# EMC TEST REPORT

## No. 1709315STO-001, Ed. 2

## Electromagnetic disturbances

### EQUIPMENT UNDER TEST

| | |
|---|---|
| Equipment: | Microwave oven |
| Type/Model: | BMP250710 |
| Additional type/model*: | BMP250700<br>BMP250730<br>BMP251700<br>BMP251710<br>BMP251730 |
| Manufacturer: | Panasonic Manufacturing (UK) Ltd. |
| Tested by request of: | Intertek Testing & Cert Ltd. |

*See opinions and interpretations clause 2.5

### SUMMARY

Referring to the emission limits, and the operating mode during the tests specified in this report, the equipment complies with the requirements according to the following standards:

FCC 47 CFR Part 18 (2016): Industrial, Scientific and Medical Equipment

For details, see clause 2 – 4.

Date of issue: June 1, 2017

Tested by: Stevan Skrobić

Approved by: Hans Kohlén

Andreas Dentas

**Revision History**

| Edition | Date | Description | Changes |
|---|---|---|---|
| 1 | May 15, 2017 | First release | |
| 2 | June 1, 2017 | Second release | Added 5 additional models on front cover and clause 2.1<br>Added clause 2.5 Opinions and interpretations. |



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## 1. CLIENT INFORMATION

The EUT has been tested by request of

| | |
|---|---|
| Company | Intertek Testing & Cert Ltd.<br>Davy Avenue, Knowhill<br>Milton Keyness MK5 8NL<br>United Kingdom |
| Name of contact | Hamza Sourroukh |

## 2. EQUIPMENT UNDER TEST (EUT)

### 2.1 Identification of the EUT

| | |
|---|---|
| Equipment | Microwave oven |
| Type/Model | BMP250710 |
| Additional type/model | BMP250700<br>BMP250730<br>BMP251700<br>BMP251710<br>BMP251730 |
| Brand name | GAGGENAU |
| Serial Number | -- |
| Manufacturer | Panasonic Manufacturing (UK) Ltd.<br>Pentwyn Industrial Estate<br>Cardiff<br>Wales, CF23 7XB<br>United Kingdom |
| Rating | 120 V, 60 Hz, 2LNPE |
| Class | I |
| Highest clock frequency (Operating frequency) | 2.4 GHz |

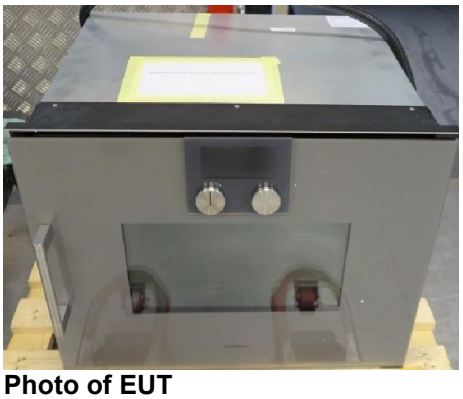

**Photo of EUT**

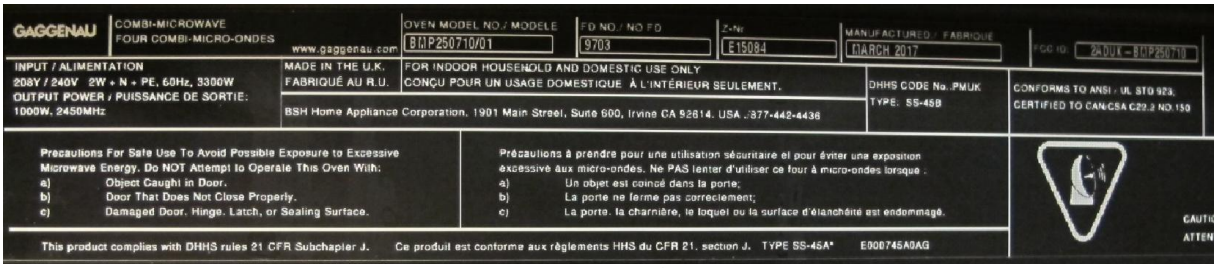


**Photo of rating plate**

## 2.2 Purpose of the test.

The purpose of the tests was to verify that the EUT fulfills the requirements according to FCC 47 CFR Part 18 (2016).

## 2.3 Additional information about the EUT

The EUT is a microwave oven and was tested in a tabletop configuration.

The EUT was tested with the following cables

| Port | Type | Length [m] |
|---|---|---|
| AC Mains | Four-core | 1.5 |

The microwave power is calculated via the calorimetric method with the following values:

| Measurement type | Designation | Value |
|---|---|---|
| Mass of the water [gram] | Mw | 1512-416 |
| Mass of the container [gram] | Mc | 416 |
| Ambient temperature [°C] | T0 | 22.0 |
| Initial temperature of the water [°C] | T1 | 11.6 |
| Final temperature of the water [°C] | T2 | 31.0 |
| Heating time [s] | t | 120 |

The following equipment was used:

| Equipment type | Manufacturer | Model | Inv. No. | Last Cal. date | Cal. interval |
|---|---|---|---|---|---|
| Thermometer | Fluke | 52 | 2476 | September, 2016 | 1 year |
| Type K Thermocouple | Pentronic | HF/D-30 | 380989 | September, 2016 | 1 year |
| Scale | Mettler | PB8000 | 918 | February, 2017 | 1 year |
| Temperature and humidity meter | Vaisala | HMI 41 | 8275 | March, 2017 | 1 year |

Power calculation:

$$P = \frac{4{,}187 \cdot M_W (T_2 - T_1) + 0{,}55 \cdot M_C (T_2 - T_0)}{t} = 759 \text{ W}$$

## 2.4 Peripheral equipment

Peripheral equipment is equipment needed for correct operation of the EUT, but not included as part of the testing and evaluation of the EUT.

| Equipment | Type / Model | Manufacturer | Serial no. |
|---|---|---|---|
| Borosilicate glass vessel | 216-0077 | VWR | -- |

## 2.5 Opinions and interpretations

The following types are also included as additional types in this test report:
BMP250700
BMP250730
BMP251700
BMP251710
BMP251730

The difference as compared to the tested type is (according to the manufacturer):

| Model | Door | Colour |
|---|---|---|
| BMP250700 | Right-hand models | Anthracite |
| BMP250710* | Right-hand models | Silver |
| BMP250730 | Right-hand models | Aluminium |
| BMP251700 | Left-hand models | Anthracite |
| BMP251710 | Left-hand models | Silver |
| BMP251730 | Left-hand models | Aluminium |

* Tested model

The difference is considered not to imply different EMC-characteristics when compared to the tested type. Therefore, this type is/these types are not tested, but considered to have the same EMC-characteristics as the tested type(s).



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## 3. TEST SPECIFICATIONS

### 3.1 Standards

Requirements:
FCC 47 CFR Part 18: Industrial, Scientific and Medical Equipment.

Test methods:
MP-5: 1986: FCC Methods of Measurements of Radio Noise Emissions from Industrial, Scientific, and Medical Equipment.

### 3.2 Additions, deviations and exclusions from standards and accreditation

The frequency was measured up to 26.5 GHz instead of the required 25 GHz.

No other additions, deviations or exclusions have been made from standards and accreditation.

### 3.3 Test site

Measurements were performed at:

Intertek Semko AB.
Torshamnsgatan 43,
P.O. Box 1103
SE-164 22 Kista

Intertek Semko AB is a FCC listed test site with site registration number 90913
Intertek Semko AB is a FCC accredited conformity assessment body with designation number SE0002
Intertek Semko AB is an Industry Canada listed test facility with IC assigned code 2042G

Measurement chambers

| Measurement Chamber | Type of chamber | IC Site filing # |
|---|---|---|
| STORA HALLEN | Semi-anechoic 10 m and 3 m | 2042G-2 |
| BJÖRKHALLEN | Semi-anechoic 3 m | 2042G-1 |

### 3.4 Mode of operation during the test

The EUT was tested with 120 V, 60 Hz.
The EUT was tested with a borosilicate glass vessel containing 300, 700 or 1000 ml of water at the maximum 1000 W microwave setting.



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### 3.5 Compliance

The EUT shall comply with the emission limits according to the standards as listed below

**Conducted emission requirements:**
The EUT shall meet the limits for the standards.
Reference: 47 CFR §18.307 (b) All other part 18 consumer devices.

| Frequency range [MHz] | Limits [dBµV] | |
|---|---|---|
| | Quasi-Peak | Average |
| 0.15 – 0.50 | 66 – 56 | 56 – 46 |
| 0.50 – 5.00 | 56 | 46 |
| 5.00 – 30.0 | 60 | 50 |

**Radiated Emission requirements:**
The EUT shall meet the limits for the standards.
Reference: 47 CFR §18.305 Any type unless otherwise specified, any ISM frequency, 500 W or more.
47 CFR §18.309 Frequency range of measurements.

| Frequency range [MHz] | Field strength at 300 m (dBµV/m) | Field strength at 3 m (dBµV/m) | Detector |
|---|---|---|---|
| 30 – 24 000 | 29.8 | 69.8 | Average |

The limit is defined as: $25 \cdot \sqrt{\frac{P}{500}}$ µV/m. With a radiated power of $P = 759$ W (see clause 2.3) the limit is calculated to 30.80 µV/m or $20 \cdot \log_{10} 30.80 = 29.77$ dBµV/m for a measurement distance of 300 m.

The value for 3 m measuring distance is calculated by adding 40.0 dB to the 300 m limit.
(I.e. an extrapolation factor of 20 dB/decade according to §18.305 (Notes))



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## 4. TEST SUMMARY

The results in this report apply only to sample tested:

| Standard | Description | Result |
|---|---|---|
| | **Emission** | |
| **FCC Part 18** | **Conducted continuous emission in the frequency range 0.150 – 30 MHz, AC Power input port**<br><br>The EUT complies with the limits.<br>The margin to the limit was at least 7.7 dB at 14.561 MHz<br>See clause 5.4. | **PASS** |
| **FCC Part 18** | **Radiated emission of electromagnetic fields in the frequency range 30 – 1000 MHz**<br><br>The EUT complies with the limits.<br>The margin to the limit was at least 42.6 dB at 41.523 MHz<br>See clause 6.5. | **PASS** |
| **FCC Part 18** | **Radiated emission of electromagnetic fields in the frequency range 1.0 – 4.0 GHz**<br><br>The EUT complies with the limits.<br>The margin to the limit was at least 17.3 dB at 2242.7 MHz<br>See clause 6.6 | **PASS** |
| **FCC Part 18** | **Radiated emission of electromagnetic fields in the frequency range 4.0 – 18.0 GHz**<br><br>The EUT complies with the limits.<br>The margin to the limit was at least 16.2 dB at 7120.2 MHz<br>See clause 6.7 | **PASS** |
| **FCC Part 18** | **Radiated emission of electromagnetic fields in the frequency range 18.0 – 26.5 GHz**<br><br>The EUT complies with the limits.<br>The margin to the limit was more than 20 dB.<br>See clause 6.8 | **PASS** |
| **FCC Part 18** | **Fundamental Frequency 2450 (±50) MHz**<br><br>The EUT complies with the limit.<br>See clause 6.9 | **PASS** |
| **FCC Part 18** | **Second and third harmonic with varied loads**<br><br>The EUT complies with the limit.<br>The margin to the limit was at least 13.2 dB at the second harmonic.<br>See clause 6.10 | **PASS** |



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## 5. CONDUCTED CONTINUOUS DISTURBANCES in the frequency-range 0.15 – 30 MHz

### 5.1 Operating environment

| Date of test: | Temperature: | Relative Humidity: |
|---|---|---|
| 2017-05-10 | 23 [°C] | 16 [%] |

### 5.2 Test set-up and test procedure

The test method is in accordance with MP-5: 1986

The EUT was connected to the power via Artificial Mains Networks AMN.

The EUT was placed on an insulating support 0.8 m above the floor, 0.4 m from the vertical reference ground plane (RGP) and 0.8 m from the AMN/ISN.

Overview sweeps were performed for each lead.
During the tests the EUT was operated according to the mode of operation mentioned in clause 3.4.

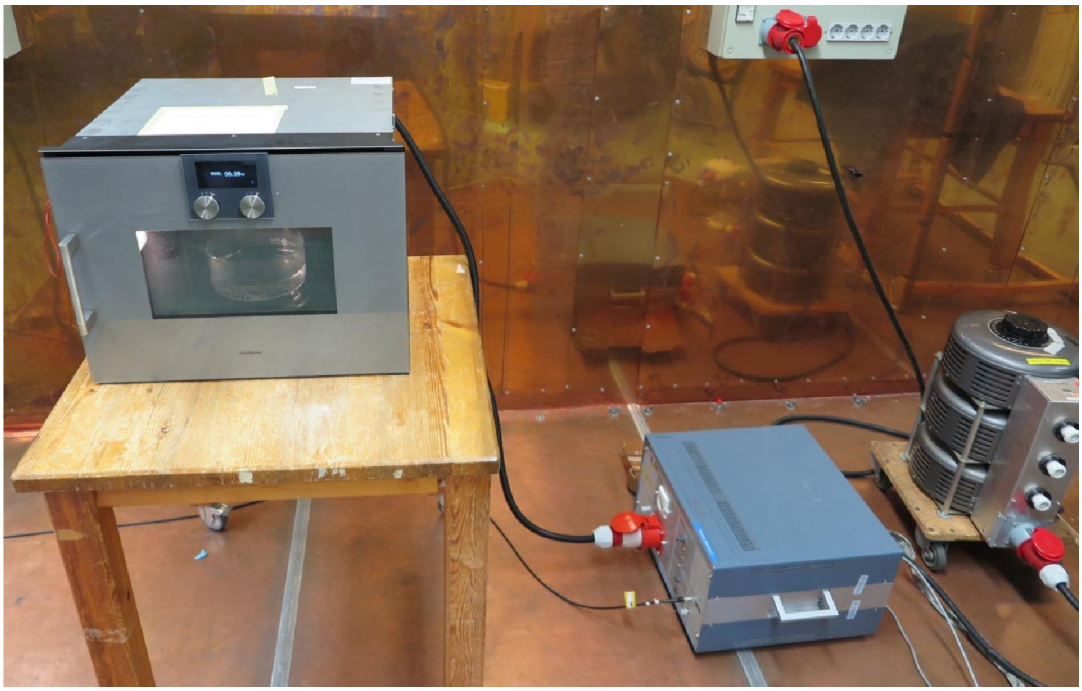

**Photo of the test set-up for conducted emission**

### 5.3 Measurement uncertainty

Continuous conducted disturbances with AMN
in the frequency range 150 kHz to 30 MHz ± 3.3 dB

Measurement uncertainty is calculated in accordance with CISPR 16-4-2: 2011.
The measurement uncertainty is given with a confidence of 95 %.



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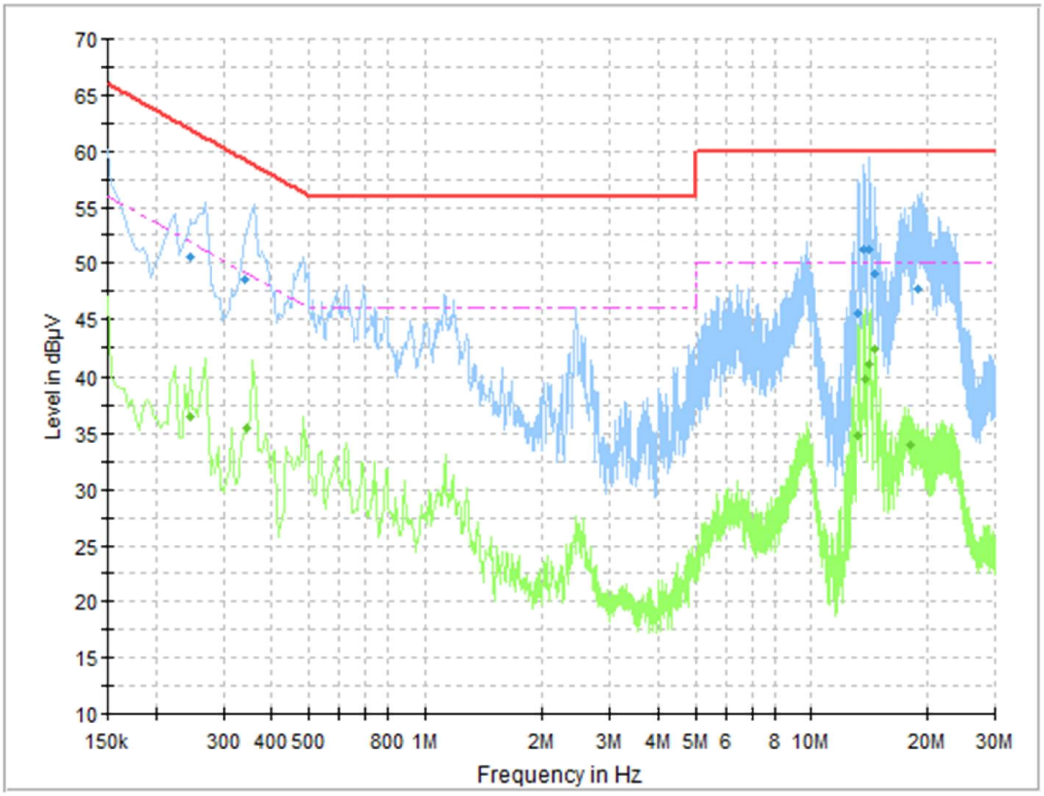
## 5.4 Test results, AC Power input port




**Diagram, Peak and Average overview sweep**

**Measurement results, Quasi-peak**

| Frequency [MHz] | Level [dBµV] | Limit [dBµV] | Line L/N | Margin [dB] |
|---|---|---|---|---|
| 0.245 | 50.6 | 61.9 | N | 11.3 |
| 0.341 | 48.5 | 59.2 | N | 10.7 |
| 13.623 | 51.3 | 60.0 | L1 | 8.7 |
| 14.128 | 51.2 | 60.0 | N | 8.8 |
| 14.610 | 49.1 | 60.0 | L1 | 10.9 |
| 18.920 | 47.6 | 60.0 | L1 | 12.4 |

**Measurement results, Average**

| Frequency [MHz] | Level [dBµV] | Limit [dBµV] | Line L/N | Margin [dB] |
|---|---|---|---|---|
| 0.247 | 36.5 | 51.9 | N | 15.4 |
| 0.346 | 35.4 | 49.1 | N | 13.7 |
| 13.249 | 34.8 | 50.0 | N | 15.2 |
| 13.740 | 39.8 | 50.0 | L1 | 10.2 |
| 14.197 | 41.0 | 50.0 | N | 9.0 |
| 14.561 | 42.3 | 50.0 | N | 7.7 |

Result [dBµV] = Analyser reading [dBµV] + cable loss [dB] + LISN insertion loss [dB]

## 5.5 Test equipment

| Equipment type | Manufacturer | Model | Inv. No. | Last Cal. date | Cal. interval |
|---|---|---|---|---|---|
| Measurement software | Rohde & Schwarz | EMC32 - 9 | -- | -- | -- |
| Measurement receiver | Rohde & Schwarz | ESCI | 31686 | July, 2016 | 1 year |
| Transient protection | Rohde & Schwarz | ESH3-Z2 | 32523 | July, 2016 | 1 year |
| Artificial main network | Rohde & Schwarz | ESH2-Z5 | 3017 | July, 2014 | 3 years |
| Coaxial cable | Suhner | RG 223/U | 9883 | July, 2014 | 3 years |



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## 6. RADIATED RF EMISSION IN THE FREQUENCY-RANGE 30 MHZ – 26.5 GHZ

### 6.1 Operating environment

| Date of test: | Temperature: | Relative Humidity: |
|---|---|---|
| 2017-04-28 | 20 [°C] | 29 [%] |
| 2017-05-05 | 24 [°C] | 21 [%] |
| 2017-05-08 | 20 [°C] | 24 [%] |
| 2017-05-10 | 21 [°C] | 14 [%] |

### 6.2 Test set-up and test procedure

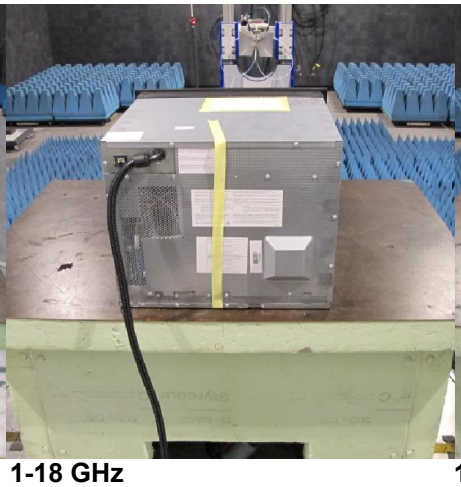
The test method is in accordance with MP-5: 1986

The EUT was placed on an insulating support 0.8 m above the turntable which is part of the reference ground plane.

Overview sweeps were performed with the measurement receiver in max-hold mode and the average detector was activated.

During the tests the EUT was operated according to the mode of operation mentioned in clause 3.4.

**30-1000 MHz**



**1-18 GHz**

**18-26.5 GHz**

**Photos of the test set-up for radiated emission**



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## 6.3 Test conditions

| | | | |
|---|---|---|---|
| **Test set-up:** | **30 – 1000 MHz** | | |
| Test receiver set-up: | | | |
| Preview test: | Peak, | RBW 120 kHz | VBW 1 MHz |
| Final test: | Average, | RBW 120 kHz | |
| Measuring distance: | 3 m | | |
| Measuring angle: | 0 – 359° | | |
| Antenna | | | |
| Height above ground plane: | 1 – 4 m | | |
| Polarisation: | Vertical and Horizontal | | |
| Type: | Bilog | | |

| | | | |
|---|---|---|---|
| **Test set-up:** | **1 – 18 GHz and 18-26.5 GHz** | | |
| Test receiver set-up: | | | |
| Preview test: | Peak, | RBW 1 MHz | VBW 3 MHz |
| Final test: | Average, | RBW 1 MHz | |
| Measuring distance: | 3 m | | |
| Measuring angle: | 0 – 359° | | |
| Antenna | | | |
| Height above ground plane: | 1 – 4 m | | |
| Polarisation: | Vertical and Horizontal | | |
| Type: | Horn | | |
| Antenna tilt: | Activated | | |

## 6.4 Measurement uncertainty

Measurement uncertainty for radiated disturbance

| | |
|---|---|
| Uncertainty for the frequency range 30 to 1000 MHz at 3 m | ± 5.1 dB |
| Uncertainty for the frequency range 1.0 to 18 GHz at 3 m | ± 4.5 dB |
| Uncertainty for the frequency range 18 to 26 GHz at 3 m | ± 4.8 dB |

Measurement uncertainty is calculated in accordance with CISPR 16-4-2: 2011.
The measurement uncertainty is given with a confidence of 95 %.



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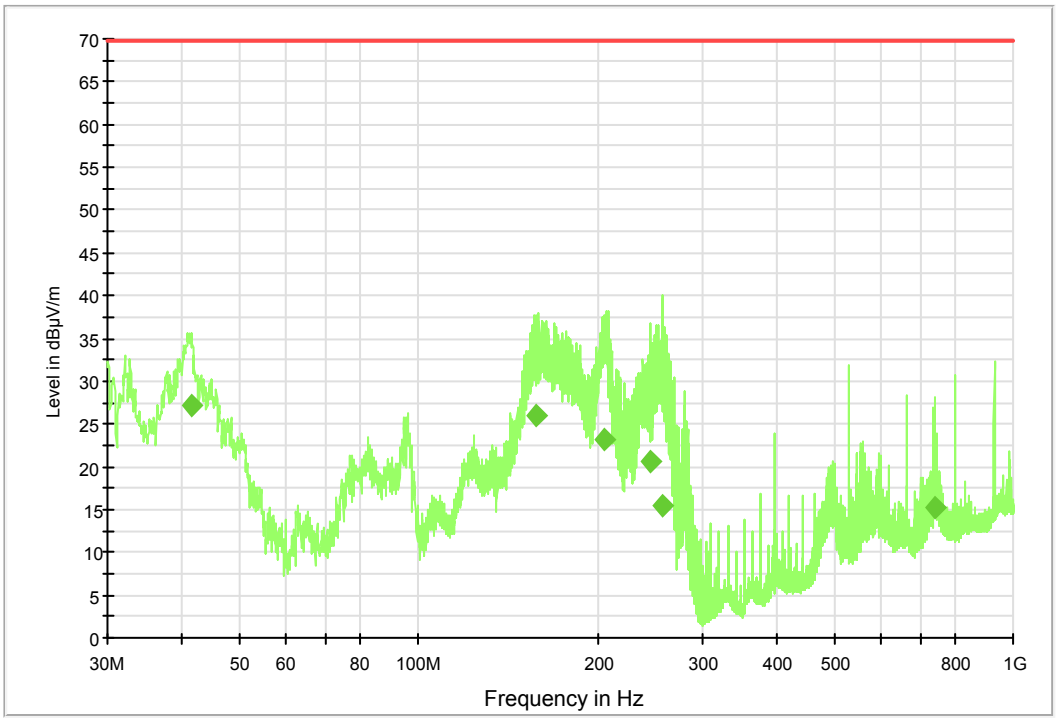
## 6.5 Test results, 30 – 1000 MHz




**Diagram, Average overview sweep, 30 – 1000 MHz at 3 m distance.**

**Measurement results, Average**

| Frequency [MHz] | Level [dBµV/m] | Limit [dBµV/m] | Polarization H/V | Margin [dB] |
|---|---|---|---|---|
| 41.523 | 27.2 | 69.8 | V | 42.6 |
| 157.314 | 26.1 | 69.8 | V | 43.7 |
| 206.078 | 23.2 | 69.8 | H | 46.6 |
| 245.463 | 20.5 | 69.8 | H | 49.3 |
| 257.438 | 15.5 | 69.8 | H | 54.3 |
| 738.547 | 15.2 | 69.8 | V | 54.6 |

Result [dBµV/m] = Analyser reading [dBµV] + Antenna factor [1/m] - Amplifier gain [dB] + Cable loss [dB]



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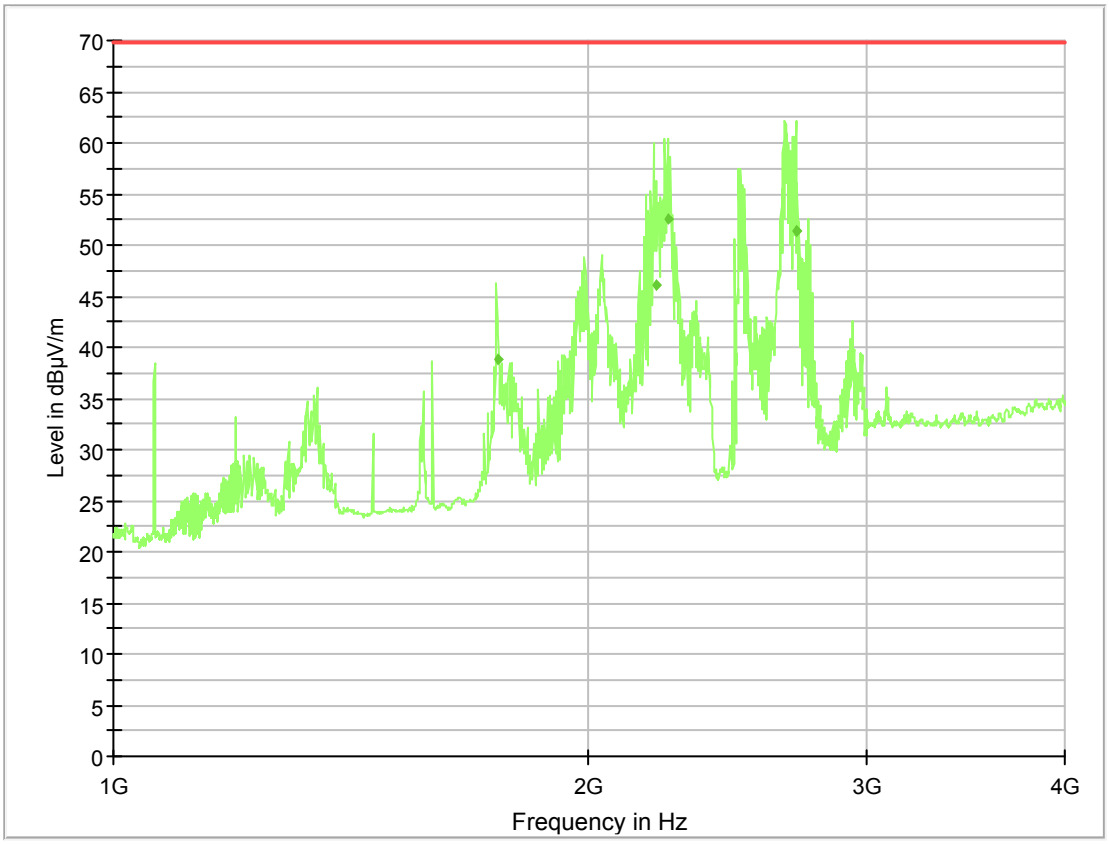
## 6.6 Test results, 1 – 4 GHz




**Diagram, Average overview sweep, 1 – 4 GHz at 3 m distance.**

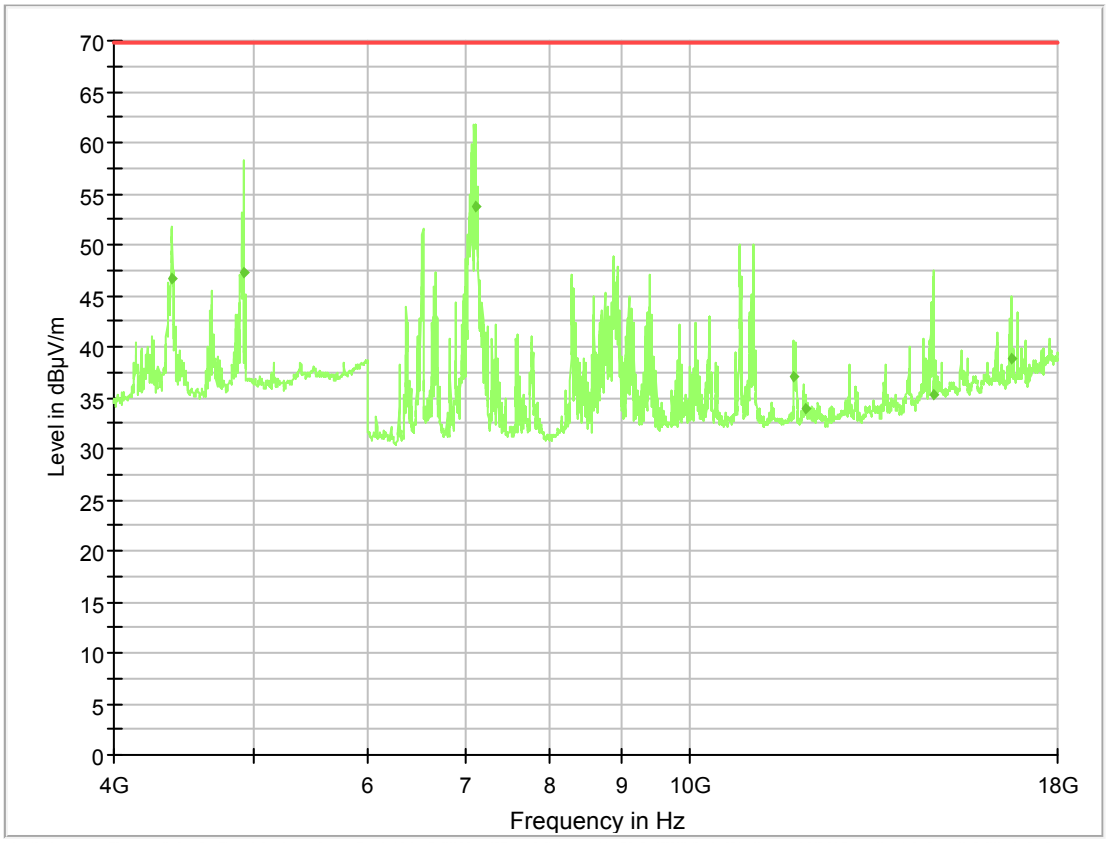
**Measurement results, Average**

| Frequency [MHz] | Level [dBµV/m] | Limit [dBµV/m] | Polarization H/V | Margin [dB] |
|---|---|---|---|---|
| 1752.5 | 38.8 | 69.8 | V | 31.0 |
| 2204.4 | 46.2 | 69.8 | V | 23.6 |
| 2242.7 | 52.5 | 69.8 | V | 17.3 |
| 2705.2 | 51.4 | 69.8 | V | 18.4 |
| 2705.2 | 51.4 | 69.8 | V | 18.4 |

All other measured disturbances have a margin of more than 20 dB to the limits.

Result [dBµV/m] = Analyser reading [dBµV] + Antenna factor [1/m] - Amplifier gain [dB] + Cable loss [dB]

## 6.7 Test results, 4 – 18 GHz




**Diagram, Average overview sweep, 4 – 18 GHz at 3 m distance.**

**Measurement results, Average**

| Frequency [MHz] | Level [dBµV/m] | Limit [dBµV/m] | Polarization H/V | Margin [dB] |
|---|---|---|---|---|
| 4384.0 | 46.7 | 69.8 | V | 23.1 |
| 4917.2 | 47.2 | 69.8 | V | 22.6 |
| 7120.2 | 53.6 | 69.8 | H | 16.2 |
| 11834.9 | 37.1 | 69.8 | V | 32.7 |
| 14768.0 | 35.2 | 69.8 | V | 34.6 |
| 16705.9 | 38.8 | 69.8 | V | 31.0 |

Result [dBµV/m] = Analyser reading [dBµV] + Antenna factor [1/m] - Amplifier gain [dB] + Cable loss [dB]



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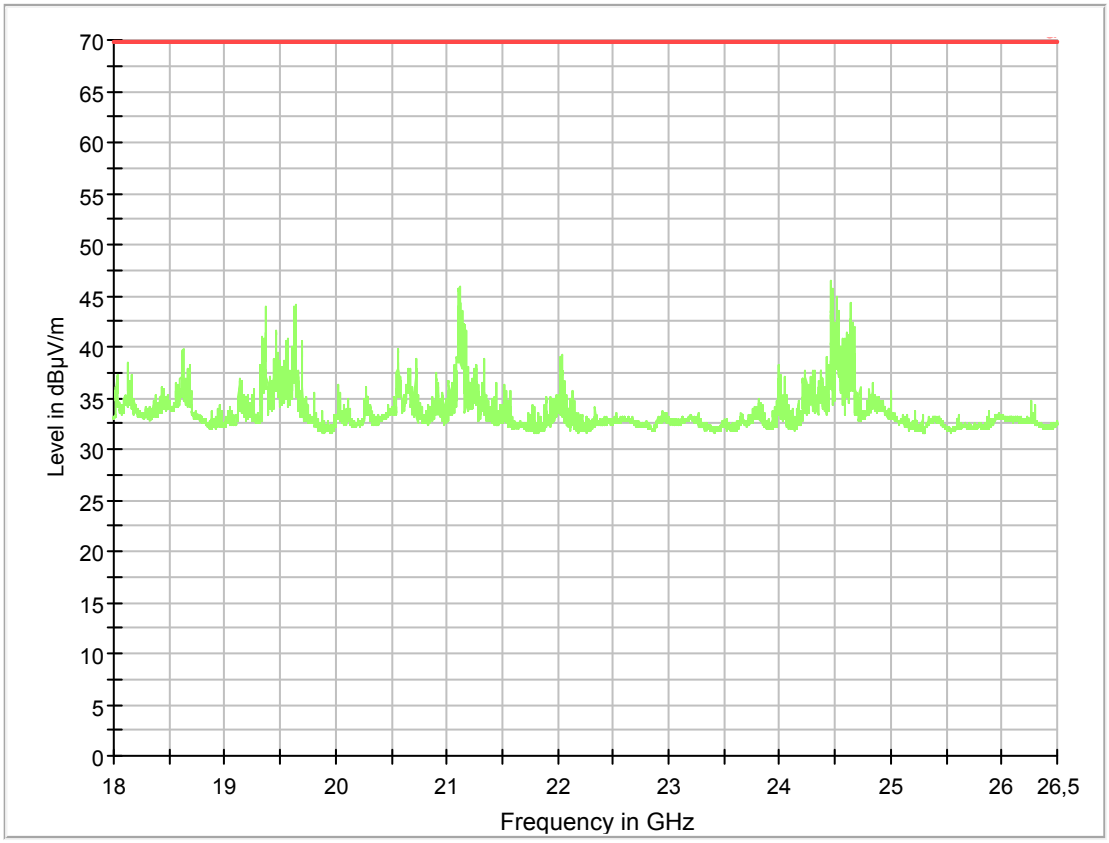
## 6.8 Test results, 18 – 26.5 GHz




**Diagram, Average overview sweep, 18 – 26.5 GHz at 3 m distance.**

**Measurement results, Average**

All measured disturbances have a margin of more than 20 dB to the limits.

Result [dBµV/m] = Analyser reading [dBµV] + Antenna factor [1/m] - Amplifier gain [dB] + Cable loss [dB]



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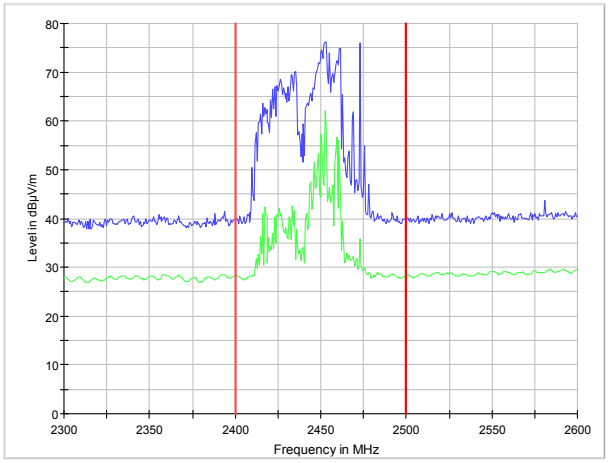
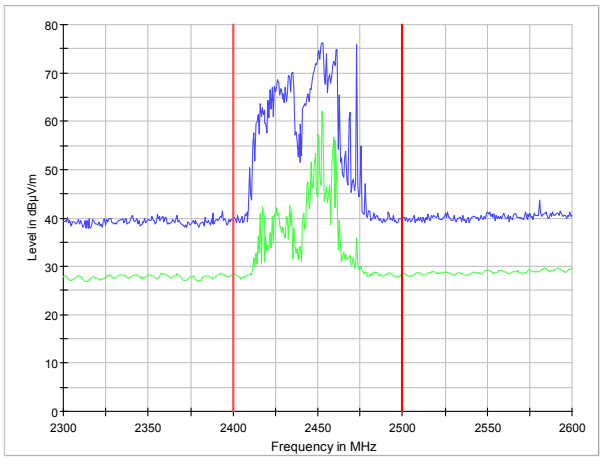
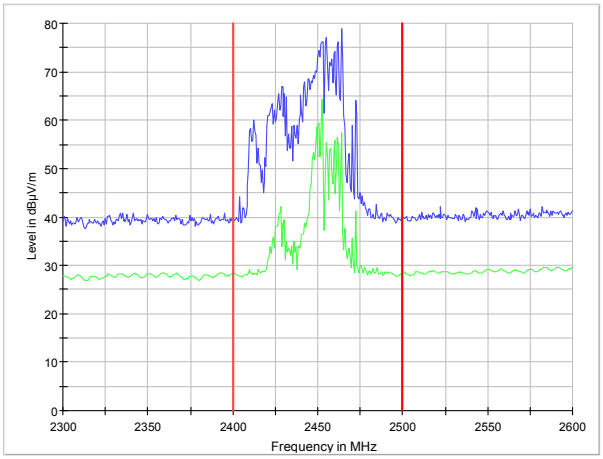
## 6.9 Test results, Fundamental Frequency 2450 (±50) MHz (20 dB filter)




**Diagram, Peak and average overview sweep, 2.3 – 2.6 GHz at 120 V mains voltage.**




**Diagram, Peak and average overview sweep, 2.3 – 2.6 GHz at 96 V mains voltage.**




**Diagram, Peak and average overview sweep, 2.3 – 2.6 GHz at 150 V mains voltage.**



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### 6.10 Test result, Second and third harmonic with varied loads

**Measurement results, Average**

| Harmonic | Polarization | Water Level [ml] | Vessel position | Emission [dBµV/m] | Limit | Margin |
|---|---|---|---|---|---|---|
| 2 | V | 700 | Center | 52.2 | 69.8 | 17.6 |
| | | | Front right | 54.3 | 69.8 | 15.5 |
| | | 300 | Center | 56.4 | 69.8 | 13.4 |
| | | | Front right | 56.6 | 69.8 | 13.2 |
| 3 | H | 700 | Center | 47.0 | 69.8 | 22.8 |
| | | | Front right | 44.7 | 69.8 | 25.1 |
| | | 300 | Center | 43.7 | 69.8 | 26.1 |
| | | | Front right | 43.7 | 69.8 | 26.1 |



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### 6.11 Test equipment

| Equipment type | Manufacturer | Model | Inv. No. | Last Cal. date | Cal. interval |
|---|---|---|---|---|---|
| Measurement software | Rohde & Schwarz | EMC32 – 9 | -- | -- | -- |
| Control unit | Maturo Gmbh | NCD | 32391 | -- | -- |
| Measurement receiver | Rohde & Schwarz | ESIB26 | 32291 | July, 2016 | 1 year |
| Open switch and control platform | Rohde & Schwarz | OSP130 | 32300 | July, 2016 | 1 year |
| Coaxial cable | Radiall | SHF8M | 9975 | July, 2016 | 1 year |
| Three meter SAC chamber | Siepel | HERMES 3 | 30900 | July, 2015 | 3 years |
| Camera Control unit | Pontis | GPIB - 110 | 30705 | -- | -- |
| Monitoring camera | Pontis | Cam 90P101 | 30712 | -- | -- |
| Antenna mast | Maturo Gmbh | TAM 4.0-E | 32376 | -- | -- |
| Preamplifier | Rohde & Schwarz | TS-PRE1 | 32306 | July, 2016 | 1 year |
| Horn antenna | Rohde & Schwarz | HF907 | 32307 | July, 2015 | 3 years |
| Coaxial cable | Rosenberger | UFB311A | 39054 | April, 2017 | 1 year |
| Coaxial cable | Rosenberger | UFB311A | 39057 | April, 2017 | 1 year |
| FILTER | K&L Microwave | 6N45-2450/T100-0/0 | 12389 | March, 2017 | 1 year |
| Coaxial cable | HUBER+SUHNER | Sucoflex 104 PE | 39094 | March, 2017 | 1 year |
| FILTER HIGHPASS | K&L Microwave | 4410-X4500/18000-0/0 | 5133 | March, 2017 | 1 year |
| EMI Test Receiver | Rohde & Schwarz | ESU 40 | 13178 | July, 2016 | 1 year |
| Coaxial cable | MEGAPHASE | GC12-K1K1-315 | 39127 | July, 2016 | 1 year |
| Measurement software | Rohde & Schwarz | EMC32 – 8 | -- | -- | -- |
| Measurement receiver | Rohde & Schwarz | ESU 8 | 12866 | July, 2016 | 1 year |
| Open switch and control platform | ETS-Lindgren | 2090 | 32522 | -- | -- |
| Open switch and control platform | ETS-Lindgren | 2090 | 8237 | -- | -- |
| Camera Control unit | Pontis | -- | 32800 | -- | -- |
| Coaxial cable | Rosenberger | LU7-S020-4000 | 39146 | October, 2016 | 1 year |
| Coaxial cable | Suhner | SUCOFLEX 104 | 39033 | April, 2017 | 1 year |
| Power supply preamplifier | Semko | -- | 7993 | June, 2016 | 1 year |
| Coaxial cable | HUBER+SUHNER | SUCOFLEX 104PEA | 39051 | April, 2017 | 1 year |
| Preamplifier | SEMKO | AM1331 | s7992 | June, 2016 | 1 year |
| Coaxial cable | Huber+Suhner | SUCOFLEX 104 | 32710 | June, 2016 | 1 year |
| Bilog antenna | Chase | CBL 6111A | 971 | July, 2015 | 3 years |
| Coaxial cable | Huber+Suhner | RG 214 | 9506 | June, 2016 | 1 year |



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