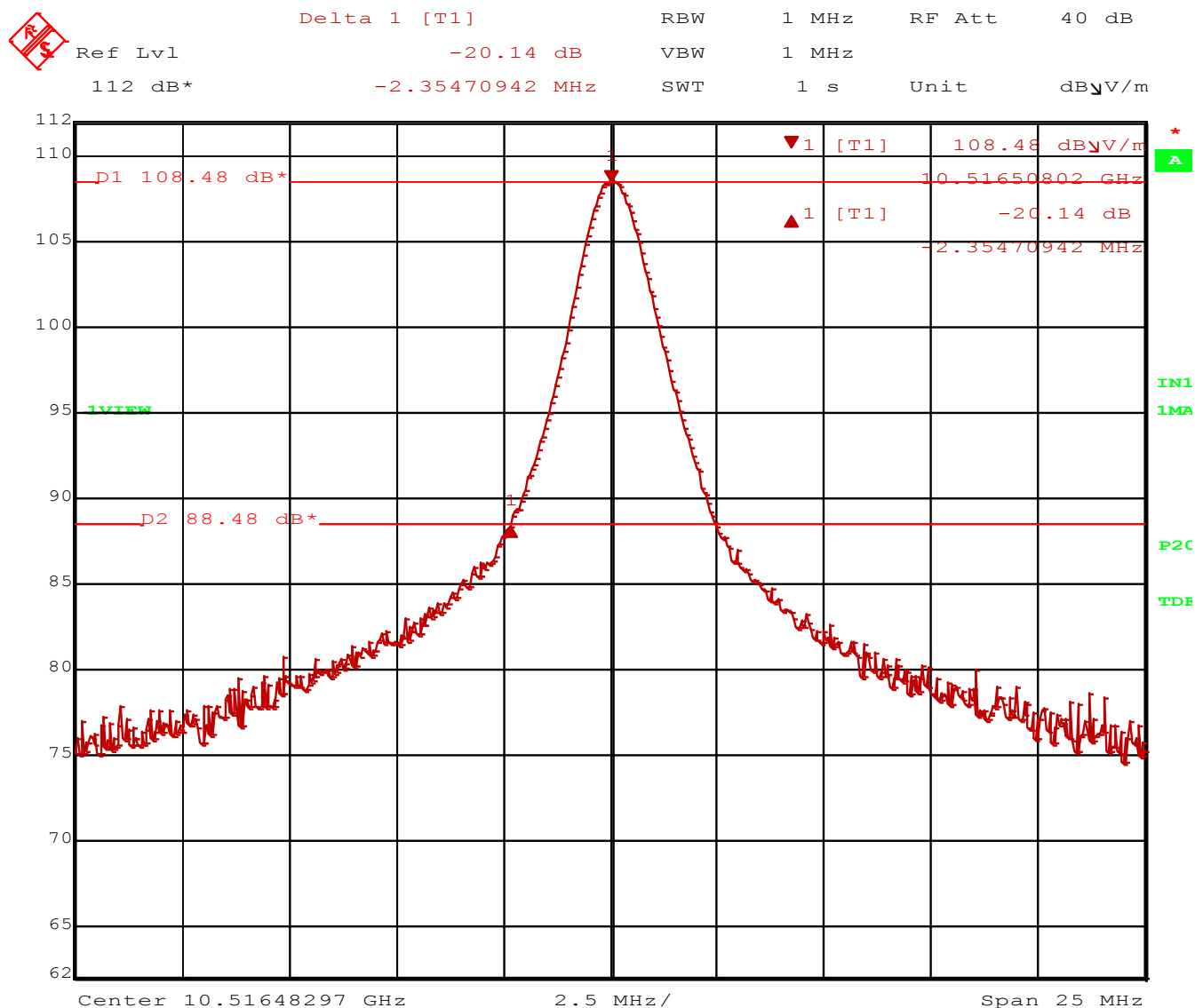
There were no deviations from the test methodology.

#### 3.3.4 Final Test

The band edge requirements of the EUT were within the limits specified in the standard.

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### 3.3.5 Band Edge Requirement Data



Date: 9.MAY.2014 14:01:08

Figure 12 – Band Edge

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### 3.4 99% Power Bandwidth

For the purpose of Section A1.1, the 99% bandwidth shall be no wider than .25% of the center frequency for devices operating between 70-900MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency.

#### 3.4.1 Test Over View

|                |                                      |      |                    |          |         |                      |           |  |
|----------------|--------------------------------------|------|--------------------|----------|---------|----------------------|-----------|--|
| Results        | Complies (as tested per this report) |      |                    |          |         | Date                 | 5/12/2014 |  |
| Standard       | RSS-210 Section A1.1.3               |      |                    |          |         |                      |           |  |
| Product Model  | BTA-1                                |      |                    |          | Serial# | TS-1                 |           |  |
| Test Set-up    | Direct Measurement from antenna port |      |                    |          |         |                      |           |  |
| EUT Powered By | Battery                              | Temp | 23° C              | Humidity | 32%     | Pressure             | 1010mbar  |  |
| Perf. Criteria | (Below Limit)                        |      | Perf. Verification |          |         | Readings Under Limit |           |  |
| Mod. to EUT    | None                                 |      | Test Performed By  |          |         | Randall Masline      |           |  |

#### 3.4.2 Test Procedure

Using the procedures of RSS-GEN section 4.6.1, the 1 kHz resolution bandwidth is 1% of the 1 MHz span. The Video bandwidth is 3 times that of the resolution bandwidth.

The limit of the bandwidth would be 0.5% of 10.525 GHz is 52.625 MHz. The measured 99% bandwidth is 13.06 MHz.

#### 3.4.3 Deviations

There were no deviations from the test methodology listed in the test plan for the 99% Power bandwidth test.

#### 3.4.4 Final Test

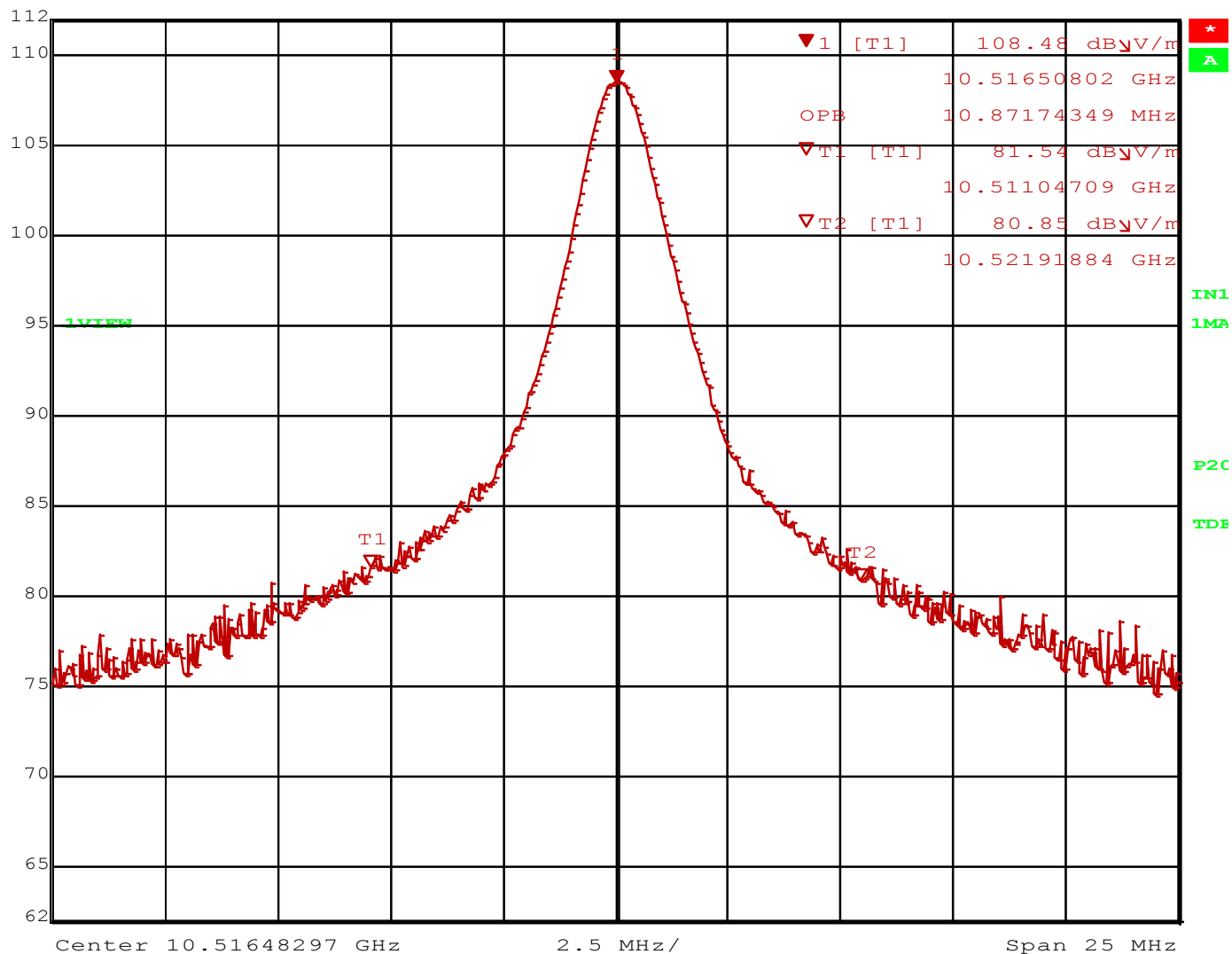
The EUT met the performance criteria requirement as specified in the test plan of this report and in the standards.

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## 3.4.5 Final Data



Marker 1 [T1] RBW 1 MHz RF Att 40 dB  
Ref Lvl 108.48 dBμV/m VBW 1 MHz  
112 dB\* 10.51650802 GHz SWT 1 s Unit dBμV/m



Date: 9.MAY.2014 13:58:54

Figure 13 – 99% Bandwidth = 10.87 MHz

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### 3.5 RF Exposure Measurement (Mobile Device)

#### 3.5.1 Test Methodology

In this document, we try to prove the safety of radiation harmfulness to the human body for our product. The limit for Maximum Permissible Exposure (MPE) specified in FCC 1.1310 is followed. The Gain of the antenna used in this product is measured in a Semi-Anechoic Chamber, and also the maximum total power input to the antenna is measured. Through the Friis transmission formula (see section 4.9.6) and the maximum gain of the antenna, we can calculate the distance, away from the product, where the limit of MPE is reached.

Although the Friis transmission formula is a far field assumption, the calculated result of that is an over-prediction for near field power density. We will take that as the worst case to specify the safety range.

#### 3.5.2 RF Exposure Limit

According to FCC 1.1310 table 1: The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1307(b)

##### LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

| Frequency Range (MHz)   | Electric Field Strength (V/m) | Magnetic Field Strength (A/m) | Power Density (mW/cm <sup>2</sup> ) | Average Time (minutes) |
|---|-------------------------------|-------------------------------|-------------------------------------|------------------------|
| <b>(A)Limits For Occupational / Control Exposures</b>           |                               |                               |                                     |                        |
| 300-1500  | ...                           | ...                           | F/300                               | 6                      |
| 1500-100,000  | ...                           | ...                           | 5                                   | 6                      |
| <b>(B)Limits For General Population / Uncontrolled Exposure</b> |                               |                               |                                     |                        |
| 300-1500  | ...                           | ...                           | $f / 1500$                          | 6                      |
| 1500-100,000  | ...                           | ...                           | 1.0                                 | 30                     |

$f$  = Frequency in MHz

#### 3.5.3 EUT Operating condition

The EUT transmits at a single frequency and at the highest output power.

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### 3.5.4 Classification

The antenna of the product, under normal use condition, is at least 20cm away from the body of the user. Warning statement to the user for keeping at least 20cm or more separation distance with the antenna should be included in users manual. Therefore, this device is classified as a **Mobile Device**.

### 3.5.5 Antenna Gain

The maximum Gain measured in Semi-Anechoic Chamber is 6.0 dBi or 3.981 (numeric).

### 3.5.6 Output Power into Antenna & RF Exposure value at distance 20cm:

Calculations for this report are based on highest power measurement and the highest gain of the antenna. Limit for MPE (from FCC part 1.1310 table 1) is  $1.0 \text{ mW/cm}^2$

Highest Pout is 5.310mW, highest antenna gain (in linear scale) is 3.981 R is 20cm, and  $f = 10525 \text{ MHz}$   
 FCC

Note: This calculation is assuming 100% duty cycle, which would not be the case in normal operation.

|   |                                |                          |
|---|--------------------------------|--------------------------|
| Uncontrolled Exposures - Limit ( $\text{W/m}^2$ ) = | 10                             |                          |
|   | $P_d =$                        | $0.042058 \text{ W/m}^2$ |
|   | Uncontrolled Margin to Limit = | $9.9579 \text{ W/m}^2$   |

Industry Canada

|   |                                |                          |
|---|--------------------------------|--------------------------|
| Uncontrolled Exposures - Limit ( $\text{W/m}^2$ ) = | 2.88666667                     |                          |
|   | $P_d =$                        | $0.000013 \text{ W/m}^2$ |
|   | Uncontrolled Margin to Limit = | $2.8867 \text{ W/m}^2$   |

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

### 3.5.7 Sample Calculation

The Friis transmission formula:  $P_d = (P_{out} * G) / (4 * \pi * R^2)$

Where;

$P_d$  = power density in  $\text{mW/cm}^2$

$P_{out}$  = output power to antenna in mW

$G$  = gain of antenna in linear scale

$\pi \approx 3.1416$

$R$  = distance between observation point and center of the radiator in cm

Ref. : David K. Cheng, *Field and Wave Electromagnetics*, Second Edition, Page 640, Eq. (11-133).

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## Appendix A

### 4 Test Plan

This test report is intended to follow this test plan outlined here in unless other wise stated in this here report. The following test plan will give details on product information, standards to be used, test set ups and refer to TUV test procedures. The test procedures will give the steps to be taken when performing the stated test. The product information below came via client, product manual, product itself and or the internet.

#### 4.1 General Information

|                       |                             |
|-----------------------|-----------------------------|
| <b>Client</b>         | Bosch Security Systems      |
| <b>Address 1</b>      | 130 Perinton Parkway        |
| <b>Address 2</b>      | Fairport, NY 14450          |
| <b>Contact Person</b> | Peter Namisnak              |
| <b>Telephone</b>      | 585-223-4060                |
| <b>Fax</b>            | 585-678-3263                |
| <b>e-mail</b>         | peter.namisnak@us.bosch.com |

#### 4.2 Model(s) Name

ISW-ZDL1-WP11G

#### 4.3 Type of Product

Wireless Tri-Tech Motion Detector

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#### 4.4 Equipment Under Test (EUT) Description

Dual or ISW-ZDL1-WP11G

The Wireless TriTech Wireless Tri-Tech Motion Detector with ZigBee technology is a small, unobtrusive detector that is simple to install and does not require field adjustments.

The detector has a dense zone pattern with 79 zones in eight layers. Passive infrared (PIR) and microwave doppler radar processing provides excellent catch performance with best-in-class false alarm immunity.

Incorporates the following features:

- ZigBee HA2.1 compliant
- First Step Processing (FSP), flexible mounting options, and temperature compensation
- Draft, insect, and pet and animal immunity
- Eight detection layers including look-down zones
- Externally-visible LED indicates test status

#### 4.5 Modifications

No modifications were necessary to meet compliance limits.

#### 4.6 Product Environment

|                                     |                         |                          |                        |
|-------------------------------------|-------------------------|--------------------------|------------------------|
| <input checked="" type="checkbox"/> | <b>Residential</b>      | <input type="checkbox"/> | <b>Hospital</b>        |
| <input checked="" type="checkbox"/> | <b>Light Industrial</b> | <input type="checkbox"/> | <b>Small Clinic</b>    |
| <input checked="" type="checkbox"/> | <b>Industrial</b>       | <input type="checkbox"/> | <b>Doctor's office</b> |
| <input type="checkbox"/>            | <b>Other</b>            |                          |                        |

\*Check all that apply

#### 4.7 Countries

|                                     |               |
|-------------------------------------|---------------|
| <input checked="" type="checkbox"/> | <b>USA</b>    |
| <input checked="" type="checkbox"/> | <b>Canada</b> |

\*Check all that apply

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