



# Test report

**Number:** T251-0646/16 A2  
**Project file:** C20161291  
**Date:** 2016-09-29  
**Pages:** 66  
**Product:** Wireless Communication module  
**Model:** Flush RF Module  
**Ratings:** 24 V DC  
Protection class: III.  
**Trademark:** Qubino, NETIChome

**Applicant:** Goap d.o.o. Nova Gorica  
Ul. Klementa Juga 7, SI-5250 Solkan, Slovenia  
**Manufacturer:** Goap d.o.o. Nova Gorica  
Ul. Klementa Juga 7, SI-5250 Solkan, Slovenia  
**Place of manufacture:** DEC elettronica srl, Via dell'Artigianato 12/1, IT-31040 Chiarano (TV), Italy  
ASTREL S.R.L., Via Isonzo 21/E, IT-34070 Mossa (GO), Italy

## Summary of testing

**Testing method:** FCC Part 15, Subpart C

**Testing location:** SIQ Ljubljana, Trpinčeva ulica 37 A, SI-1000 Ljubljana, Slovenia

**Remarks:** Date of receipt of test items: 2016-03-24  
Number of items tested: 1  
Date of performance of tests: 2016-06-08  
The test results presented in this report relate only to the items tested.  
The product complies with the requirements of the testing methods.  
/

**Tested by:** Andrej Škof

**Approved by:** Luka Tosetto

*The report shall not be reproduced except in full.*



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## 1 GENERAL

| History sheet |                 |  |          |
|---------------|-----------------|--|----------|
| Date          | Report No.      | Change   | Revision |
| 2016-06-13    | T251-0646/16    | Initial Test Report issued.  | --       |
| 2016-09-02    | T251-0646/16 A1 | Corrected initial test report due to required changes in:<br>- general product information,<br>- test setup picture  | 1.0      |
| 2016-09-29    | T251-0646/16 A2 | - Added Occupied Bandwidth emission test procedure.<br>- Updated Occupied Bandwidth result table.<br>- Added additional note at Occupied Bandwidth and Emission of the Carrier result table. | 2.0      |

### Environmental conditions:

Ambient temperature: 15°C to 35°C

Relative humidity: 30% to 60%

Atmospheric pressure: 860 mbar to 1060 mbar

## 1.1 Equipment under test

### Wireless Communication module

Model: Flush RF Module

### 1.1.1 General product information

Tested SIQ sample number: S20162816

Antenna of the device is designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device as required per section 15.203 of FCC part 15. Antenna is permanently attached without possibility of replacement by user which according to this section, is considered sufficient to comply with the provisions of this section.

### Operating Channels/frequencies:

| Channel | Frequency (MHz) |
|---------|-----------------|
| 1 (Lo)  | 908,4           |
| 0 (Hi)  | 916,0           |



Picture of EUT



## 1.2 ANSI C63.4 Subpart selection

### *Subpart C: Intentional Radiators*

## 1.3 Class statement requirements

- The Class A statement cautions that operation of the device in a residential area is likely to cause harmful interference.
- The Class B statement offers several suggestions for minimizing interference to radio or TV receivers, including reorienting the receiving antenna and moving the Class B device farther away from the receiver.

## 1.4 Occupied bandwidth measurement

| Fundamental frequency | Minimum resolution bandwidth |
|-----------------------|------------------------------|
| 9 kHz to 30 MHz       | 1 kHz                        |
| 30 to 1000 MHz        | 10 kHz                       |
| 1000 MHz to 40 GHz    | 100 kHz                      |

## 1.5 Quasi-peak detector

| Frequency range   | Bandwidth (-6dB)      |
|-------------------|-----------------------|
| 10 Hz to 20 kHz   | Full range (wideband) |
| 10 kHz to 150 kHz | 200 Hz                |
| 150 kHz to 30 MHz | 9 kHz                 |
| 30 MHz to 1 GHz   | 120 kHz               |

## 1.6 Peak, rms, and average detectors

| Frequency range   | Bandwidth (-6dB)    |
|-------------------|---------------------|
| 10 Hz to 20 kHz   | 10, 100, 1000 Hz    |
| 10 kHz to 150 kHz | 1 and 10 kHz        |
| 150 kHz to 30 MHz | 1 and 10 kHz        |
| 30 MHz to 1 GHz   | 10 and 100 kHz      |
| 1 GHz to 40 GHz   | 0.1, 1.0 and 10 MHz |

## 2 LIMITS FOR ALL SUBPARTS

### 2.1 Subpart C: Intentional Radiators

#### 2.1.1 Conducted emission limits:

**CLASS B limits:**

| Frequency Range<br>(MHz) | Limits (dB $\mu$ V) |          |
|--------------------------|---------------------|----------|
|                          | Quasi-peak          | Average  |
| 0.15 to 0.5              | 66 – 56*            | 56 – 46* |
| 0.5 to 5.0               | 56                  | 46       |
| 5.0 to 30.0              | 60                  | 50       |

\* Decreases with the logarithm of the frequency.

The shown limits in table shall not apply to carrier current systems operating as intentional radiators on frequencies below 30 MHz. In lieu thereof, these carrier current systems shall be subject to the following standards:

- For carrier current systems containing their fundamental emission within the frequency band 535-1705 kHz and intended to be received using a standard AM broadcast receiver: no limit on conducted emissions.
- For all other carrier current systems: 1000  $\mu$ V within the frequency band 535-1705 kHz, as measured using a 50  $\mu$ H/50 ohms LISN.
- Carrier current systems operating below 30 MHz are also subject to the radiated emission limits as appropriate.

### 2.1.2 Section 15.209, Radiated emission:

Limit:

| Frequency Range (MHz) | Limits (dBμV/m)                     |                                     | Test distance (m) |
|-----------------------|-------------------------------------|-------------------------------------|-------------------|
|                       | VERTICAL                            | HORIZONTAL                          |                   |
| 0,009 to 0,490        | $20 \cdot \log(2400/F(\text{kHz}))$ | $20 \cdot \log(2400/F(\text{kHz}))$ | 300               |
| 0,490 to 1,705        | $20 \cdot \log(2400/F(\text{kHz}))$ | $20 \cdot \log(2400/F(\text{kHz}))$ | 30                |
| 1,705 to 30,0         | 30                                  | 30                                  | 30                |
| 30 to 88              | 40**                                | 40**                                | 3                 |
| 88 to 216             | 43.5**                              | 43.5**                              | 3                 |
| 216 to 960            | 46**                                | 46**                                | 3                 |
| Above 960             | 54                                  | 54                                  | 3                 |

\*\* Except as provided in paragraph below, fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz.

Perimeter protection systems may operate in the 54-72 MHz and 76-88 MHz bands under the provisions of this section. The use of such perimeter protection systems is limited to industrial, business and commercial applications.

### 2.1.3 Section 15.215, 20 dB Bandwidth

Test specification: FCC Part 15 Section 15.215(c)

Intentional radiators operating under the alternative provisions to the general emission limits must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

Limit:

| Frequency band (MHz) |
|----------------------|
| 902 – 928            |

### 2.1.4 Section 15.249(a), Radiated emission of Carrier

Limit:

| Fundamental Frequency (MHz) | Field strength of fundamental (mV/m) | Field strength of harmonics (μV/m) | Test distance (m) |
|-----------------------------|--------------------------------------|------------------------------------|-------------------|
| 902-928                     | 50                                   | 500                                | 3                 |

**NOTE (Additional provisions to the general radiated emission limitations – 15.215):** In no case shall the level of the unwanted emissions from an intentional radiator operating under these additional provisions exceed the field strength of the fundamental emission as per clause 15.209.

### 3 ALL TEST EQUIPMENT AND THEIR DESCRIPTION

#### 3.1 General information

| Description                                 | Model No. | SIQ No. | Last calibration | Calibrated until | Calibration period | Used |
|---|-----------|---------|------------------|------------------|--------------------|------|
| Rohde-Schwarz, RFI receiver                 | ESU8      | 105187  | 2015-11          | 2017-11          | 24 months          |      |
| Rohde-Schwarz, RFI receiver                 | ESU26     | 100428  | 2016-02          | 2018-02          | 24 months          | X    |
| Rohde & Schwarz, Artificial main network    | ESH2-Z5   | 106899  | 2015-05          | 2017-05          | 24 months          | X    |
| ETS, Anechoic chamber                       | 3m        | 103949  | 2014-11          | 2016-11          | 24 months          | X    |
| R&S, Antenna                                | HFH2-Z2   | /       | 2015-09          | 2017-09          | 24 months          | X    |
| EMCO, Antenna                               | 3142B     | 104351  | 2015-09          | 2017-09          | 24 months          | X    |
| EMCO, Antenna                               | 3115      | 103002  | 2015-09          | 2017-09          | 24 months          | X    |
| Heinrich Deisel, Turn table                 | DS 420.00 | 103337  | NA               | NA               | NA                 | X    |
| Antenna tower                               | /         | /       | NA               | NA               | NA                 | X    |
| Controller for turn table and antenna tower | /         | /       | NA               | NA               | NA                 | X    |

### 3.2 Other instrument information and auxiliary equipment

| Description                               | Model No.  | Bandwidth                 | Detector functions    | Antenna factors  | Cable loss       | Range            |
|---|------------|---------------------------|-----------------------|------------------|------------------|------------------|
| Rohde-Schwarz, AMN                        | ENV216     | /                         | /                     | /                | /                | 9 kHz do 30 MHz  |
| Rohde-Schwarz, RFI receiver               | ESU8       | 200Hz, 9kHz, 120kHz, 1MHz | Peak, Q-peak, Average | /                | /                | 20 Hz – 8 GHz    |
| Rohde-Schwarz, RFI receiver               | ESU26      | 200Hz, 9kHz, 120kHz, 1MHz | Peak, Q-peak, Average | /                | /                | 20 Hz – 26.5 GHz |
| Hewlett Packard, RF Spectrum Analyzer     | 8593E      | 200Hz, 9kHz, 120kHz, 1MHz | Peak, Q-peak, Average | /                | /                | 9 kHz – 26.5 GHz |
| Rohde & Schwarz, Artificial main network  | ESH 2-Z5   | /                         | /                     | /                | /                | 9 kHz – 30 MHz   |
| ETS, Anechoic chamber                     | 3m         | /                         | /                     | /                | /                | 30 MHz – 18 GHz  |
| EMCO, Antenna                             | model 3142 | /                         | /                     | See tables below | /                | 26 MHz – 2 GHz   |
| EMCO, Antenna                             | model 3115 | /                         | /                     | See tables below | /                | 1 GHz – 18 GHz   |
| Schwarzbeck Mess-Elektronik, Horn antenna | BBHA9120E  | /                         | /                     | See tables below | /                | 450 MHz – 6 GHz  |
| SIQ, Conducted emission cable             | SIQ        | /                         | /                     | /                | See tables below | /                |
| SIQ, Radiated emission cable              | SIQ        | /                         | /                     | /                | See tables below | /                |



### 3.2.1 Cable loss and attenuation of radiated emission

#### 3.2.1.1 Conducted emission cable (SIQ-K024)

| Point | Frequency (9kHz-30MHz) | Cable length (meters) | Loss (dB) |
|-------|------------------------|-----------------------|-----------|
| 1     | 190 kHz                | 1                     | 0,4       |
| 2     | 530 kHz                | 1                     | 0,26      |
| 3     | 2,53 MHz               | 1                     | 0,16      |
| 4     | 5,19 MHz               | 1                     | 0,07      |
| 5     | 11,05 MHz              | 1                     | 0,03      |
| 6     | 22,01 MHz              | 1                     | 0,06      |
| 7     | 24,03 MHz              | 1                     | 0,04      |

#### 3.2.1.2 Radiated emission attenuation

| Point | Frequency (30 MHz – 26,5 GHz) | Attenuation (dB) |
|-------|-------------------------------|------------------|
| 1     | 30 MHz                        | 0,501            |
| 2     | 150 MHz                       | 1,174            |
| 3     | 400 MHz                       | 2,034            |
| 4     | 800 MHz                       | 2,995            |
| 5     | 1 GHz                         | 3,416            |
| 6     | 1,363                         | 1,666667         |
| 7     | 2,686                         | 3,583333         |
| 8     | 5,332                         | 5,25             |
| 9     | 7,978                         | 6,25             |
| 10    | 10,624                        | 7,5              |
| 11    | 13,27                         | 8,333333         |
| 12    | 15,916                        | 9,166666         |
| 13    | 18,562                        | 9,833333         |
| 14    | 21,208                        | 10,66667         |
| 15    | 23,854                        | 11,5             |
| 16    | 26,5                          | 12,16667         |



#### 4 CONVERSION FACTORS AND ALL OTHER FORMULAS

| Unit                   | Conversion unit                 | Formula of conversion  |
|------------------------|---------------------------------|--|
| $\text{dB}\mu\text{V}$ | $\text{dB}\mu\text{V}/\text{m}$ | $\text{dB}\mu\text{V}/\text{m} = \text{dB}\mu\text{V} + \text{AF}$             |
| $\mu\text{V}/\text{m}$ | $\text{dB}\mu\text{V}/\text{m}$ | $\text{dB}\mu\text{V}/\text{m} = 20\log(X(\mu\text{V}/\text{m})/1\mu\text{V})$ |

|         | Test distance stated in standard | Test distance of measurement | Conversion factor |
|---------|----------------------------------|------------------------------|-------------------|
| Class B | 3 m                              | 3 m                          | /                 |
| Class A | 10 m                             | 3 m                          | 20dB/decade       |

## 5 GENERAL AND SPECIAL CONDITIONS DESCRIPTION

### 5.1 General condition description

#### Interconnect and power cabling (or wiring)

##### 5.1.1 Test arrangement for conducted emissions

Interconnecting cables that hang closer than 40 cm to the ground-plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50  $\Omega$ . LISN can be placed on top of, or immediately beneath, reference ground-plane.

All other equipment powered from additional LISN(s).

Multiple outlet strip can be used for multiple power cords of non-EUT equipment.

LISN at least 80 cm from nearest part of EUT chassis.

Cables of hand-operated devices, such as keyboards, mice, etc., shall be placed as for normal use.

Non-EUT components of EUT system being tested.

Rear of EUT, including peripherals, shall all be aligned and flush with rear of tabletop.

Rear of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground-plane.

##### 5.1.2 Test arrangement for conducted emissions- floor-standing equipment

Excess I/O cables shall be bundled in the center. If bundling is not possible, the cables shall be arranged in serpentine fashion. Bundling shall not exceed 40 cm in length.

Excess power cords shall be bundled in the center or shortened to appropriate length.

I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. If bundling is not possible, the cable shall be arranged in serpentine fashion.

EUT and all cables shall be insulated, if required, from the ground-plane by up to 12 mm of insulating material.

EUT connected to one LISN. LISN can be placed on top of, or immediately beneath, the ground-plane.

All other equipment powered from a second LISN or additional LISN(s).

Multiple outlet strip can be used for multiple power cords of non-EUT equipment.



### **5.1.3 Test arrangement for radiated emissions tabletop equipment**

Interconnecting cables that hang closer than 40 cm to the ground-plane shall be folded back and forth in the center, forming a bundle 30 to 40 cm long.

I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated if required using the correct terminating impedance. The total length shall not exceed 1 m.

If LISNs are kept in the test setup for radiated emissions, it is preferred that they be installed under the ground-plane with the receptacle flush with the ground-plane.

Cables of hand-operated devices, such as keyboards, mice, etc., shall be placed as for normal use.

Non-EUT components of EUT system being tested.

Rear of EUT, including peripherals, shall all be aligned and flush with rear of tabletop.

No vertical conducting plane used.

Power cords drape to the floor and are routed over to receptacle.

### **5.1.4 Test arrangement for radiated emissions floor-standing equipment**

Excess I/O cables shall be bundled in center. If bundling is not possible, the cables shall be arranged in serpentine fashion. Bundling not to exceed 40 cm in length.

Excess power cords shall be bundled in the center or shortened to appropriate length.

I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. If bundling is not possible, the cable shall be arranged in a serpentine fashion.

EUT and all cables shall be insulated, if required, from the ground-plane by up to 12 mm of insulating material.

If LISNs are kept in the test setup for radiated emissions, it is preferred that they be installed under the ground-plane with the receptacle flush with the ground plane.

## Overhead cable trays and suspended ceilings

### 5.1.5 Test arrangement for floor-standing equipment

Only one vertical riser may be used where typical of system under test.

Excess power cord shall be bundled in the center or shortened to appropriate length.

EUT and cables shall be insulated from ground-plane by up to 12 mm. Where the manual has specified or there exists a code of practice for installation of the EUT, the test arrangement shall allow the use of this practice for the tests.

Power cords being measured connected to one LISN. All other system power cords powered through other LISN(s). A multiple receptacle strip may be used for other power cords.

For *conducted* tests, the LISNs may be placed on top of or immediately beneath and bonded directly to the ground-plane. For *radiated* tests, the LISN(s), if used, should be installed under, with the receptacle flush with the ground-plane.

### 5.1.6 Placement and manipulation of interconnect cabling (or wiring) of tabletop equipment

LISN(s) may have to be positioned to the side of the table to meet the criterion that the LISN receptacle shall be 80 cm away from the EUT. LISN(s) may be above ground-plane only for conducted emission measurements.

Accessories, such as ac power adapter, if typically table-mounted, shall occupy peripheral positions as is applicable.

Accessories, which are typically floor-mounted, shall occupy a floor position directly below the portion of the EUT to which they are typically connected. T

Table length may be extended beyond 1.5 m with peripherals aligned with the back edge. The table depth may be extended beyond 1 m. The 40 cm distance to the vertical conducting plane shall be maintained for conducted emission testing.



## Placement of wall-mounted equipment

### 5.1.7 Test configuration/arrangement for combination floor-standing and tabletop equipment

Interconnecting cables that hang closer than 40 cm to the ground-plane shall be folded back and forth in the center, forming a bundle 30 to 40 cm long.

I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated if required using the correct terminating impedance.

If LISNs are kept in the test setup for radiated emissions, it is preferred that they be installed under the ground-plane with the receptacle flush with the ground-plane.

Cables of hand-operated devices, such as keyboards, mice, etc., have to be placed as for normal use.

Non-EUT components of EUT system being tested.

I/O cable to floor-standing unit drapes to the ground-plane and shortened or excess bundled. Cables not reaching the metal ground-plane are draped to the height of the connector or 40 cm, whichever is lower.

Power cords and signal cables shall drape to the floor. No extension cords shall be used to the power receptacles.

The floor-standing unit can be placed under the table if its height permits.

### 5.2 Special condition description

If for some reason the above measurement conditions can't be met, the description below should be used as an appropriate measurement condition and placement.

**(Description is written additionally as the measurements differ – all is within test procedure)**

## 6 TEST SUMMARY

| STANDARDS (details on first page)       | Tested                              |                          | Sample                              |                          |
|---|-------------------------------------|--------------------------|-------------------------------------|--------------------------|
|   | yes                                 | no                       | pass                                | not pass                 |
| ANSI C63.4-2014; FCC Part 15, Subpart C | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

| Test                             | Section within the report | Conclusion |
|----------------------------------|---------------------------|------------|
| Conducted emission               | 7.1                       | PASS       |
| Radiated emission                | 7.2                       | PASS       |
| 20 db Bandwidth                  | 7.2                       | PASS       |
| Radiated emission of the carrier | 7.2                       | PASS       |

### 6.1 Operating voltages/frequencies used for testing

| Section | Test  | Operating conditions                           |
|---------|---|--|
| 7.1     | Conducted emission measurement (intentional radiator) | 24 VDC (120 V; 60 Hz)<br>24 VDC (240 V; 50 Hz) |
| 7.2     | Radiated emission measurement (intentional radiator)  | 24 VDC   |
| 7.2     | 20 db Bandwidth                                       | 24 VDC   |
| 7.2     | Radiated emission of the carrier                      | 24 VDC   |

## 7 EMISSION TESTS

### 7.1 Conducted emission measurement (intentional radiator)

#### 7.1.1 Test instruments

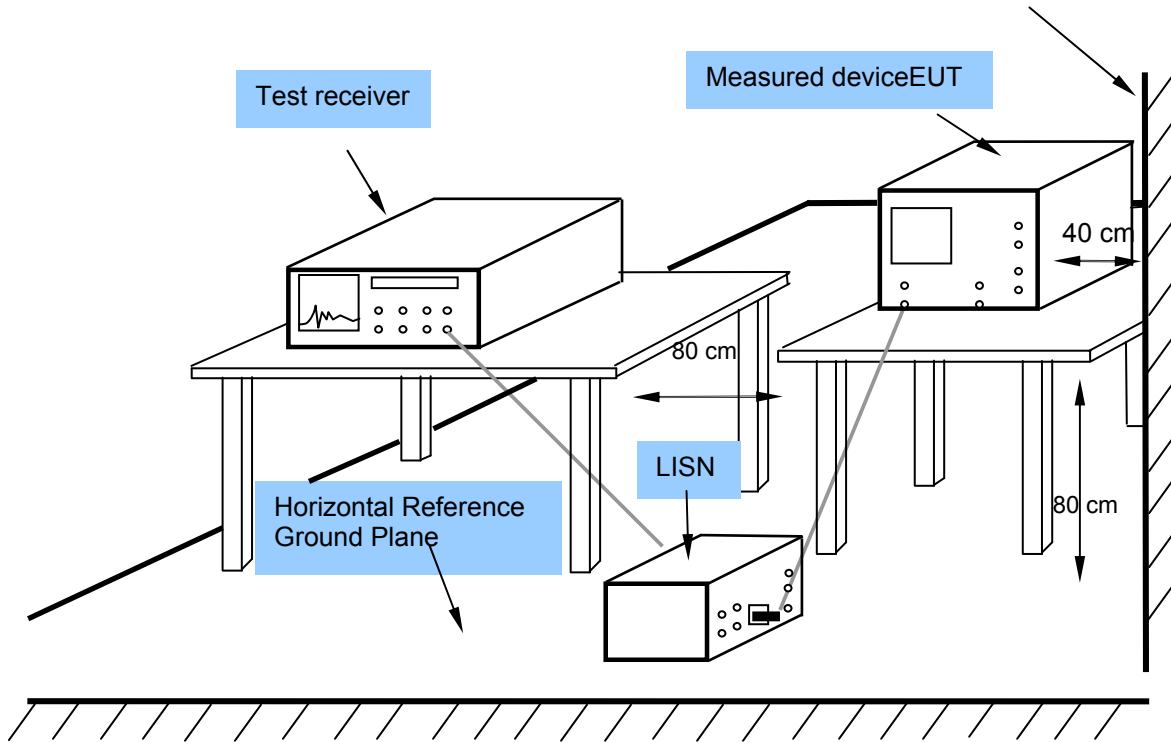
| Description                                    | Model No. | SIQ No. | Last calibration | Calibrated until | Calibration period | Used |
|--|-----------|---------|------------------|------------------|--------------------|------|
| Rohde-Schwarz,<br>RFI receiver                 | ESU26     | 100428  | 2016-02          | 2018-02          | 24 months          | X    |
| Rohde & Schwarz,<br>Artificial main<br>network | ESH2-Z5   | 100406  | 2015-05          | 2017-05          | 24 months          | X    |

#### 7.1.2 Test procedure

- The EUT is placed on a non-conductive 0.8 meters high table, 0.4 meters from the vertical conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). LISN provide 50 Ohm / 50  $\mu$ H + 5 Ohm of coupling impedance for the measuring instrument.
- Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition.
- AC power lines of EUT are checked for maximum conducted interference.
- The frequency range from 150 kHz to 30 MHz is searched using PEAK, QUASI-PEAK and AVERAGE function of the receiver. Bandwidth is set to 9 kHz.
- If applicable functions are changed (data transfer speed, clock speed,...) it should be noted in the test report.



### 7.1.3 Test setup



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

## 7.1.4 Test results

**NOTE:** margin set at measurement is 15 dB. All measurements bellow the level of 15 dB margin are not reported.



**C20161291**

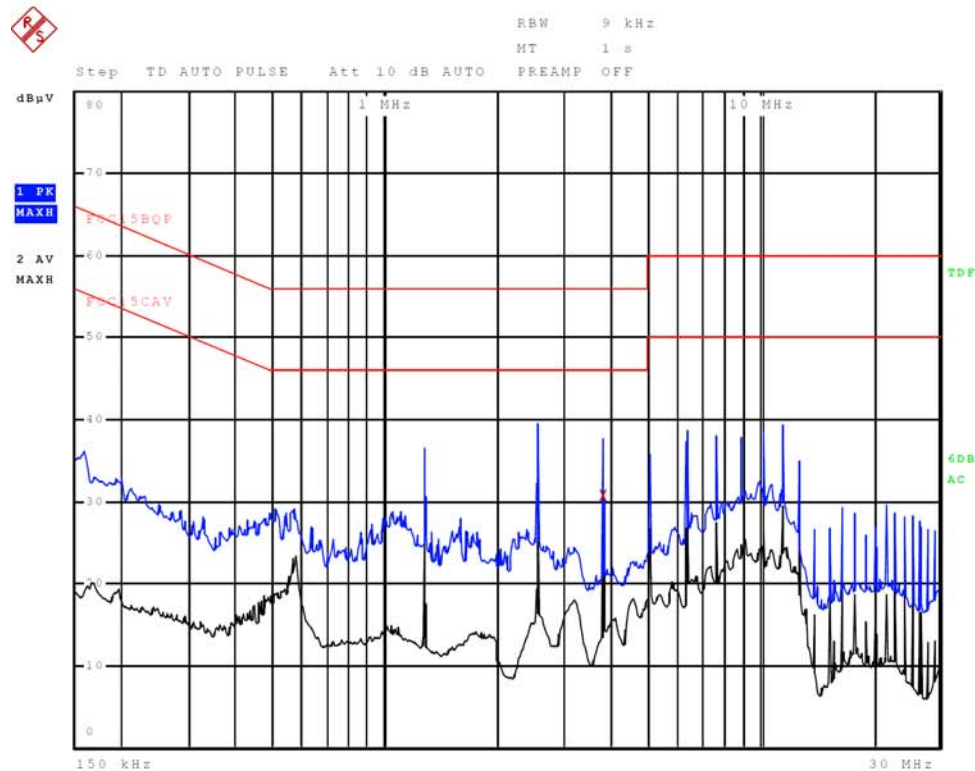
08.Jun 16 12:31

**Meas Type** CONDUCTED EMISSION  
**Equipment under Test** Z-Wave  
**Manufacturer** GOAP d.o.o.  
**OP Condition** CH0, Uin: 120 V, 60 Hz  
**Operator** Andrej Skof  
**Test Spec**  
 PHASE

### Time Domain Scan (1 Range)

Scan Start: 150 kHz  
 Scan Stop: 30 MHz  
 Detector: Trace 1: MAX PEAK Trace 2: Average  
 Transducer: ENV216

| Start Frequency | Stop Frequency | Step Size | Res BW   | Meas Time | RF Atten | Preamp | Input  |
|-----------------|----------------|-----------|----------|-----------|----------|--------|--------|
| 150.000000 kHz  | 30.000000 MHz  | 2.25 kHz  | 9.00 kHz | 30 ms     | Auto     | 0 dB   | INPUT2 |



**ROHDE & SCHWARZ****C20161291**

08.Jun 16 12:31

Meas Type CONDUCTED EMISSION  
Equipment under Test Z-Wave  
Manufacturer GOAP d.o.o.  
OP Condition CH0, Uin: 120 V, 60 Hz  
Operator Andrej Skof  
Test Spec  
PHASE

**Final Measurement**

Meas Time: 1 s  
Margin: 15 dB  
Peaks: 1

| Trace | Frequency       | Level (dB $\mu$ V) | Detector     | Delta Limit/dB |
|-------|-----------------|--------------------|--------------|----------------|
| 2     | 3.819750000 MHz | 30.65              | CISPR Averag | -15.35         |

**C20161291**

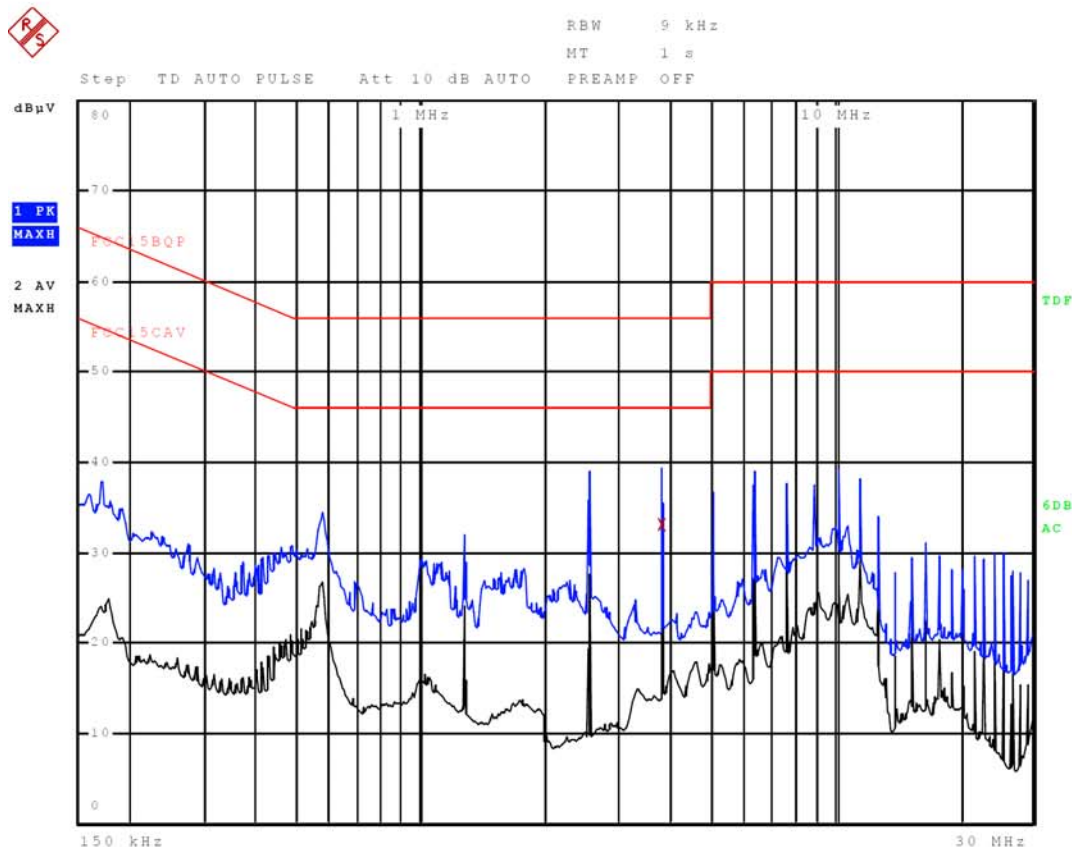
08.Jun 16 12:30

**Meas Type** CONDUCTED EMISSION  
**Equipment under Test** Z-Wave  
**Manufacturer** GOAP d.o.o.  
**OP Condition** CH0, Uin: 120 V, 60 Hz  
**Operator** Andrej Skof  
**Test Spec**  
 NEUTRAL

**Time Domain Scan (1 Range)**

Scan Start: 150 kHz  
 Scan Stop: 30 MHz  
 Detector: Trace 1: MAX PEAK Trace 2: Average  
 Transducer: ENV216

| Start Frequency | Stop Frequency | Step Size | Res BW   | Meas Time | RF Atten | Preamp | Input  |
|-----------------|----------------|-----------|----------|-----------|----------|--------|--------|
| 150.000000 kHz  | 30.000000 MHz  | 2.25 kHz  | 9.00 kHz | 30 ms     | Auto     | 0 dB   | INPUT2 |



**ROHDE & SCHWARZ****C20161291**

08.Jun 16 12:30

Meas Type CONDUCTED EMISSION  
Equipment under Test Z-Wave  
Manufacturer GOAP d.o.o.  
OP Condition CH0, Uin: 120 V, 60 Hz  
Operator Andrej Skof  
Test Spec  
NEUTRAL

**Final Measurement**

Meas Time: 1 s  
Margin: 15 dB  
Peaks: 1

| Trace | Frequency       | Level (dB $\mu$ V) | Detector     | Delta Limit/dB |
|-------|-----------------|--------------------|--------------|----------------|
| 2     | 3.822000000 MHz | 32.98              | CISPR Averag | -13.02         |

**C20161291**

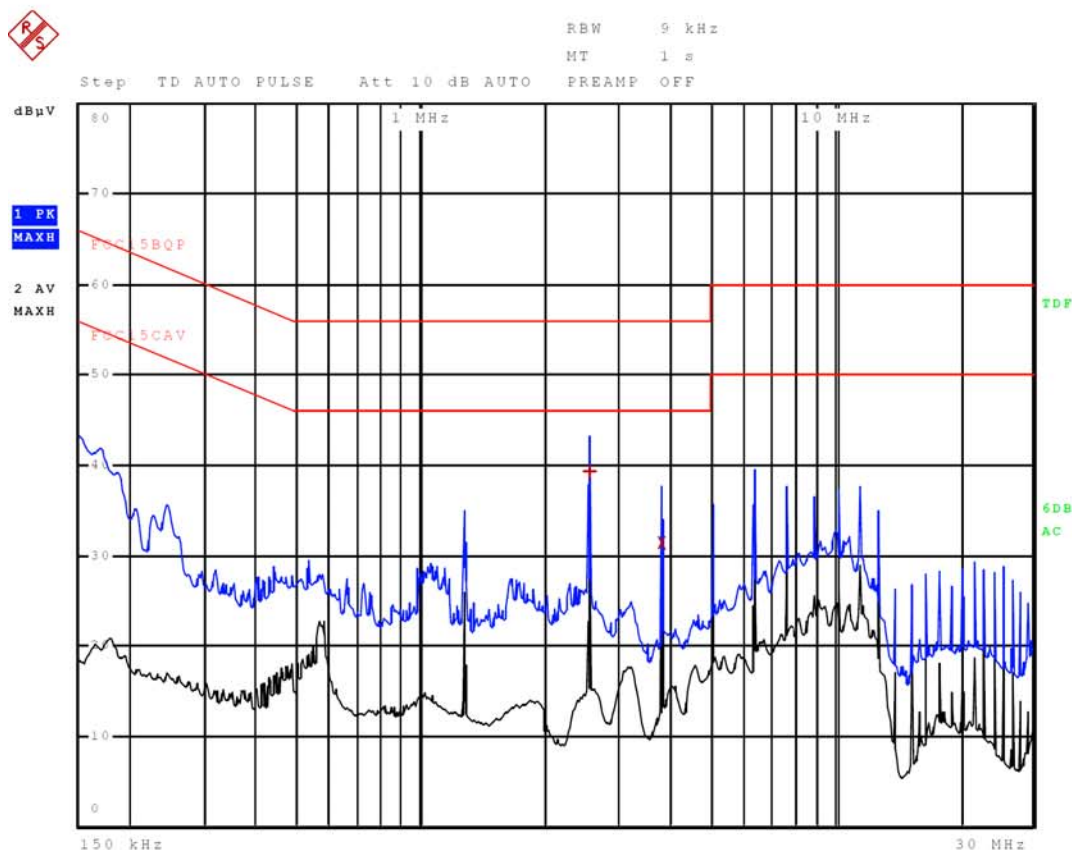
08.Jun 16 12:35

**Meas Type** CONDUCTED EMISSION  
**Equipment under Test** Z-Wave  
**Manufacturer** GOAP d.o.o.  
**OP Condition** CH1, Uin: 120 V, 60 Hz  
**Operator** Andrej Skof  
**Test Spec**  
 PHASE

**Time Domain Scan (1 Range)**

Scan Start: 150 kHz  
 Scan Stop: 30 MHz  
 Detector: Trace 1: MAX PEAK Trace 2: Average  
 Transducer: ENV216

| Start Frequency | Stop Frequency | Step Size | Res BW   | Meas Time | RF Atten | Preamp | Input  |
|-----------------|----------------|-----------|----------|-----------|----------|--------|--------|
| 150.000000 kHz  | 30.000000 MHz  | 2.25 kHz  | 9.00 kHz | 30 ms     | Auto     | 0 dB   | INPUT2 |



**ROHDE & SCHWARZ****C20161291**

08.Jun 16 12:35

Meas Type CONDUCTED EMISSION  
Equipment under Test Z-Wave  
Manufacturer GOAP d.o.o.  
OP Condition CH1, Uin: 120 V, 60 Hz  
Operator Andrej Skof  
Test Spec  
PHASE

**Final Measurement**

Meas Time: 1 s  
Margin: 15 dB  
Peaks: 2

| Trace | Frequency       | Level (dBμV) | Detector     | Delta Limit/dB |
|-------|-----------------|--------------|--------------|----------------|
| 2     | 3.822000000 MHz | 31.33        | CISPR Averag | -14.67         |
| 1     | 2.548500000 MHz | 39.19        | Quasi Peak   | -16.81         |

**C20161291**

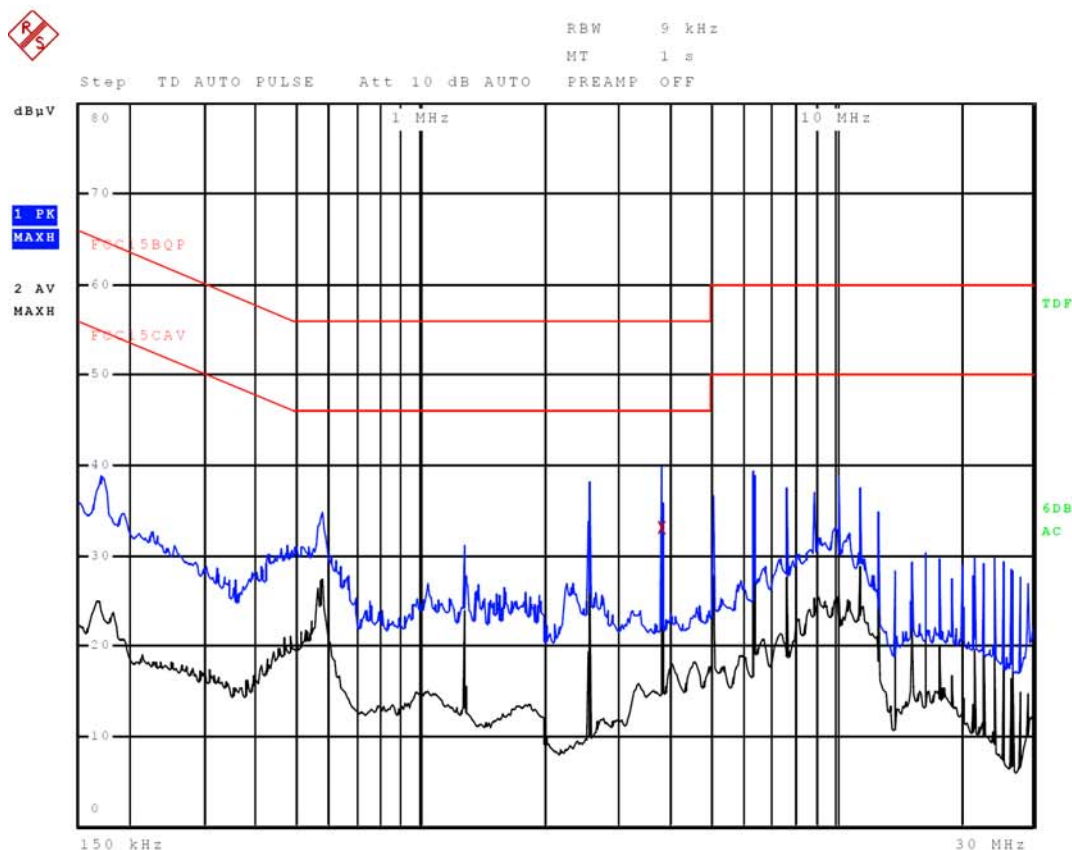
08.Jun 16 12:36

**Meas Type** CONDUCTED EMISSION  
**Equipment under Test** Z-Wave  
**Manufacturer** GOAP d.o.o.  
**OP Condition** CH1, Uin: 120 V, 60 Hz  
**Operator** Andrej Skof  
**Test Spec**  
 NEUTRAL

**Time Domain Scan (1 Range)**

Scan Start: 150 kHz  
 Scan Stop: 30 MHz  
 Detector: Trace 1: MAX PEAK Trace 2: Average  
 Transducer: ENV216

| Start Frequency | Stop Frequency | Step Size | Res BW   | Meas Time | RF Atten | Preamp | Input  |
|-----------------|----------------|-----------|----------|-----------|----------|--------|--------|
| 150.000000 kHz  | 30.000000 MHz  | 2.25 kHz  | 9.00 kHz | 30 ms     | Auto     | 0 dB   | INPUT2 |





**ROHDE & SCHWARZ****C20161291**

08.Jun 16 12:36

Meas Type CONDUCTED EMISSION  
Equipment under Test Z-Wave  
Manufacturer GOAP d.o.o.  
OP Condition CH1, Uin: 120 V, 60 Hz  
Operator Andrej Skof  
Test Spec  
NEUTRAL

**Final Measurement**

Meas Time: 1 s  
Margin: 15 dB  
Peaks: 1

| Trace | Frequency       | Level (dB $\mu$ V) | Detector     | Delta Limit/dB |
|-------|-----------------|--------------------|--------------|----------------|
| 2     | 3.819750000 MHz | 32.99              | CISPR Averag | -13.01         |

**C20161291**

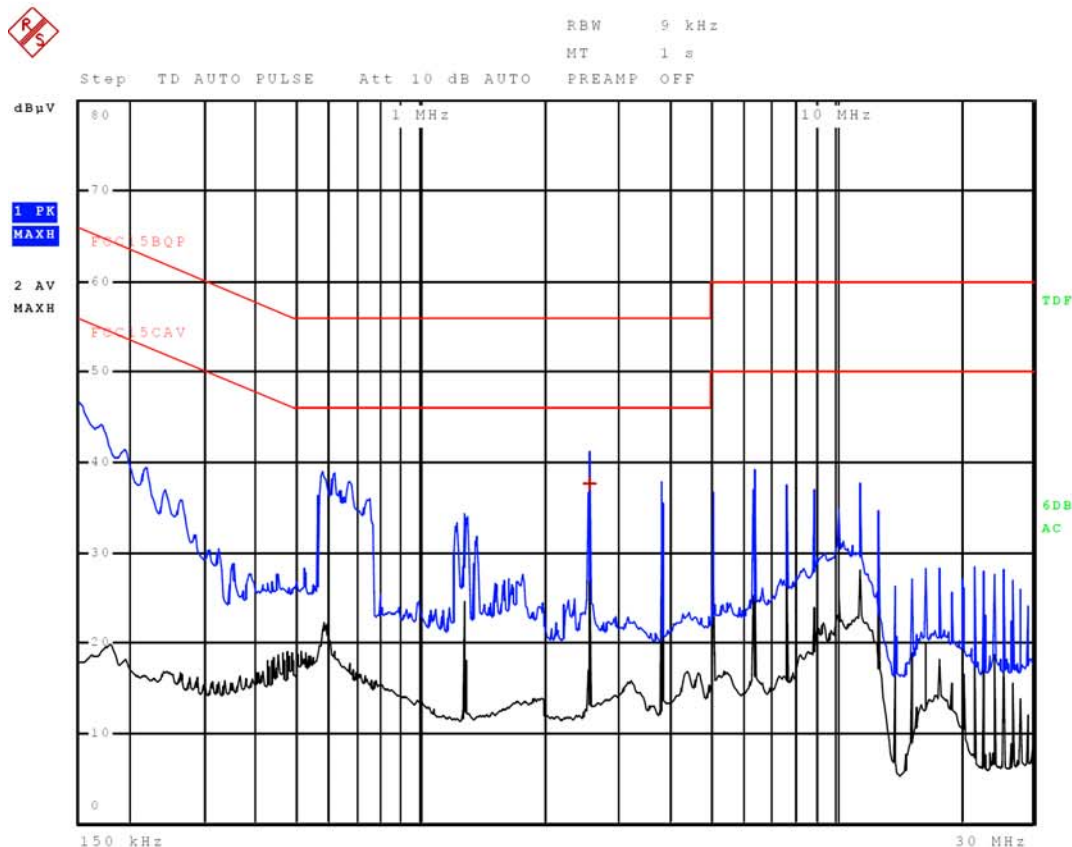
08.Jun 16 12:29

**Meas Type** CONDUCTED EMISSION  
**Equipment under Test** Z-Wave  
**Manufacturer** GOAP d.o.o.  
**OP Condition** CH0, Uin: 240 V, 50 Hz  
**Operator** Andrej Skof  
**Test Spec**  
 PHASE

**Time Domain Scan (1 Range)**

Scan Start: 150 kHz  
 Scan Stop: 30 MHz  
 Detector: Trace 1: MAX PEAK Trace 2: Average  
 Transducer: ENV216

| Start Frequency | Stop Frequency | Step Size | Res BW   | Meas Time | RF Atten | Preamp | Input  |
|-----------------|----------------|-----------|----------|-----------|----------|--------|--------|
| 150.000000 kHz  | 30.000000 MHz  | 2.25 kHz  | 9.00 kHz | 30 ms     | Auto     | 0 dB   | INPUT2 |



**ROHDE & SCHWARZ****C20161291**

08.Jun 16 12:29

Meas Type CONDUCTED EMISSION  
Equipment under Test Z-Wave  
Manufacturer GOAP d.o.o.  
OP Condition CH0, Uin: 240 V, 50 Hz  
Operator Andrej Skof  
Test Spec  
PHASE

**Final Measurement**

Meas Time: 1 s  
Margin: 15 dB  
Peaks: 1

| Trace | Frequency       | Level (dBμV) | Detector   | Delta Limit/dB |
|-------|-----------------|--------------|------------|----------------|
| 1     | 2.548500000 MHz | 37.53        | Quasi Peak | -18.47         |

**C20161291**

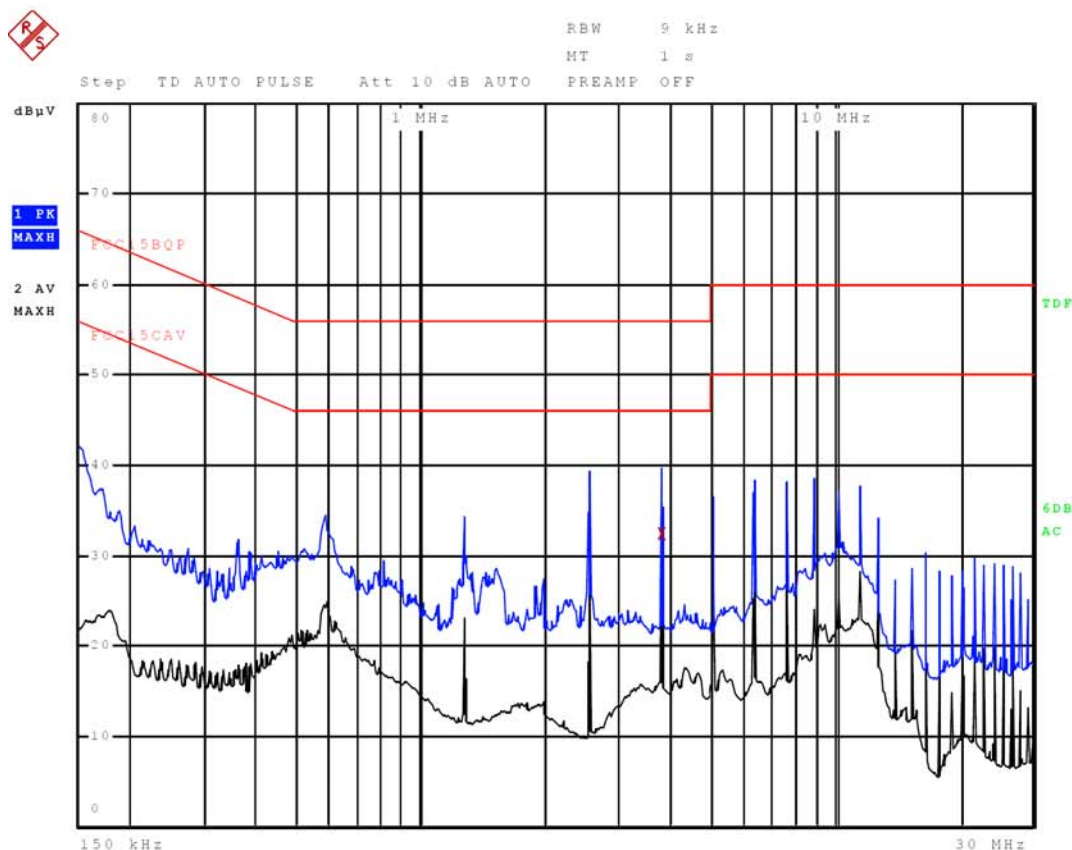
08.Jun 16 12:30

**Meas Type** CONDUCTED EMISSION  
**Equipment under Test** Z-Wave  
**Manufacturer** GOAP d.o.o.  
**OP Condition** CH0, Uin: 240 V, 50 Hz  
**Operator** Andrej Skof  
**Test Spec**  
 NEUTRAL

**Time Domain Scan (1 Range)**

Scan Start: 150 kHz  
 Scan Stop: 30 MHz  
 Detector: Trace 1: MAX PEAK Trace 2: Average  
 Transducer: ENV216

| Start Frequency | Stop Frequency | Step Size | Res BW   | Meas Time | RF Atten | Preamp | Input  |
|-----------------|----------------|-----------|----------|-----------|----------|--------|--------|
| 150.000000 kHz  | 30.000000 MHz  | 2.25 kHz  | 9.00 kHz | 30 ms     | Auto     | 0 dB   | INPUT2 |



**ROHDE & SCHWARZ****C20161291**

08.Jun 16 12:30

Meas Type CONDUCTED EMISSION  
Equipment under Test Z-Wave  
Manufacturer GOAP d.o.o.  
OP Condition CH0, Uin: 240 V, 50 Hz  
Operator Andrej Skof  
Test Spec  
NEUTRAL

**Final Measurement**

Meas Time: 1 s  
Margin: 15 dB  
Peaks: 1

| Trace | Frequency       | Level (dBμV) | Detector     | Delta Limit/dB |
|-------|-----------------|--------------|--------------|----------------|
| 2     | 3.822000000 MHz | 32.30        | CISPR Averag | -13.70         |

## 7.2 Radiated emission measurement (intentional radiator)

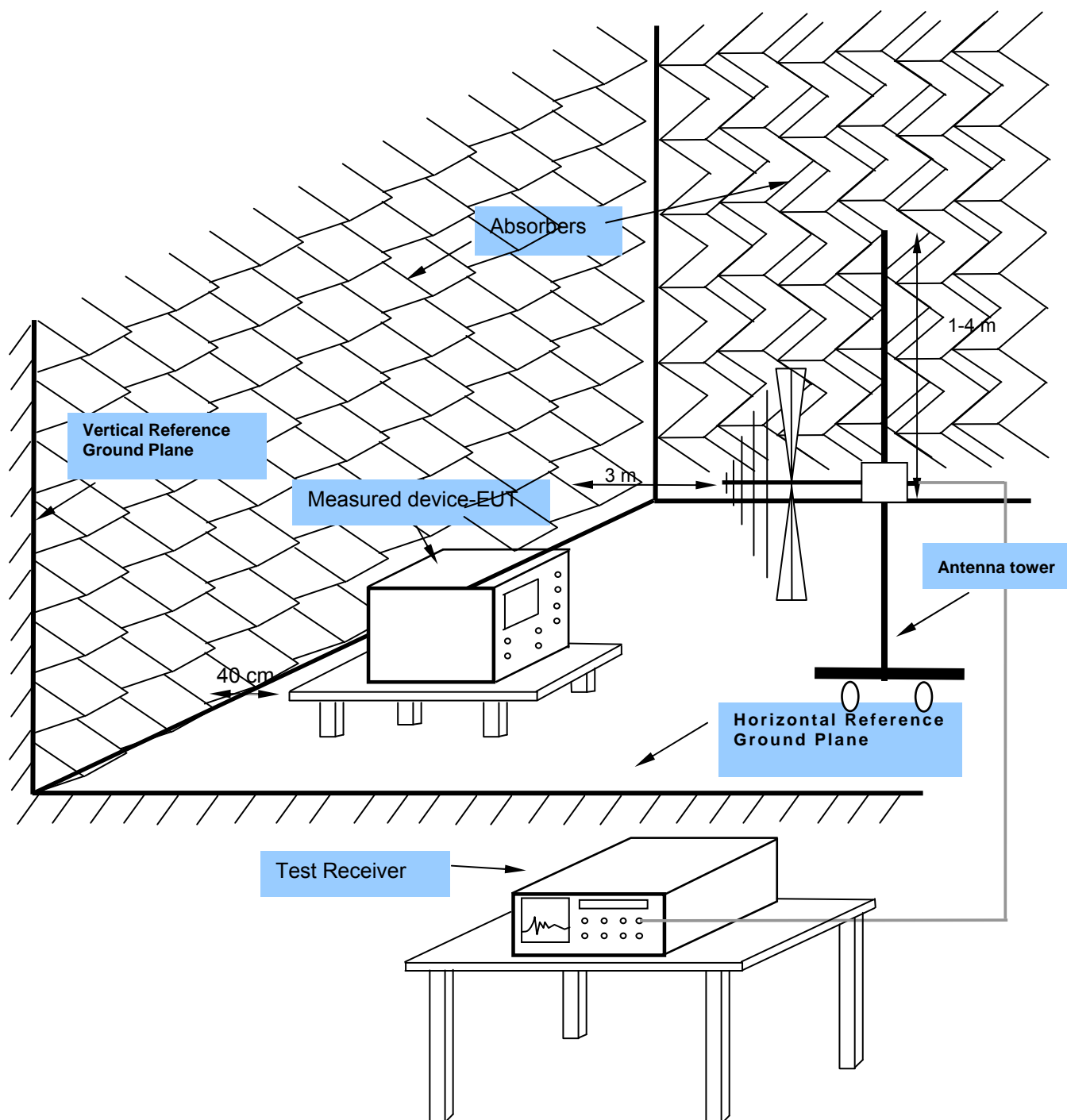
### 7.2.1 Test instruments

| Description & Manufacturer                  | Model No. | SIQ No. | Last calibration | Calibrated until | Calibration period | Used |
|---|-----------|---------|------------------|------------------|--------------------|------|
| ETS, Anechoic chamber                       | 3m        | 103949  | 2014-11          | 2016-11          | 24 months          | X    |
| Rohde-Schwarz, RFI receiver                 | ESU8      | 105187  | 2015-11          | 2017-11          | 24 months          |      |
| Rohde-Schwarz, RFI receiver                 | ESU26     | 100428  | 2016-02          | 2018-02          | 24 months          | X    |
| R&S, Antenna                                | HFH2-Z2   | /       | 2015-09          | 2017-09          | 24 months          | X    |
| EMCO, Antenna                               | 3142B     | 104351  | 2015-09          | 2017-09          | 24 months          | X    |
| EMCO, Antenna                               | 3115      | 103002  | 2015-09          | 2017-09          | 24 months          | X    |
| Heinrich Deisel, Turn table                 | DS 420.00 | 103337  | NA               | NA               | NA                 | X    |
| Antenna tower                               | /         | /       | NA               | NA               | NA                 | X    |
| Controller for turn table and antenna tower | /         | /       | NA               | NA               | NA                 | X    |

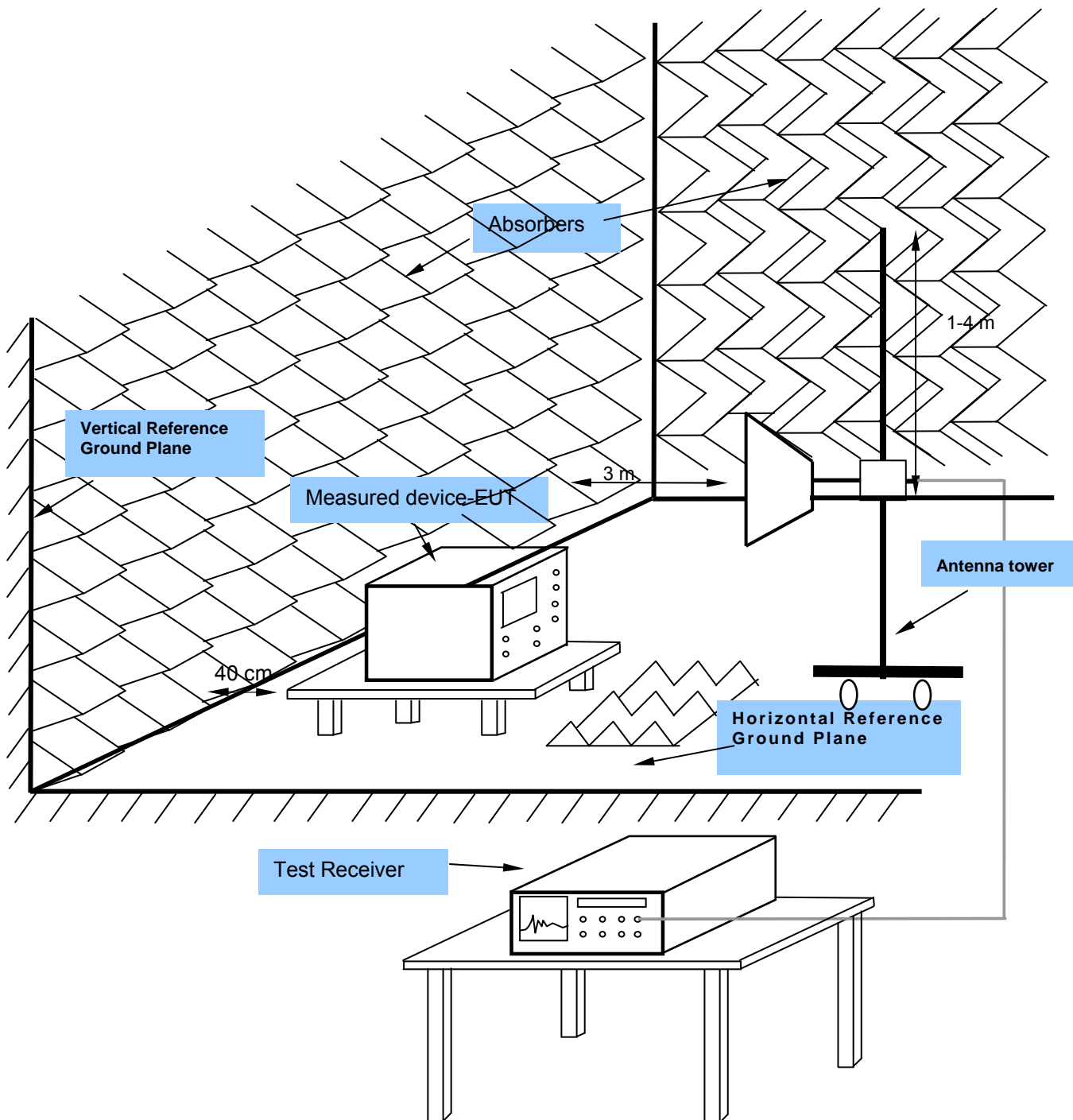
### 7.2.2 Test procedure

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground in an Anechoic Chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 m away from the interference-receiving antenna, which was mounted on the top of variable-height antenna tower.
3. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the turn table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to PEAK and QUAS-PEAK Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. The highest points would be re-tested one by one using the quasi-peak method.
7. 20 dB Occupied Bandwidth: The occupied bandwidth was measured as the width of the spectral envelope of the modulated signal, at an amplitude level reduced from a reference value by a 20 dB. The spectrum analyzer center frequency was set to the nominal EUT channel center frequency. The test-receiver system was set to PEAK Detect Function with Maximum Hold Mode. Placed were two markers, one at the lowest frequency and the other at the highest frequency of the envelope of the spectral display, such that each marker was 20 dB below the reference value. The occupied bandwidth is the frequency difference between the two markers. If EUT has detachable antenna the measurement shall be performed at the antenna connector. If radiated measurements were performed the same test setup was used as with the radiated emission measurements for the appropriate frequency range.

### 7.2.3 Test setup



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.



## 7.2.4 Test result (15.209)

**NOTE:** margin set at measurement is 10, 20 and 40 dB (depending on the measurement). All measurements bellow the level of margin are not reported.


**C20161291**

08.Jun 16 12:02

Meas Type RADIATED EMISSION  
Equipment under Test Z-Wave  
Manufacturer GOAP d.o.o.  
OP Condition CH0  
Operator Andrej Skof

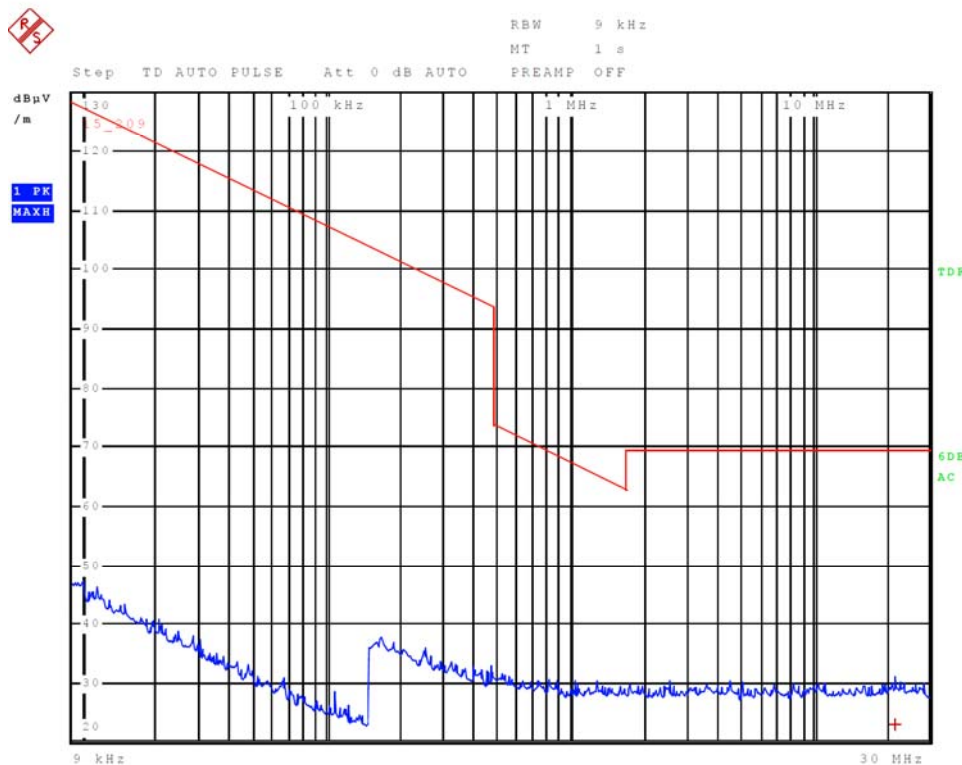
### Test Spec

Antenna: 0 deg, Sample: 0 deg

### Time Domain Scan (2 Ranges)

Scan Start: 9 kHz  
Scan Stop: 30 MHz  
Detector: Trace 1: MAX PEAK  
Transducer: HFH2-Z2V

| Start Frequency | Stop Frequency | Step Size | Res BW    | Meas Time | RF Atten | Preamp | Input  |
|-----------------|----------------|-----------|-----------|-----------|----------|--------|--------|
| 9.000000 kHz    | 149.950000 kHz | 50.00 Hz  | 200.00 Hz | 300 ms    | Auto     | 0 dB   | INPUT2 |
| 150.000000 kHz  | 30.000000 MHz  | 2.25 kHz  | 9.00 kHz  | 30 ms     | Auto     | 0 dB   | INPUT2 |



**C20161291**

08.Jun 16 12:02

Meas Type RADIATED EMISSION  
Equipment under Test Z-Wave  
Manufacturer GOAP d.o.o.  
OP Condition CH0  
Operator Andrej Skof

**Test Spec**

Antenna: 0 deg, Sample: 0 deg

**Final Measurement**

Meas Time: 1 s  
Margin: 40 dB  
Peaks: 1

| Trace | Frequency        | Level (dB $\mu$ V/m) | Detector   | Delta Limit/dB |
|-------|------------------|----------------------|------------|----------------|
| 1     | 21.570000000 MHz | 22.99                | Quasi Peak | -46.51         |

**ROHDE & SCHWARZ****C20161291**

08.Jun 16 11:56

Meas Type RADIATED EMISSION  
Equipment under Test Z-Wave  
Manufacturer GOAP d.o.o.  
OP Condition CH1  
Operator Andrej Skof

**Test Spec**

Antenna: 0 deg, Sample: 0 deg

**Time Domain Scan (2 Ranges)**

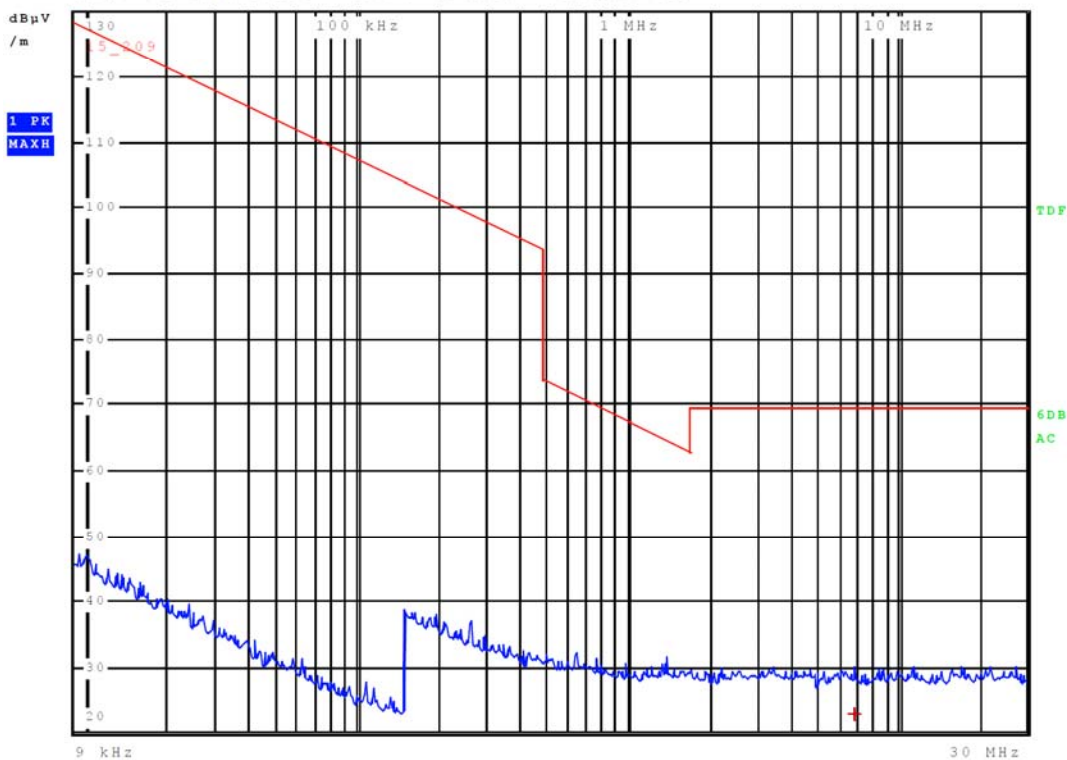
Scan Start: 9 kHz  
Scan Stop: 30 MHz  
Detector: Trace 1: MAX PEAK  
Transducer: HFH2-Z2V

| Start Frequency | Stop Frequency | Step Size | Res BW    | Meas Time | RF Atten | Preamp | Input  |
|-----------------|----------------|-----------|-----------|-----------|----------|--------|--------|
| 9.000000 kHz    | 149.950000 kHz | 50.00 Hz  | 200.00 Hz | 300 ms    | Auto     | 0 dB   | INPUT2 |
| 150.000000 kHz  | 30.000000 MHz  | 2.25 kHz  | 9.00 kHz  | 30 ms     | Auto     | 0 dB   | INPUT2 |



RBW 9 kHz  
MT 1 s

Step TD AUTO PULSE Att 0 dB AUTO PREAMP OFF



**C20161291**

08.Jun 16 11:56

Meas Type RADIATED EMISSION  
Equipment under Test Z-Wave  
Manufacturer GOAP d.o.o.  
OP Condition CH1  
Operator Andrej Skof

**Test Spec**

Antenna: 0 deg, Sample: 0 deg

**Final Measurement**

Meas Time: 1 s  
Margin: 40 dB  
Peaks: 1

| Trace | Frequency       | Level (dB $\mu$ V/m) | Detector   | Delta Limit/dB |
|-------|-----------------|----------------------|------------|----------------|
| 1     | 6.940500000 MHz | 22.97                | Quasi Peak | -46.53         |

**Meas Type** RADIATED EMISSION  
**Equipment under Test** Z-Wave  
**Manufacturer** GOAP d.o.o.  
**OP Condition** CH0  
**Operator** Andrej Skof  
**Test Spec**  
 VERTICAL 100 cm, 0 deg

### Time Domain Scan (1 Range)

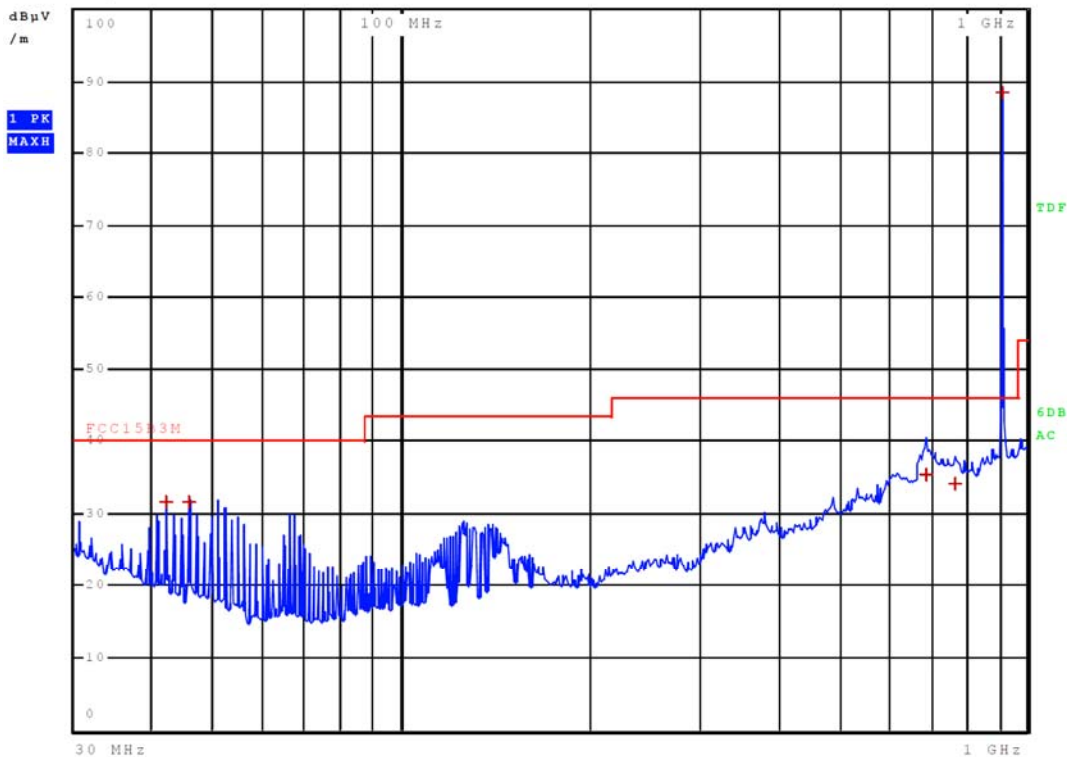
**Scan Start:** 30 MHz  
**Scan Stop:** 1 GHz  
**Detector:** Trace 1: MAX PEAK  
**Transducer:** 3142B3m

| Start Frequency | Stop Frequency | Step Size | Res BW     | Meas Time | RF Atten | Preamp | Input  |
|-----------------|----------------|-----------|------------|-----------|----------|--------|--------|
| 30.000000 MHz   | 1.000000 GHz   | 30.00 kHz | 120.00 kHz | 1 ms      | Auto     | 0 dB   | INPUT2 |



RBW 120 kHz  
 MT 1 s  
 PREAMP OFF

Step TD AUTO PULSE Att 0 dB AUTO PREAMP OFF



**C20161291**

08.Jun 16 10:07

**Meas Type** RADIATED EMISSION  
**Equipment under Test** Z-Wave  
**Manufacturer** GOAP d.o.o.  
**OP Condition** CH0  
**Operator** Andrej Skof

**Test Spec**  
 VERTICAL 100 cm, 0 deg

**Final Measurement**

**Meas Time:** 1 s  
**Margin:** 10 dB  
**Subranges:** 5

| Trace | Frequency         | Level (dBμV/m) | Detector   | Delta Limit/dB |
|-------|-------------------|----------------|------------|----------------|
| 1     | 915.960000000 MHz | 88.38          | Quasi Peak | 42.38          |
| 1     | 41.970000000 MHz  | 31.59          | Quasi Peak | -8.41          |
| 1     | 45.810000000 MHz  | 31.58          | Quasi Peak | -8.42          |
| 1     | 688.470000000 MHz | 35.32          | Quasi Peak | -10.68         |
| 1     | 766.830000000 MHz | 34.09          | Quasi Peak | -11.91         |

**Meas Type** RADIATED EMISSION  
**Equipment under Test** Z-Wave  
**Manufacturer** GOAP d.o.o.  
**OP Condition** CH0  
**Operator** Andrej Skof  
**Test Spec**  
 HORIZONTAL 100 cm, 0 deg

### Time Domain Scan (1 Range)

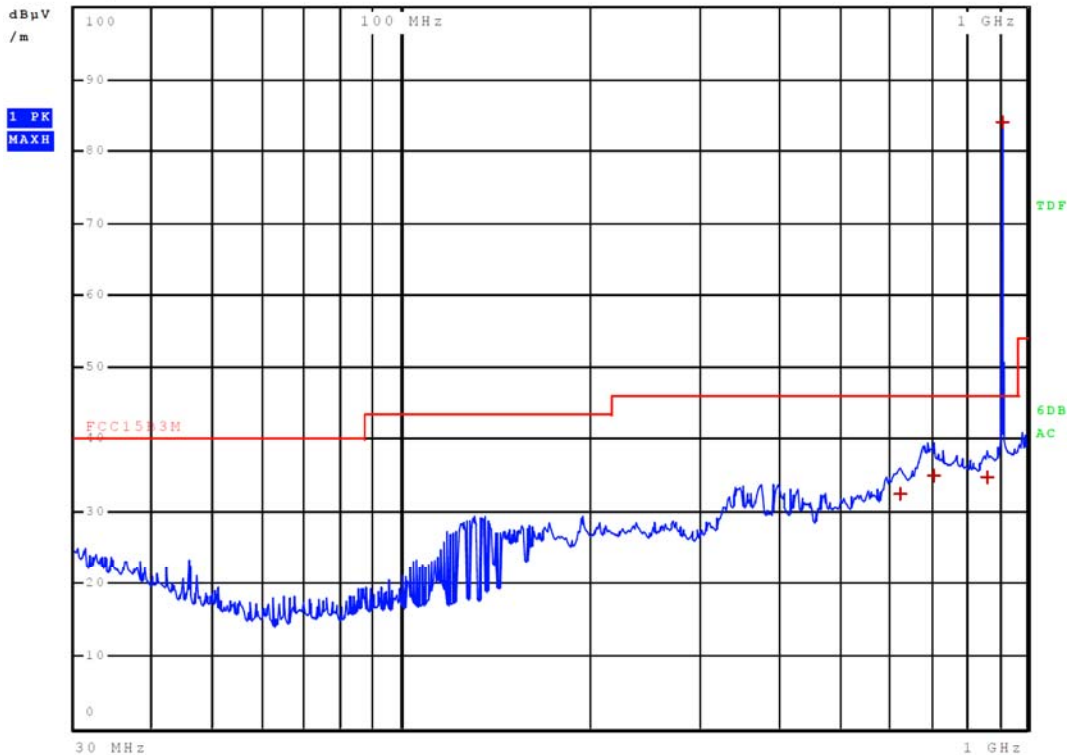
**Scan Start:** 30 MHz  
**Scan Stop:** 1 GHz  
**Detector:** Trace 1: MAX PEAK  
**Transducer:** 3142B3m

| Start Frequency | Stop Frequency | Step Size | Res BW     | Meas Time | RF Atten | Preamp | Input  |
|-----------------|----------------|-----------|------------|-----------|----------|--------|--------|
| 30.000000 MHz   | 1.000000 GHz   | 30.00 kHz | 120.00 kHz | 1 ms      | Auto     | 0 dB   | INPUT2 |



RBW 120 kHz  
 MT 1 s

Step TD AUTO PULSE Att 0 dB AUTO PREAMP OFF



**C20161291**

08.Jun 16 10:09

**Meas Type** RADIATED EMISSION  
**Equipment under Test** Z-Wave  
**Manufacturer** GOAP d.o.o.  
**OP Condition** CH0  
**Operator** Andrej Skof

**Test Spec**  
 HORIZONTAL 100 cm, 0 deg

**Final Measurement**

**Meas Time:** 1 s  
**Margin:** 10 dB  
**Subranges:** 4

| Trace | Frequency         | Level (dBμV/m) | Detector   | Delta Limit/dB |
|-------|-------------------|----------------|------------|----------------|
| 1     | 915.960000000 MHz | 83.86          | Quasi Peak | 37.86          |
| 1     | 708.540000000 MHz | 35.03          | Quasi Peak | -10.97         |
| 1     | 862.170000000 MHz | 34.75          | Quasi Peak | -11.25         |
| 1     | 628.290000000 MHz | 32.42          | Quasi Peak | -13.58         |



**Meas Type** RADIATED EMISSION  
**Equipment under Test** Z-Wave  
**Manufacturer** GOAP d.o.o.  
**OP Condition** CH1  
**Operator** Andrej Skof  
**Test Spec**  
 VERTICAL 100 cm, 0 deg

### Time Domain Scan (1 Range)

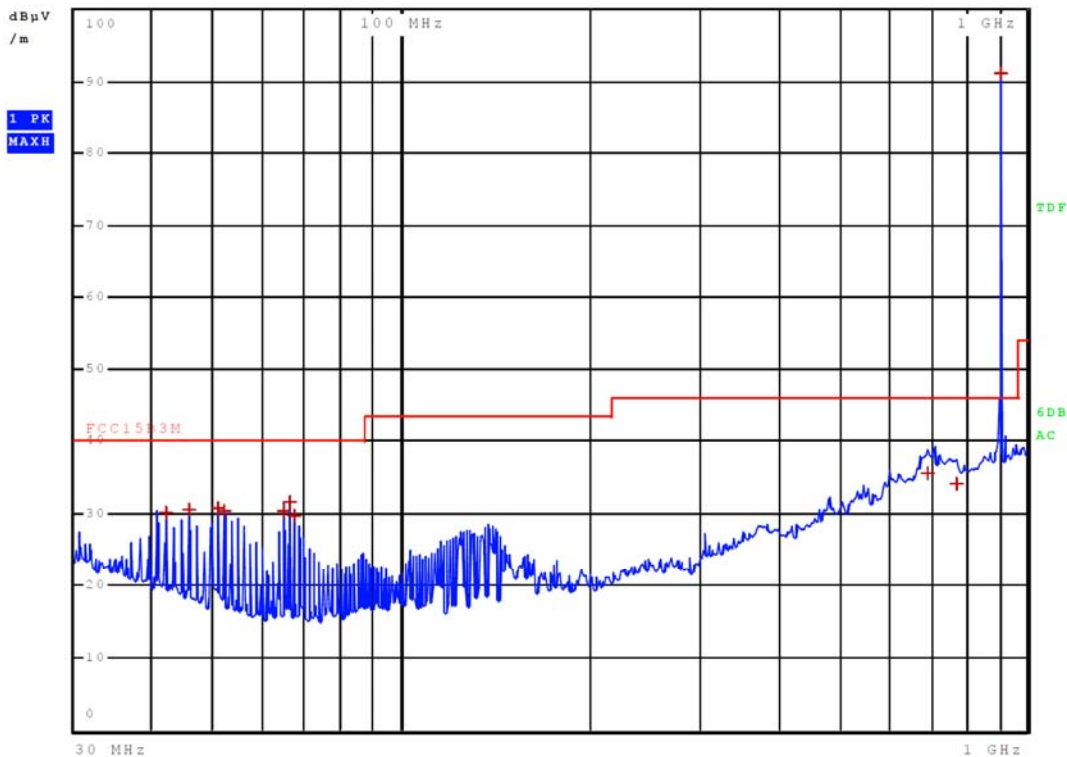
**Scan Start:** 30 MHz  
**Scan Stop:** 1 GHz  
**Detector:** Trace 1: MAX PEAK  
**Transducer:** 3142B3m

| Start Frequency | Stop Frequency | Step Size | Res BW     | Meas Time | RF Atten | Preamp | Input  |
|-----------------|----------------|-----------|------------|-----------|----------|--------|--------|
| 30.000000 MHz   | 1.000000 GHz   | 30.00 kHz | 120.00 kHz | 1 ms      | Auto     | 0 dB   | INPUT2 |



RBW 120 kHz  
 MT 1 s

Step TD AUTO PULSE Att 0 dB AUTO PREAMP OFF



**C20161291**

08.Jun 16 10:25

**Meas Type** RADIATED EMISSION  
**Equipment under Test** Z-Wave  
**Manufacturer** GOAP d.o.o.  
**OP Condition** CH1  
**Operator** Andrej Skof

**Test Spec**  
 VERTICAL 100 cm, 0 deg

**Final Measurement**

**Meas Time:** 1 s  
**Margin:** 10 dB  
**Peaks:** 10

| Trace | Frequency         | Level (dBμV/m) | Detector   | Delta Limit/dB |
|-------|-------------------|----------------|------------|----------------|
| 1     | 908.370000000 MHz | 91.00          | Quasi Peak | 45.00          |
| 1     | 66.120000000 MHz  | 31.54          | Quasi Peak | -8.46          |
| 1     | 50.850000000 MHz  | 30.83          | Quasi Peak | -9.17          |
| 1     | 45.780000000 MHz  | 30.54          | Quasi Peak | -9.46          |
| 1     | 64.860000000 MHz  | 30.40          | Quasi Peak | -9.60          |
| 1     | 52.110000000 MHz  | 30.29          | Quasi Peak | -9.71          |
| 1     | 41.970000000 MHz  | 30.21          | Quasi Peak | -9.79          |
| 1     | 67.380000000 MHz  | 29.63          | Quasi Peak | -10.37         |
| 1     | 694.350000000 MHz | 35.55          | Quasi Peak | -10.45         |
| 1     | 770.970000000 MHz | 34.11          | Quasi Peak | -11.89         |



ROHDE &amp; SCHWARZ

C20161291

08.Jun 16 10:11

Meas Type RADIATED EMISSION  
Equipment under Test Z-Wave  
Manufacturer GOAP d.o.o.  
OP Condition CH1  
Operator Andrej Skof  
Test Spec  
HORIZONTAL 100 cm, 0 deg

**Time Domain Scan (1 Range)**

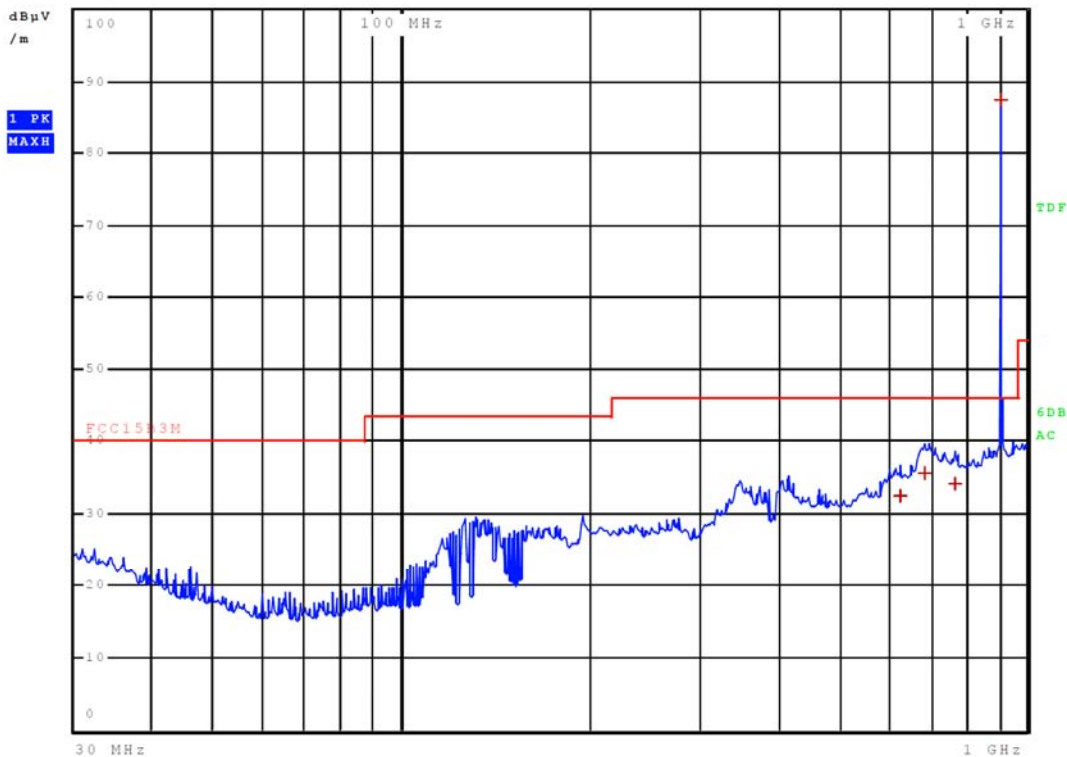
Scan Start: 30 MHz  
Scan Stop: 1 GHz  
Detector: Trace 1: MAX PEAK  
Transducer: 3142B3m

| Start Frequency | Stop Frequency | Step Size | Res BW     | Meas Time | RF Atten | Preamp | Input  |
|-----------------|----------------|-----------|------------|-----------|----------|--------|--------|
| 30.000000 MHz   | 1.000000 GHz   | 30.00 kHz | 120.00 kHz | 1 ms      | Auto     | 0 dB   | INPUT2 |



RBW 120 kHz  
MT 1 s

Step TD AUTO PULSE Att 0 dB AUTO PREAMP OFF



**C20161291**

08.Jun 16 10:11

**Meas Type** RADIATED EMISSION  
**Equipment under Test** Z-Wave  
**Manufacturer** GOAP d.o.o.  
**OP Condition** CH1  
**Operator** Andrej Skof

**Test Spec**  
 HORIZONTAL 100 cm, 0 deg

**Final Measurement**

**Meas Time:** 1 s  
**Margin:** 10 dB  
**Subranges:** 4

| Trace | Frequency         | Level (dBμV/m) | Detector   | Delta Limit/dB |
|-------|-------------------|----------------|------------|----------------|
| 1     | 908.370000000 MHz | 87.20          | Quasi Peak | 41.20          |
| 1     | 686.070000000 MHz | 35.53          | Quasi Peak | -10.47         |
| 1     | 767.790000000 MHz | 34.13          | Quasi Peak | -11.87         |
| 1     | 626.790000000 MHz | 32.38          | Quasi Peak | -13.62         |

**Meas Type** RADIATED EMISSION  
**Equipment under Test** Z-Wave  
**Manufacturer** GOAP d.o.o.  
**OP Condition** CH1  
**Operator** Andrej Skof  
**Test Spec**  
 VERTICAL 100 cm, 15 deg

### Time Domain Scan (1 Range)

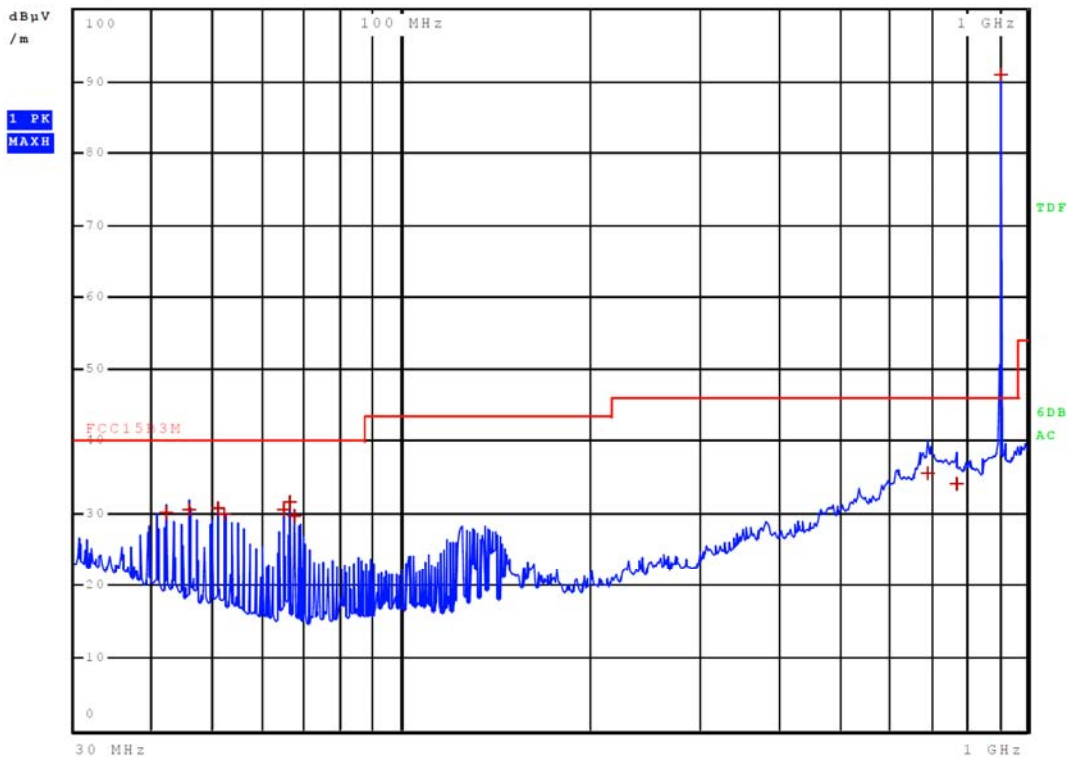
**Scan Start:** 30 MHz  
**Scan Stop:** 1 GHz  
**Detector:** Trace 1: MAX PEAK  
**Transducer:** 3142B3m

| Start Frequency | Stop Frequency | Step Size | Res BW     | Meas Time | RF Atten | Preamp | Input  |
|-----------------|----------------|-----------|------------|-----------|----------|--------|--------|
| 30.000000 MHz   | 1.000000 GHz   | 30.00 kHz | 120.00 kHz | 1 ms      | Auto     | 0 dB   | INPUT2 |



RBW 120 kHz  
 MT 1 s

Step TD AUTO PULSE Att 0 dB AUTO PREAMP OFF



**C20161291**

08.Jun 16 10:23

**Meas Type** RADIATED EMISSION  
**Equipment under Test** Z-Wave  
**Manufacturer** GOAP d.o.o.  
**OP Condition** CH1  
**Operator** Andrej Skof

**Test Spec**  
 VERTICAL 100 cm, 15 deg

**Final Measurement**

**Meas Time:** 1 s  
**Margin:** 10 dB  
**Peaks:** 10

| Trace | Frequency         | Level (dBμV/m) | Detector   | Delta Limit/dB |
|-------|-------------------|----------------|------------|----------------|
| 1     | 908.370000000 MHz | 90.81          | Quasi Peak | 44.81          |
| 1     | 66.120000000 MHz  | 31.66          | Quasi Peak | -8.34          |
| 1     | 50.850000000 MHz  | 30.76          | Quasi Peak | -9.24          |
| 1     | 45.780000000 MHz  | 30.62          | Quasi Peak | -9.38          |
| 1     | 64.860000000 MHz  | 30.60          | Quasi Peak | -9.40          |
| 1     | 41.970000000 MHz  | 30.13          | Quasi Peak | -9.87          |
| 1     | 52.110000000 MHz  | 30.02          | Quasi Peak | -9.98          |
| 1     | 67.380000000 MHz  | 29.69          | Quasi Peak | -10.31         |
| 1     | 694.350000000 MHz | 35.53          | Quasi Peak | -10.47         |
| 1     | 770.970000000 MHz | 34.13          | Quasi Peak | -11.87         |



**C20161291**

Meas Type RADIATED EMISSION

Equipment under Test Z-Wave

Manufacturer GOAP d.o.o.

OP Condition CH0

Operator Andrej Skof

Test Spec

VERTICAL 100 cm, 0 deg

### Time Domain Scan (1 Range)

Scan Start: 1 GHz

Scan Stop: 10 GHz

Detector: Trace 1: MAX PEAK Trace 2: Average

Transducer: RE-18GHz

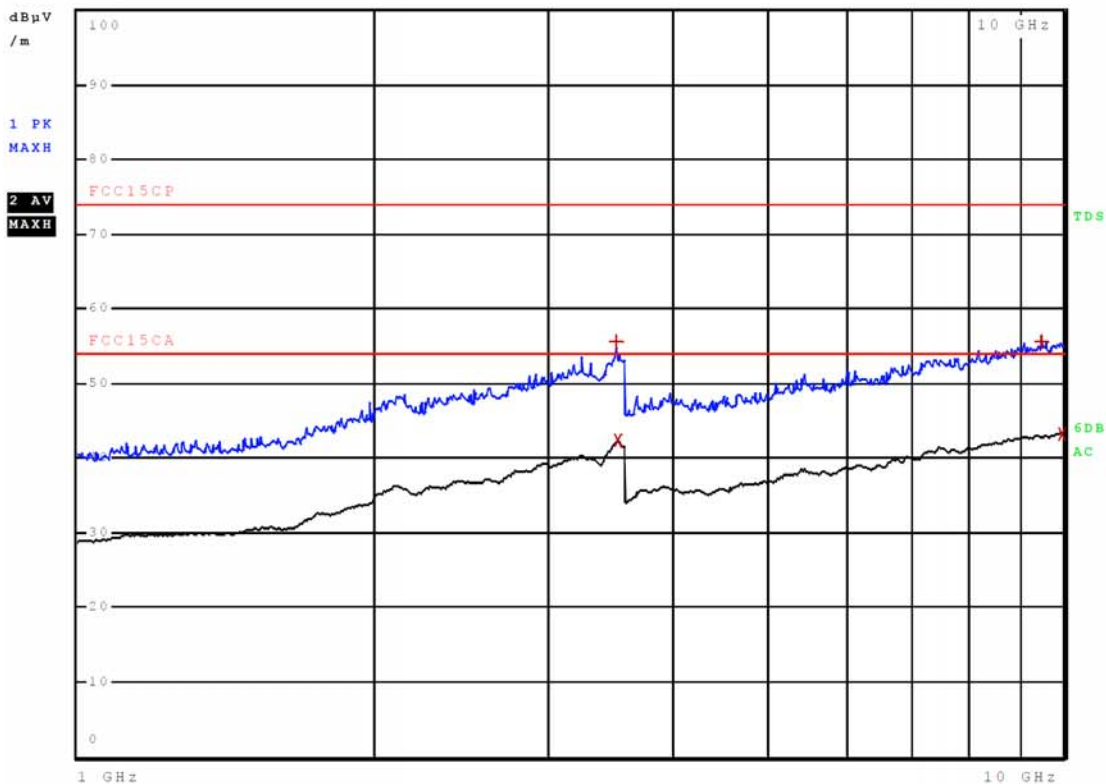
| Start Frequency | Stop Frequency | Step Size  | Res BW   | Meas Time | RF Atten | Preamp | Input  |
|-----------------|----------------|------------|----------|-----------|----------|--------|--------|
| 1.000000 GHz    | 10.000000 GHz  | 250.00 kHz | 1.00 MHz | 1 ms      | Auto     | 35 dB  | INPUT1 |



RBW 1 MHz

MT 1 s

Step TD AUTO PULSE Att 0 dB AUTO PREAMP ON





**C20161291**

**Meas Type** RADIATED EMISSION  
**Equipment under Test** Z-Wave  
**Manufacturer** GOAP d.o.o.  
**OP Condition** CH0  
**Operator** Andrej Skof  
**Test Spec**  
 VERTICAL 100 cm, 0 deg

**Final Measurement**

**Meas Time:** 1 s  
**Margin:** 20 dB  
**Peaks:** 4

| Trace | Frequency       | Level (dB $\mu$ V/m) | Detector     | Delta Limit/dB |
|-------|-----------------|----------------------|--------------|----------------|
| 2     | 9.955000000 GHz | 43.27                | CISPR Averag | -10.73         |
| 2     | 3.534500000 GHz | 42.29                | CISPR Averag | -11.71         |
| 1     | 9.494750000 GHz | 55.57                | Max Peak     | -18.43         |
| 1     | 3.524750000 GHz | 55.55                | Max Peak     | -18.45         |





**C20161291**

Meas Type RADIATED EMISSION

Equipment under Test Z-Wave

Manufacturer GOAP d.o.o.

OP Condition CH0

Operator Andrej Skof

Test Spec

HORIZONTAL 100 cm, 0 deg

### Time Domain Scan (1 Range)

Scan Start: 1 GHz

Scan Stop: 10 GHz

Detector: Trace 1: MAX PEAK Trace 2: Average

Transducer: RE-18GHz

| Start Frequency | Stop Frequency | Step Size  | Res BW   | Meas Time | RF Atten | Preamp | Input  |
|-----------------|----------------|------------|----------|-----------|----------|--------|--------|
| 1.000000 GHz    | 10.000000 GHz  | 250.00 kHz | 1.00 MHz | 1 ms      | Auto     | 35 dB  | INPUT1 |



RBW 1 MHz

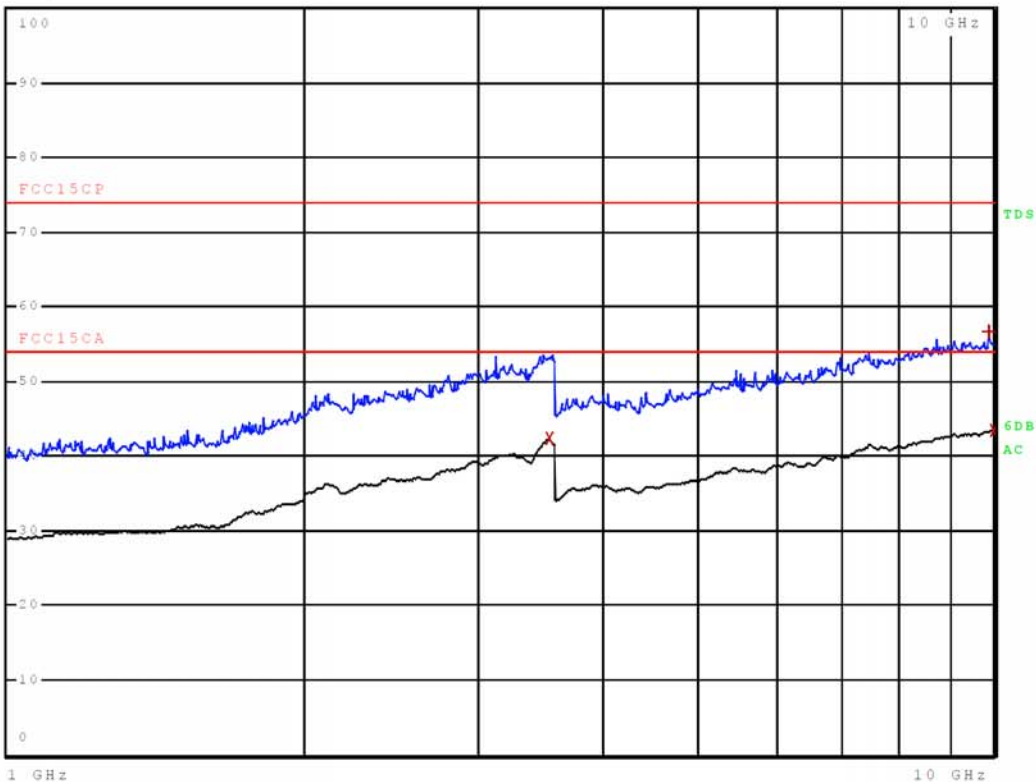
MT 1 s

Step TD AUTO PULSE Att 0 dB AUTO PREAMP ON

dBμV  
/m

1 PK  
MAXH

2 AV  
MAXH



**C20161291**

Meas Type RADIATED EMISSION  
Equipment under Test Z-Wave  
Manufacturer GOAP d.o.o.  
OP Condition CH0  
Operator Andrej Skof

Test Spec  
HORIZONTAL 100 cm, 0 deg

**Final Measurement**

Meas Time: 1 s  
Margin: 20 dB  
Peaks: 3

| Trace | Frequency       | Level (dBµV/m) | Detector     | Delta Limit/dB |
|-------|-----------------|----------------|--------------|----------------|
| 2     | 9.984000000 GHz | 43.30          | CISPR Averag | -10.70         |
| 2     | 3.545500000 GHz | 42.30          | CISPR Averag | -11.70         |
| 1     | 9.888000000 GHz | 56.59          | Max Peak     | -17.41         |



**C20161291**

Meas Type RADIATED EMISSION

Equipment under Test Z-Wave

Manufacturer GOAP d.o.o.

OP Condition CH1

Operator Andrej Skof

Test Spec

VERTICAL 100 cm, 0 deg

### Time Domain Scan (1 Range)

Scan Start: 1 GHz

Scan Stop: 10 GHz

Detector: Trace 1: MAX PEAK Trace 2: Average

Transducer: RE-18GHz

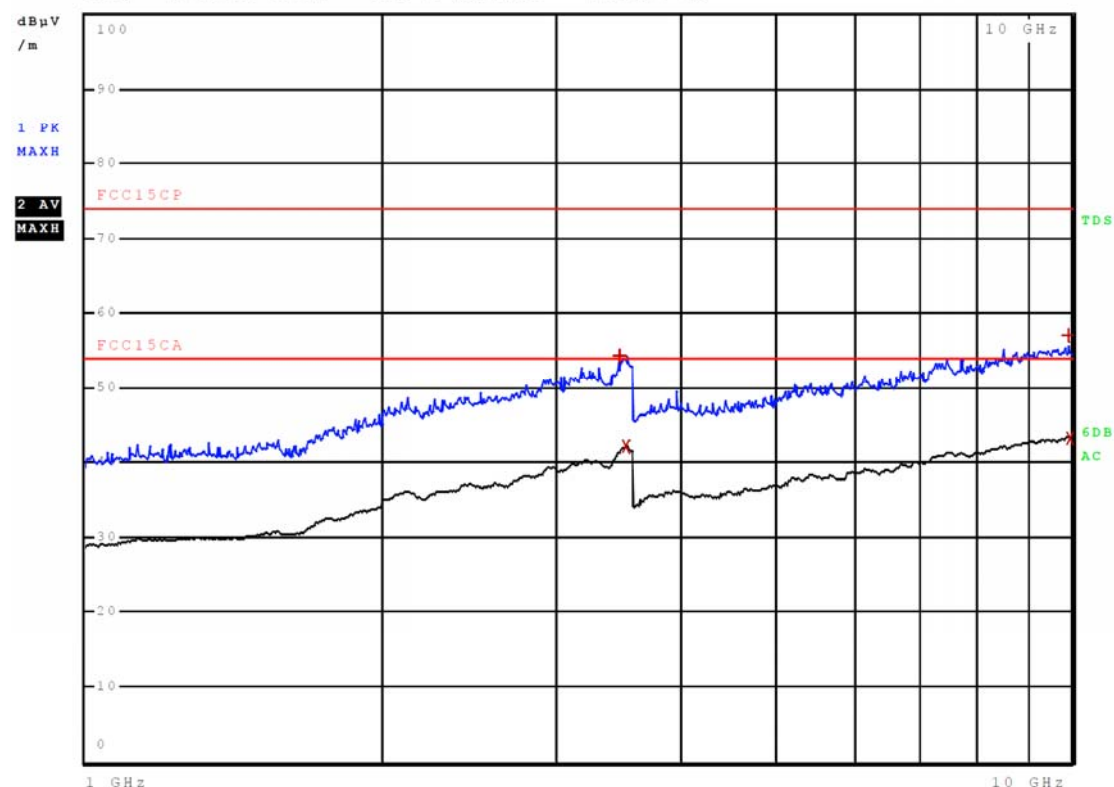
| Start Frequency | Stop Frequency | Step Size  | Res BW   | Meas Time | RF Atten | Preamp | Input  |
|-----------------|----------------|------------|----------|-----------|----------|--------|--------|
| 1.000000 GHz    | 10.000000 GHz  | 250.00 kHz | 1.00 MHz | 1 ms      | Auto     | 35 dB  | INPUT1 |



RBW 1 MHz

MT 1 s

Step TD AUTO PULSE Att 0 dB AUTO PREAMP ON



**C20161291**

**Meas Type** RADIATED EMISSION  
**Equipment under Test** Z-Wave  
**Manufacturer** GOAP d.o.o.  
**OP Condition** CH1  
**Operator** Andrej Skof  
**Test Spec**  
 VERTICAL 100 cm, 0 deg

**Final Measurement**

**Meas Time:** 1 s  
**Margin:** 20 dB  
**Peaks:** 4

| Trace | Frequency       | Level (dB $\mu$ V/m) | Detector     | Delta Limit/dB |
|-------|-----------------|----------------------|--------------|----------------|
| 2     | 9.977000000 GHz | 43.24                | CISPR Averag | -10.76         |
| 2     | 3.537750000 GHz | 42.20                | CISPR Averag | -11.80         |
| 1     | 9.909750000 GHz | 57.07                | Max Peak     | -16.93         |
| 1     | 3.482250000 GHz | 54.29                | Max Peak     | -19.71         |


**C20161291**

Meas Type RADIATED EMISSION

Equipment under Test Z-Wave

Manufacturer GOAP d.o.o.

OP Condition CH1

Operator Andrej Skof

Test Spec

HORIZONTAL 100 cm, 0 deg

### Time Domain Scan (1 Range)

Scan Start: 1 GHz

Scan Stop: 10 GHz

Detector: Trace 1: MAX PEAK Trace 2: Average

Transducer: RE-18GHz

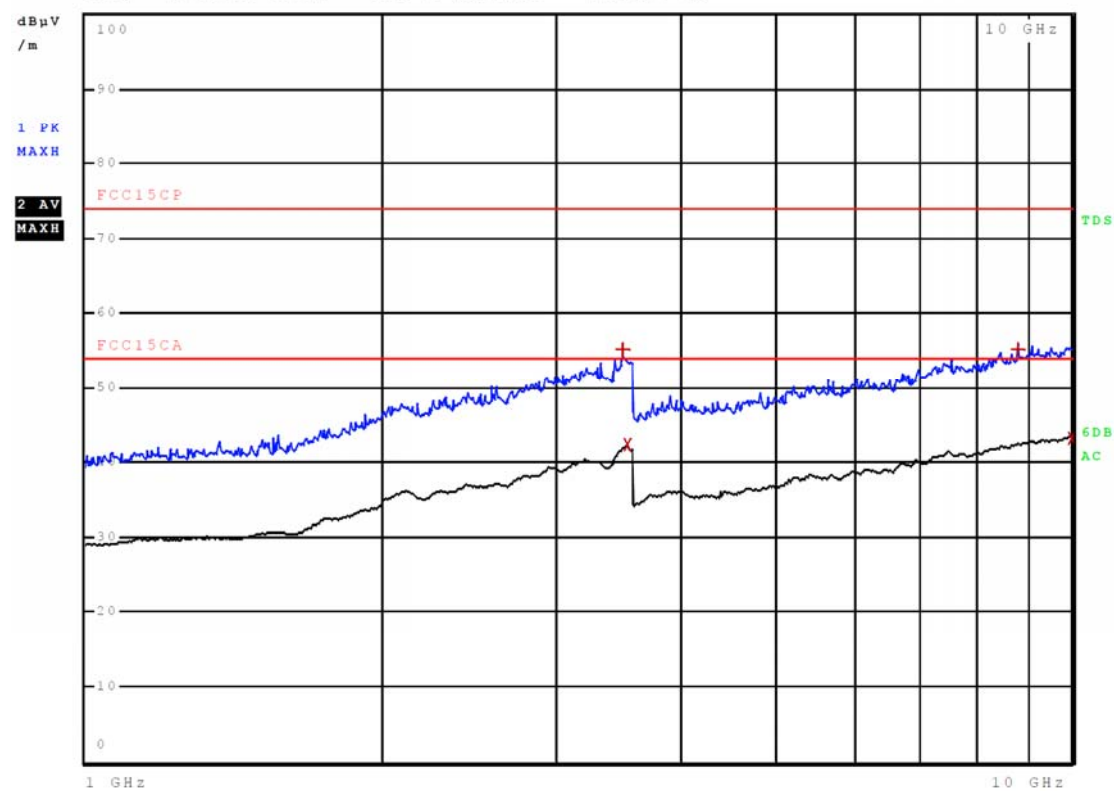
| Start Frequency | Stop Frequency | Step Size  | Res BW   | Meas Time | RF Atten | Preamp | Input  |
|-----------------|----------------|------------|----------|-----------|----------|--------|--------|
| 1.000000 GHz    | 10.000000 GHz  | 250.00 kHz | 1.00 MHz | 1 ms      | Auto     | 35 dB  | INPUT1 |



RBW 1 MHz

MT 1 s

Step TD AUTO PULSE Att 0 dB AUTO PREAMP ON



**C20161291**

**Meas Type** RADIATED EMISSION  
**Equipment under Test** Z-Wave  
**Manufacturer** GOAP d.o.o.  
**OP Condition** CH1  
**Operator** Andrej Skof  
**Test Spec**  
 HORIZONTAL 100 cm, 0 deg

**Final Measurement**

**Meas Time:** 1 s  
**Margin:** 20 dB  
**Peaks:** 4

| Trace | Frequency       | Level (dB $\mu$ V/m) | Detector     | Delta Limit/dB |
|-------|-----------------|----------------------|--------------|----------------|
| 2     | 9.989750000 GHz | 43.27                | CISPR Averag | -10.73         |
| 2     | 3.543250000 GHz | 42.24                | CISPR Averag | -11.76         |
| 1     | 3.502250000 GHz | 55.16                | Max Peak     | -18.84         |
| 1     | 8.820000000 GHz | 55.05                | Max Peak     | -18.95         |

## 7.2.5 Test result (15.215)

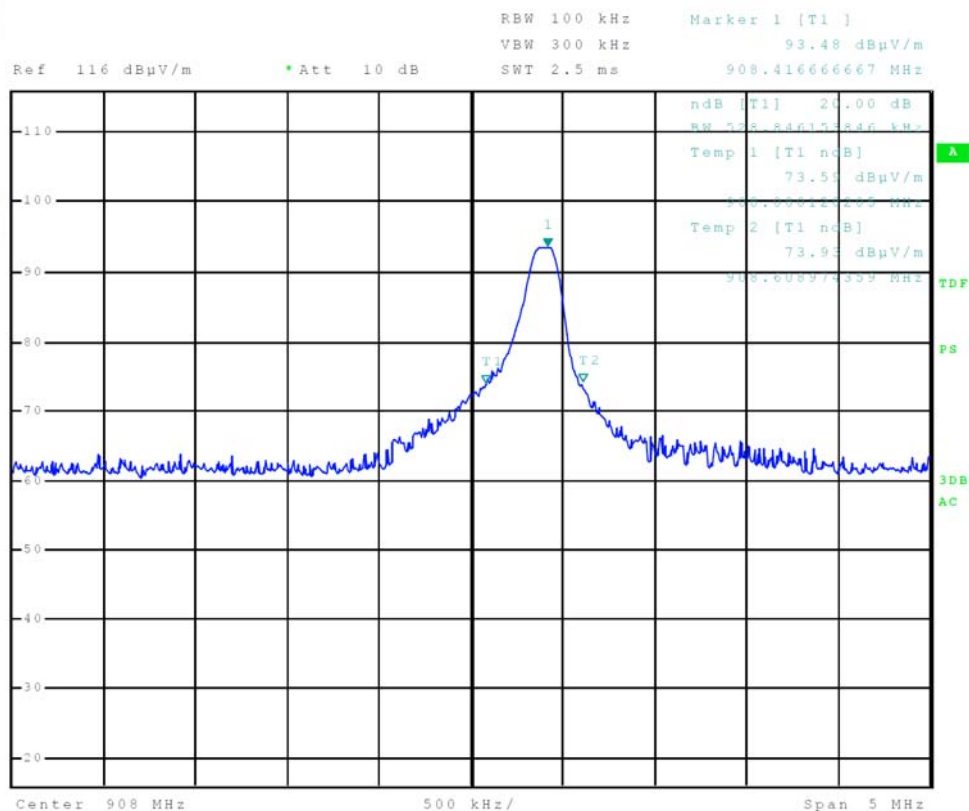

**ROHDE & SCHWARZ**
**C20161291**

08.Jun 16 10:39

**Meas Type** BANDWIDTH OF THE EMISSION  
**Equipment under Test** Z-Wave  
**Manufacturer** GOAP d.o.o.  
**OP Condition** CH1  
**Operator** Andrej Skof  
**Test Spec**  
 VERTICAL 100 cm, 300 deg

### Sweep Settings Screen A

|                  |                |                  |                |
|------------------|----------------|------------------|----------------|
| Center Frequency | 908.000000 MHz | Ref Level        | 116.000 dBμV/m |
| Frequency Offset | 0.000000 Hz    | Ref Level Offset | 0.000 dB       |
| Span             | 5.000000 MHz   | Ref Position     | 100.000 %      |
| Start Frequency  | 905.500000 MHz | Level Range      | 100.000 dB     |
| Stop Frequency   | 910.500000 MHz | RF Att           | 10.000 dB      |
| RBW              | 100.000000 kHz |                  |                |
| VBW              | 300.000000 kHz | X-Axis           | LIN            |
| Sweep Time       | 2.50 ms        | Y-Axis           | LOG            |





**C20161291**

08.Jun 16 10:42

Meas Type BANDWIDTH OF THE EMISSION

Equipment under Test Z-Wave

Manufacturer GOAP d.o.o.

OP Condition CH1

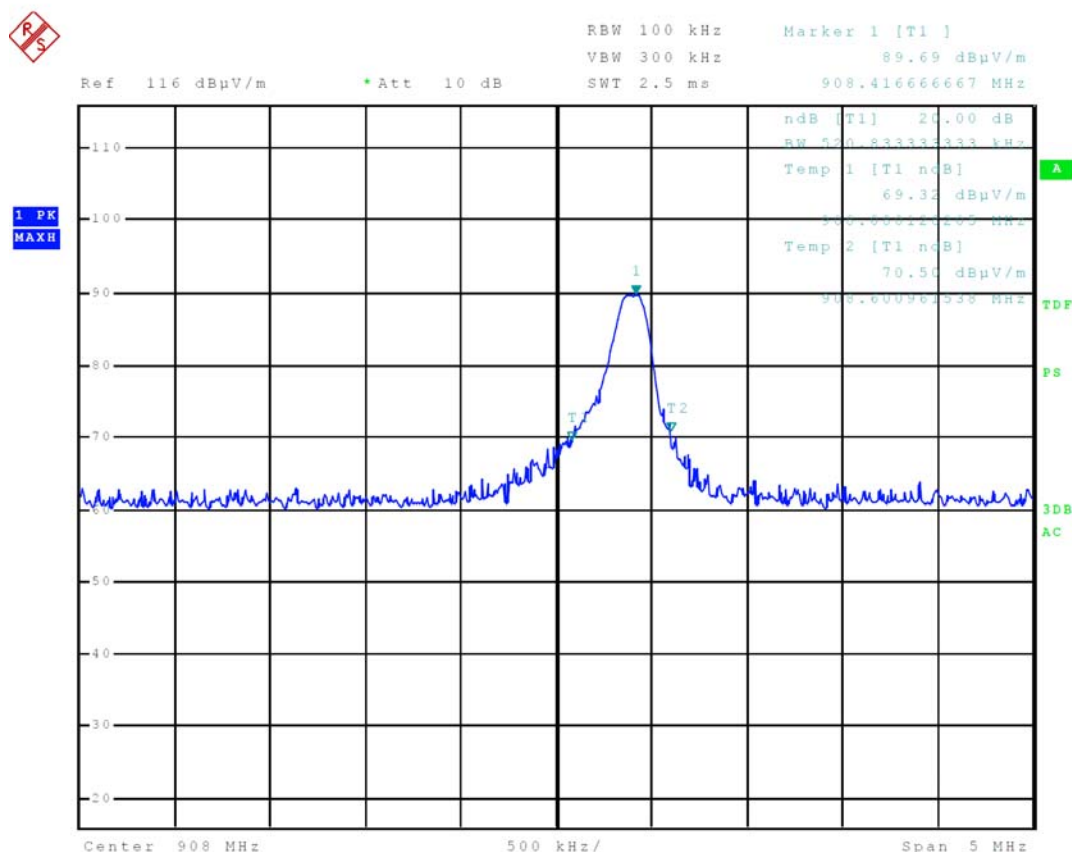
Operator Andrej Skof

Test Spec

HORIZONTAL 167 cm, 245 deg

**Sweep Settings Screen A**

|                  |                |                  |                |
|------------------|----------------|------------------|----------------|
| Center Frequency | 908.000000 MHz | Ref Level        | 116.000 dBμV/m |
| Frequency Offset | 0.000000 Hz    | Ref Level Offset | 0.000 dB       |
| Span             | 5.000000 MHz   | Ref Position     | 100.000 %      |
| Start Frequency  | 905.500000 MHz | Level Range      | 100.000 dB     |
| Stop Frequency   | 910.500000 MHz | RF Att           | 10.000 dB      |
| RBW              | 100.000000 kHz |                  |                |
| VBW              | 300.000000 kHz | X-Axis           | LIN            |
| Sweep Time       | 2.50 ms        | Y-Axis           | LOG            |







ROHDE &amp; SCHWARZ

**C20161291**

08.Jun 16 10:49

Meas Type BANDWIDTH OF THE EMISSION  
Equipment under Test Z-Wave  
Manufacturer GOAP d.o.o.  
OP Condition CH1  
Operator Andrej Skof  
Test Spec  
VERTICAL 100 cm, 300 deg

**Sweep Settings Screen A**

|                  |                |                  |                |
|------------------|----------------|------------------|----------------|
| Center Frequency | 916.000000 MHz | Ref Level        | 116.000 dBμV/m |
| Frequency Offset | 0.000000 Hz    | Ref Level Offset | 0.000 dB       |
| Span             | 5.000000 MHz   | Ref Position     | 100.000 %      |
| Start Frequency  | 913.500000 MHz | Level Range      | 100.000 dB     |
| Stop Frequency   | 918.500000 MHz | RF Att           | 10.000 dB      |
| RBW              | 100.000000 kHz | X-Axis           | LIN            |
| VBW              | 300.000000 kHz | Y-Axis           | LOG            |
| Sweep Time       | 2.50 ms        |                  |                |

**MARKER 1**

915.9839744 MHz

RBW 100 kHz

Marker 1 [T1]

VBW 300 kHz

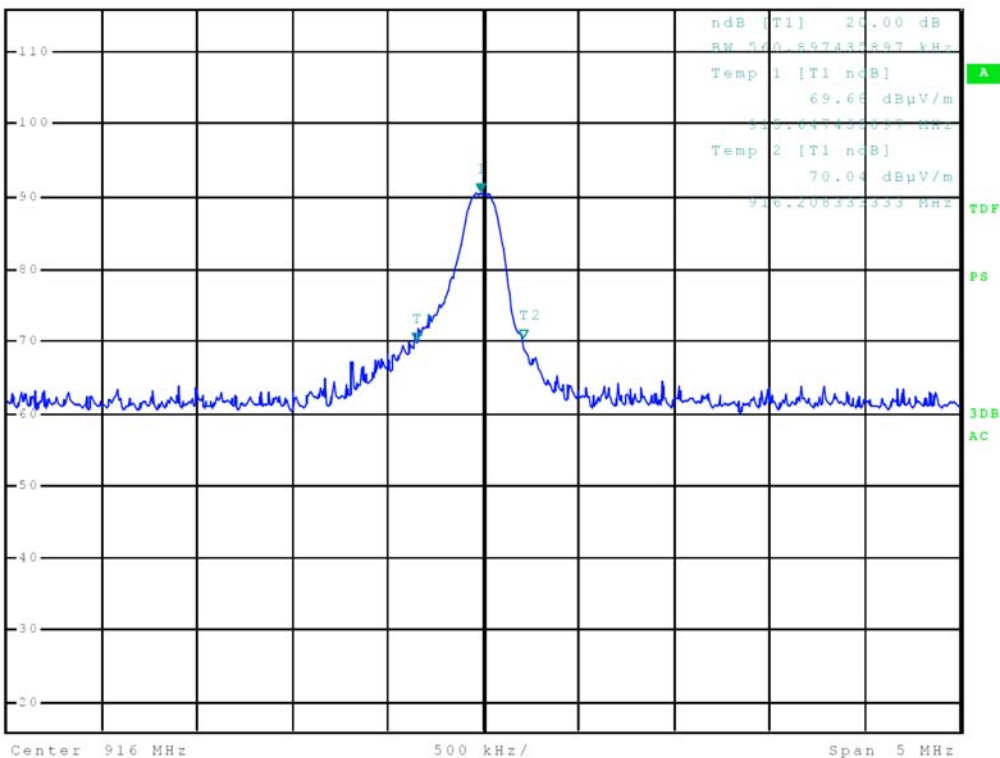
90.38 dBμV/m

Ref 116 dBμV/m

\* Att 10 dB

SWT 2.5 ms

915.983974359 MHz

1 PK  
MAXH

**C20161291**

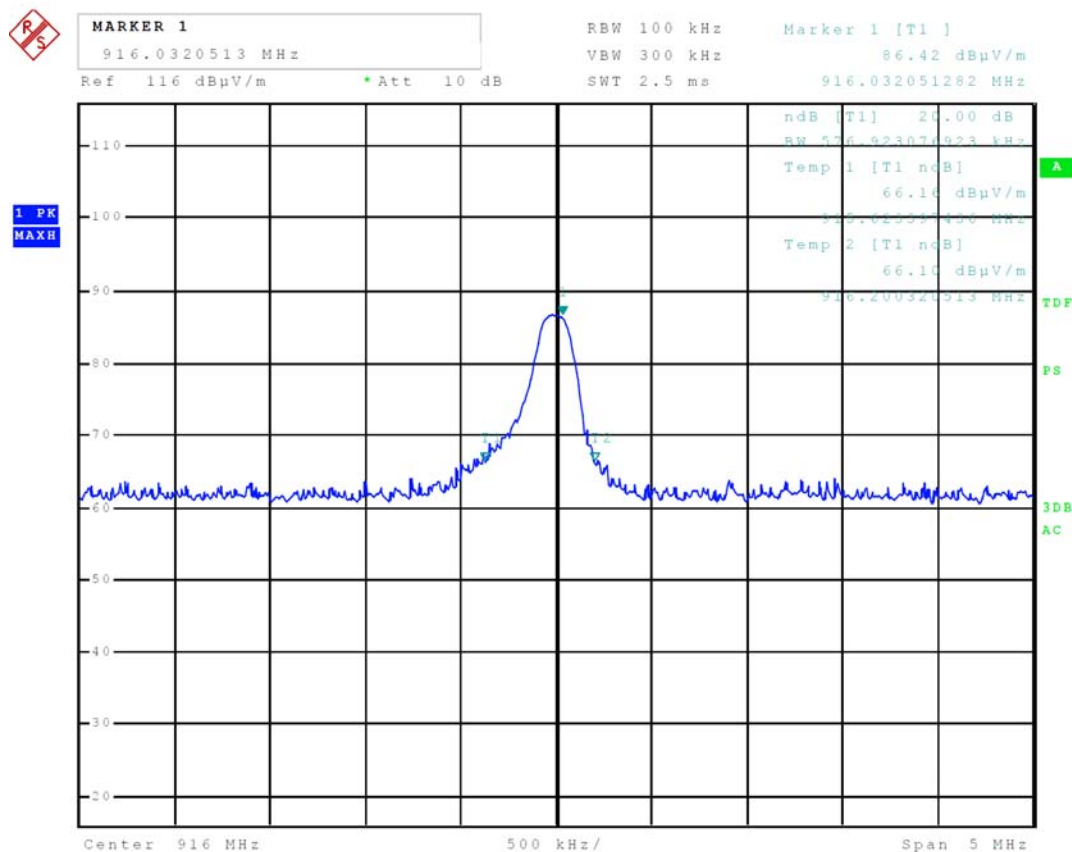
08.Jun 16 10:47

**Meas Type** BANDWIDTH OF THE EMISSION  
**Equipment under Test** Z-Wave  
**Manufacturer** GOAP d.o.o.  
**OP Condition** CH1  
**Operator** Andrej Skof

**Test Spec**  
 HORIZONTAL 167 cm, 245 deg

### Sweep Settings Screen A

|                  |                |                  |                |
|------------------|----------------|------------------|----------------|
| Center Frequency | 916.000000 MHz | Ref Level        | 116.000 dBμV/m |
| Frequency Offset | 0.000000 Hz    | Ref Level Offset | 0.000 dB       |
| Span             | 5.000000 MHz   | Ref Position     | 100.000 %      |
| Start Frequency  | 913.500000 MHz | Level Range      | 100.000 dB     |
| Stop Frequency   | 918.500000 MHz | RF Att           | 10.000 dB      |
| RBW              | 100.000000 kHz |                  |                |
| VBW              | 300.000000 kHz | X-Axis           | LIN            |
| Sweep Time       | 2.50 ms        | Y-Axis           | LOG            |



**Tabulated results – Occupied Bandwidth:**

| Channel | Frequency (MHz) | 20 dB Bandwidth (MHz) | Frequency at 20 dB BW closest to Band Edge (MHz) | Delta to Band Edge (MHz) |
|---------|-----------------|-----------------------|--|--------------------------|
| 1 (Lo)  | 908,42          | 0,528                 | 908,08   | 6,08                     |
| 0 (Hi)  | 916,03          | 0,577                 | 916,20   | 11,80                    |

**Note:** Presented are worst case results for each channel.

## 7.2.6 Test result (15.249)


**ROHDE & SCHWARZ**
**C20161291**

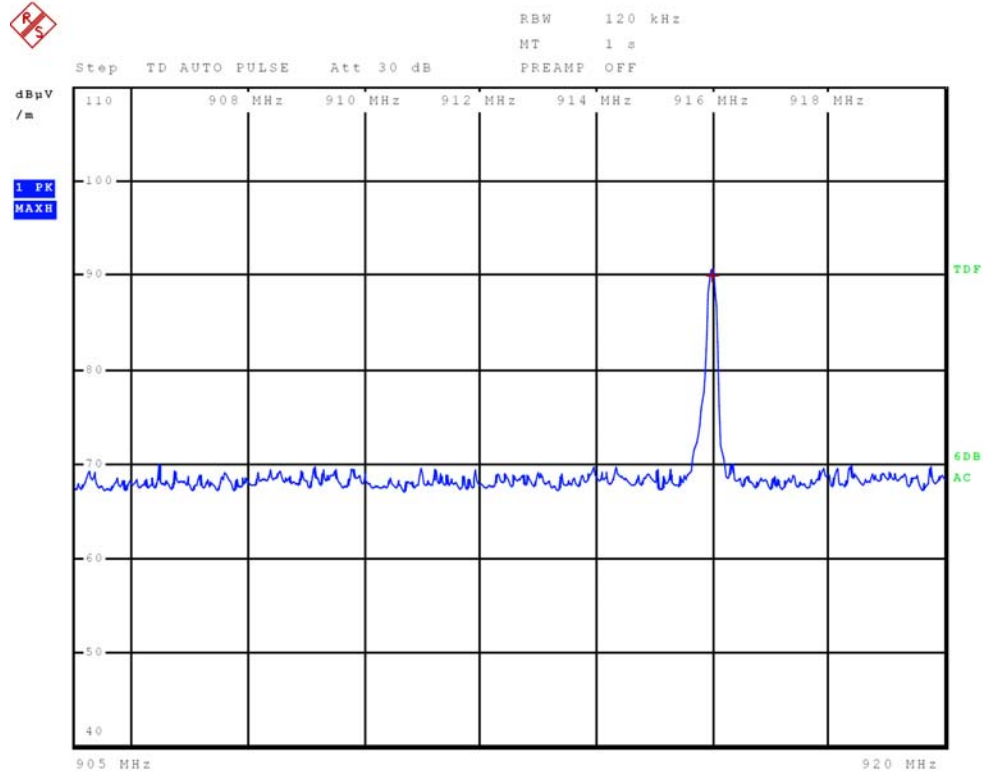
08.Jun 16 10:01

**Meas Type** EMISSION OF THE CARRIER  
**Equipment under Test** Z-Wave  
**Manufacturer** GOAP d.o.o.  
**OP Condition** CH0  
**Operator** Andrej Skof  
**Test Spec**  
 VERTICAL 100 cm, 300 deg

### Time Domain Scan (1 Range)

**Scan Start:** 905 MHz  
**Scan Stop:** 920 MHz  
**Detector:** Trace 1: MAX PEAK  
**Transducer:** 3142B3m

| Start Frequency | Stop Frequency | Step Size | Res BW     | Meas Time | RF Atten | Preamp | Input  |
|-----------------|----------------|-----------|------------|-----------|----------|--------|--------|
| 905.000000 MHz  | 920.000000 MHz | 30.00 kHz | 120.00 kHz | 1 ms      | 30 dB    | 0 dB   | INPUT2 |



**ROHDE & SCHWARZ****C20161291**

08.Jun 16 10:01

Meas Type EMISSION OF THE CARRIER  
Equipment under Test Z-Wave  
Manufacturer GOAP d.o.o.  
OP Condition CH0  
Operator Andrej Skof  
Test Spec  
VERTICAL 100 cm, 300 deg

**Final Measurement**

Meas Time: 1 s  
Margin: 6 dB  
Peaks: 1

| Trace | Frequency         | Level (dB $\mu$ V/m) | Detector   | Delta Limit/dB |
|-------|-------------------|----------------------|------------|----------------|
| 1     | 915.980000000 MHz | 89.94                | Quasi Peak |                |

**C20161291**

08.Jun 16 10:03

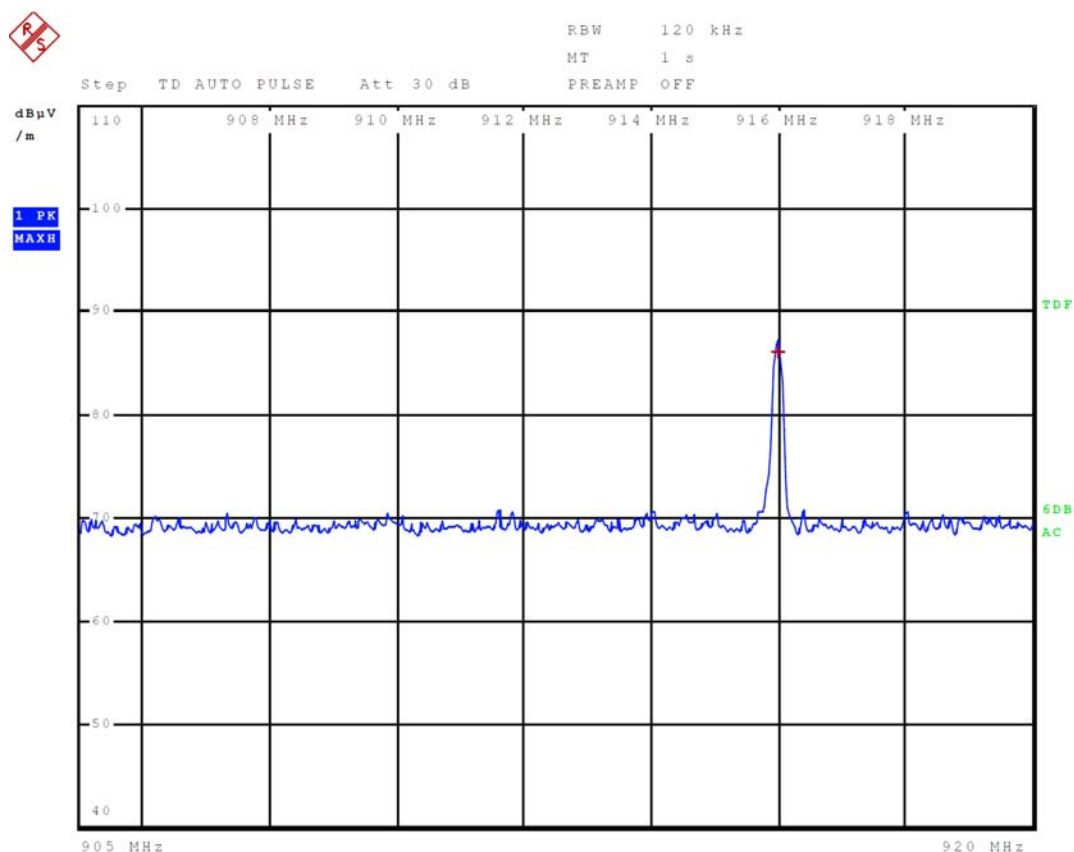
**Meas Type** EMISSION OF THE CARRIER  
**Equipment under Test** Z-Wave  
**Manufacturer** GOAP d.o.o.  
**OP Condition** CH0  
**Operator** Andrej Skof

**Test Spec**  
 HORIZONTAL 167 cm, 245 deg

**Time Domain Scan (1 Range)**

Scan Start: 905 MHz  
 Scan Stop: 920 MHz  
 Detector: Trace 1: MAX PEAK  
 Transducer: 3142B3m

| Start Frequency | Stop Frequency | Step Size | Res BW     | Meas Time | RF Atten | Preamplifier | Input  |
|-----------------|----------------|-----------|------------|-----------|----------|--------------|--------|
| 905.000000 MHz  | 920.000000 MHz | 30.00 kHz | 120.00 kHz | 1 ms      | 30 dB    | 0 dB         | INPUT2 |



**ROHDE & SCHWARZ****C20161291**

08.Jun 16 10:03

Meas Type EMISSION OF THE CARRIER  
Equipment under Test Z-Wave  
Manufacturer GOAP d.o.o.  
OP Condition CH0  
Operator Andrej Skof

Test Spec  
HORIZONTAL 167 cm, 245 deg

**Final Measurement**

Meas Time: 1 s  
Margin: 6 dB  
Peaks: 1

| Trace | Frequency         | Level (dB $\mu$ V/m) | Detector   | Delta Limit/dB |
|-------|-------------------|----------------------|------------|----------------|
| 1     | 915.980000000 MHz | 86.09                | Quasi Peak |                |

**C20161291**

08.Jun 16 09:49

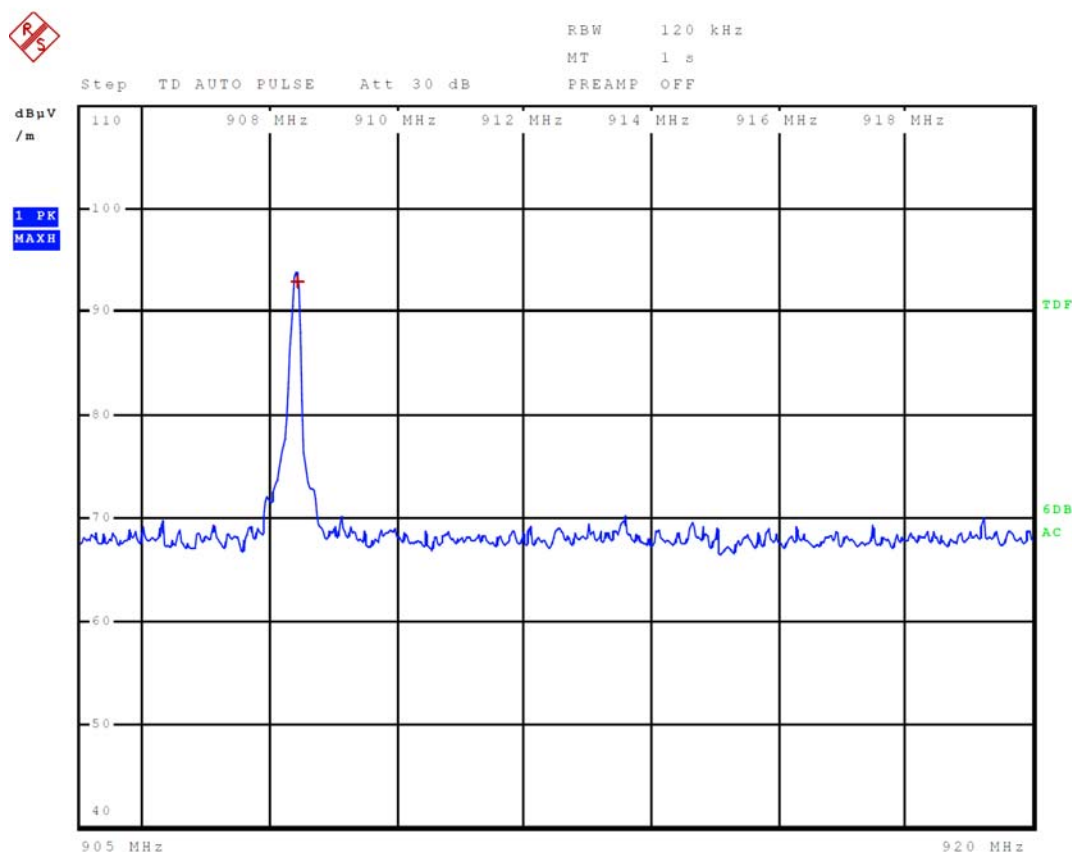
**Meas Type** EMISSION OF THE CARRIER  
**Equipment under Test** Z-Wave  
**Manufacturer** GOAP d.o.o.  
**OP Condition** CH1  
**Operator** Andrej Skof

**Test Spec**  
 VERTICAL 100 cm, 300 deg

**Time Domain Scan (1 Range)**

Scan Start: 905 MHz  
 Scan Stop: 920 MHz  
 Detector: Trace 1: MAX PEAK  
 Transducer: 3142B3m

| Start Frequency | Stop Frequency | Step Size | Res BW     | Meas Time | RF Atten | Preamplifier | Input  |
|-----------------|----------------|-----------|------------|-----------|----------|--------------|--------|
| 905.000000 MHz  | 920.000000 MHz | 30.00 kHz | 120.00 kHz | 1 ms      | 30 dB    | 0 dB         | INPUT2 |





**ROHDE & SCHWARZ****C20161291**

08.Jun 16 09:49

Meas Type EMISSION OF THE CARRIER  
Equipment under Test Z-Wave  
Manufacturer GOAP d.o.o.  
OP Condition CH1  
Operator Andrej Skof  
Test Spec  
VERTICAL 100 cm, 300 deg

**Final Measurement**

Meas Time: 1 s  
Margin: 6 dB  
Peaks: 1

| Trace | Frequency         | Level (dB $\mu$ V/m) | Detector   | Delta Limit/dB |
|-------|-------------------|----------------------|------------|----------------|
| 1     | 908.420000000 MHz | 92.91                | Quasi Peak |                |

**Tabulated results – Emission of the Carrier**

| Channel | Frequency<br>(MHz) | Field strength<br>(dB $\mu$ V/m) | Limit<br>(dB $\mu$ V/m) | Delta to Limit<br>(dB) |
|---------|--------------------|----------------------------------|-------------------------|------------------------|
| 1       | 908,37             | 89,13                            | 94,00                   | -4,87                  |
| 0       | 915,97             | 86,09                            | 94,00                   | -7,91                  |

**Note:** Presented are worst case results for each channel.