



BNetzA-CAB-21/21-21

# Test Report

**Test report no.:** 24100656-44703-0

**Date of issue:** 2025-06-10

**Test result:** The test item - **passed** - and complies with the listed standards.

## Applicant

Huf Baolong Electronics Bretten GmbH

## Manufacturer

Huf Baolong Electronics Bretten GmbH

## Test Item

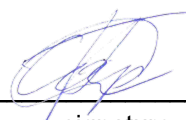
TMSS5G2

## Radio Frequency Testing according to:

**Title 47**  
**FCC Regulations Subpart 15C**  
§15.231

Tested by  
(name, function, signature)

*Piotr Sardyko*  
*Lab Manager RF*

  
signature

Approved by  
(name, function, signature)

*Janoschka Sebastian*  
*Head of Department Radio*

  
signature

| Applicant and Test item details |                                                                                  |
|---------------------------------|----------------------------------------------------------------------------------|
| Applicant                       | Huf Baolong Electronics Bretten GmbH<br>Gewerbestr. 40, 75015 Bretten<br>Germany |
| Manufacturer                    | Huf Baolong Electronics Bretten GmbH<br>Gewerbestr. 40, 75015 Bretten<br>Germany |
| Test item description           | TPMS Sensor S5.xP Dual Band                                                      |
| Model/Type reference            | TMSS5G2                                                                          |
| FCC ID                          | OYGTMSS5G2                                                                       |

### Disclaimer and Notes

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Within this test report, a ☒ point / ☐ comma is used as a decimal separator.  
 If otherwise, a detailed note is added adjected to its use.

Decision rule:

Decision rule based on simple acceptance without guard bands, binary statement, based on mutually agreed uncertainty tolerances with expansion factor k=2.

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## 2 GENERAL INFORMATION

### 2.1 Administrative details

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Testing laboratory              | <b>IBL-Lab GmbH</b><br>Heinrich-Hertz-Allee 7<br>66386 St. Ingbert / Germany<br>Fon: +49 6894 38938-0<br>Fax: +49 6894 38938-99<br>URL: <a href="https://ib-lenhardt.com/">https://ib-lenhardt.com/</a><br>E-Mail: <a href="mailto:info@ib-lenhardt.com">info@ib-lenhardt.com</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Accreditation / Designation     | <p>The testing laboratory is accredited by Deutsche Akkreditierungsstelle GmbH (DAkkS) in compliance with DIN EN ISO/IEC 17025:2018.</p> <p>Scope of testing and registration number:</p> <ul style="list-style-type: none"><li>Attachment to the accreditation certificate <a href="#">D-PL-21375-01-00</a><ul style="list-style-type: none"><li>Electronics</li><li>Electromagnetic Compatibility</li><li>Radio</li><li>Electromagnetic Compatibility and Telecommunication (FCC requirements)</li><li>Telecommunication (TC) and Electromagnetic Compatibility (EMC) for Canadian Standards</li><li>Automotive EMC</li></ul></li></ul> <p>Website DAkkS: <a href="https://www.dakks.de/">https://www.dakks.de/</a><br/>The Deutsche Akkreditierungsstelle GmbH (DAkkS) is also a signatory to the <a href="#">ILAC Mutual Recognition Arrangement</a>.</p> <ul style="list-style-type: none"><li>Designations<ul style="list-style-type: none"><li>FCC Testing Laboratory Designation No. DE0024</li><li>ISED Company Number 27156</li><li>Testing Laboratory CAB Identifier DE0020</li><li>Kraftfahrt-Bundesamt KBA-P 00120-23</li></ul></li></ul> |
| Testing location                | <b>IBL-Lab GmbH</b><br>Heinrich-Hertz-Allee 7<br>66386 St. Ingbert / Germany                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Date of receipt of test samples | 2025-05-12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Start – End of tests            | 2025-05-12 – 2025-05-23                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

### 2.2 Possible verdicts of the results

|                                             |                                                                      |
|---------------------------------------------|----------------------------------------------------------------------|
| Test sample meets the requirements          | P (PASS) – the measured value is below the acceptance limit, AL = TL |
| Test sample does not meet the requirements  | F (FAIL) – the measured value is above the acceptance limit, AL = TL |
| Test case does not apply to the test sample | N/A (Not applicable)                                                 |
| Test case not performed                     | N/P (Not performed)                                                  |

## 2.3 Observations

No additional observations other than the reported observations within this test report have been made.

## 2.4 Opinions and Interpretations

No appropriate opinions or interpretations according ISO/IEC 17025:2017 clause 7.8.7 are within this test report.

## 2.5 Revision History

-0 Initial Version

## 2.6 Further documents

List of further applicable documents belonging to the present test report:

Measurement plots: 24100656-44703-0\_Annex A

EUT photographs: 24100656-44703-0\_Annex B

Test setup photographs: 24100656-44703-0\_Annex C

## 2.7 Formula for determination of correction values ( $E_C$ )

$$E_C = E_R + AF + C_L + D_F - G_A \quad (1)$$

$$M = L_T - E_C \quad (2)$$

$E_C$  = Electrical field – corrected value

$E_R$  = Receiver reading

$M$  = Margin

$L_T$  = Limit

$AF$  = Antenna factor

$C_L$  = Cable loss

$D_F$  = Distance correction factor (if used)

$G_A$  = Gain of pre-amplifier (if used)

All units are dB-units, positive margin means value is below limit.

## 2.8 Software/Firmware used for measurements

All measurements were done directly with spectrum analyzer or SW R&S EMC32.

In some measurements (please see test equipment list for each test) R&S ESW 26 was used (please see chapter 8).

(Instrument) Firmware Version: **1.70**

In some measurements (please see test equipment list for each test) R&S FSW 50 was used (please see chapter 8).

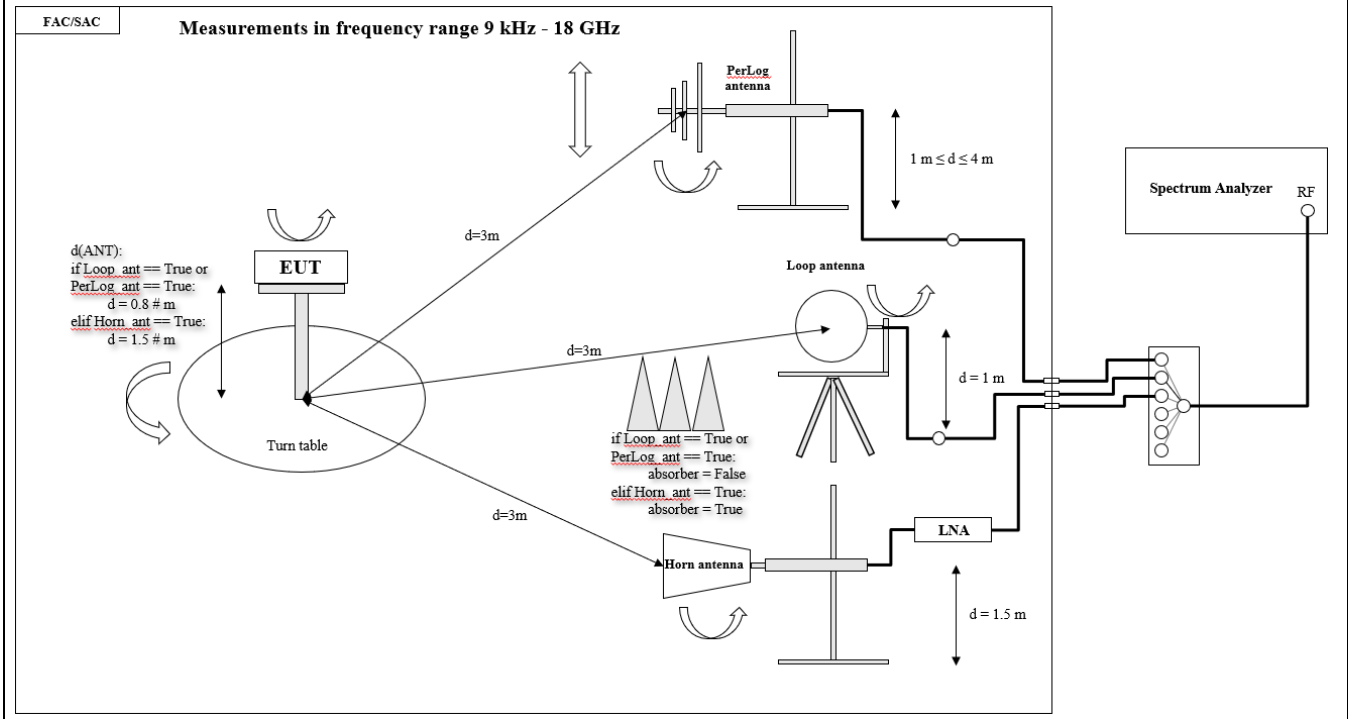
(Instrument) Firmware Version: **4.61**

In some measurements SW R&S EMC32 was used.

Version: **11.10.00**

## 2.9 Block diagrams

Block diagram 1:



### 3 ENVIRONMENTAL & TEST CONDITIONS

#### 3.1 Environmental conditions of lab

|                     |                                   |
|---------------------|-----------------------------------|
| Temperature         | 20°C ± 5°C                        |
| Relative humidity   | 25-75 % R.H.                      |
| Barometric Pressure | 860-1060 mbar                     |
| Power supply        | Battery and External power supply |

### 4 TEST STANDARDS AND REFERENCES

#### Test standard (accredited)

|                                         |     |
|-----------------------------------------|-----|
| FCC CFR Title 47 Part 15 Subpart C:2016 | --- |
| ANSI C63.10: 2013                       | --- |

#### Test standard (not accredited)

|      |
|------|
| None |
|------|

| Reference | Description |
|-----------|-------------|
| none      | ---         |

## 5 EQUIPMENT UNDER TEST (EUT)

### 5.1 Product Description\*

TPMS Sensor for Tire Pressure Monitoring System (TPMS) of passenger cars. The Sensor will be installed inside the tire by the use of a special TPMS valve. The device measure the pressure, temperature and acceleration and transmit the data to the TPMS ECU in the car. The RF transmissison take place in the ISM band 434 MHz (SRD application) or 315 MHz (North America/Japan).

\*: declared by the applicant

### 5.2 Technical Data of Equipment\*

|                                                     |                                                               |
|-----------------------------------------------------|---------------------------------------------------------------|
| TX Frequency band:                                  | [433.050 – 434.790] MHz                                       |
| Number of channel:                                  | 2                                                             |
| Modulation type:                                    | FSK and ASK                                                   |
| Channel bandwidth:                                  | 150 kHz (FSK), 65 kHz (ASK)                                   |
| Channel tested:                                     | f <sub>cent1</sub> : 433.92 MHz, f <sub>cent2</sub> : 315 MHz |
| Spectrum Access Mechanism:                          | Duty Cycle                                                    |
| Adaptive Frequency Agility:                         | No                                                            |
| DSSS:                                               | No                                                            |
| RF mode:                                            | TX                                                            |
| Antenna Type:                                       | Internal                                                      |
| Antenna gain:                                       | -25 dBi                                                       |
| Antenna connector:                                  | None                                                          |
| Equipment type:                                     | Production model                                              |
| Temperature range:                                  | Tmin: -40 °C, Tmax: 120 °C                                    |
| Type of power source:                               | 3 V lithium battery                                           |
| Operational voltage( minimal, nominal and maximal): | Vmin: 2.55 VDC, Vnom: 3 VDC, Vmax: 3.4 VDC                    |

\*: declared by the applicant

### 5.3 Test Item (Equipment Under Test) Description\*

| Short designation | EUT Model | EUT Description                    | ID number | Hardware status | Software status |
|-------------------|-----------|------------------------------------|-----------|-----------------|-----------------|
| EUT A             | TMSS5G2   | Radiated sample with housing S5.1P | 2000DD18  | 300.378.00      | 253.04          |
| EUT B             | TMSS5G2   | Radiated sample with housing S5.2P | 2000DD21  | 300.378.00      | 253.04          |
| EUT C             | TMSS5G2   | Radiated sample with housing S5.5P | 2000DD2C  | 300.378.00      | 253.04          |

\*: declared by the applicant

### 5.4 Auxiliary Equipment (AE) Description\*

| AE short designation | AE Name (if available) | AE Description    | Serial number (if available) | Software (if used) |
|----------------------|------------------------|-------------------|------------------------------|--------------------|
| AE 1                 | SmarTool               | TPMS Trigger Tool | -                            | -                  |

\*: declared by the applicant

## 5.5 Test Item Operating Modes Description\*

| EUT operating mode no. | Description of operating modes | Additional information              |
|------------------------|--------------------------------|-------------------------------------|
| op. 1                  | CW low                         | unmodulated, 433.88 MHz             |
| op. 2                  | CW mid                         | unmodulated, 433.92 MHz             |
| op. 3                  | CW high                        | unmodulated, 433.96 MHz             |
| op. 4                  | FSK mode                       | modulated, FSK, 9.6 Kbps 433.92 MHz |
| op. 5                  | ASK mode                       | modulated, ASK, 4.2 Kbps 433.92 MHz |
| op. 6                  | CW low                         | unmodulated, 315 MHz                |
| op. 7                  | CW mid                         | unmodulated, 315 MHz                |
| op. 8                  | CW high                        | unmodulated, 315 MHz                |
| op. 9                  | FSK mode                       | modulated, FSK, 9.6 Kbps 315 MHz    |
| op. 10                 | ASK mode                       | modulated, ASK, 4.2 Kbps 315 MHz    |

\*: declared by the applicant

## 5.6 Test Item Set-ups Description

|        |              |
|--------|--------------|
| set. 1 | EUT A + AE1  |
| set. 2 | EUT B + AE 1 |
| set. 3 | EUT C + AE 1 |

## 5.7 Test conditions

| Temperatur, [°C] |        | Voltage, [V] |   |
|------------------|--------|--------------|---|
| Tnom             | 20 ± 5 | Vnom         | 3 |
| Tmax             | -      | Vmax         | - |
| Tmin             | -      | Vmin         | - |

## 5.8 Additional Information

|                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Test items differences</b>                                                    | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Additional application considerations to test a component or sub-assembly</b> | <p>The EFS measurement was done with 3 EUTs. All 3 EUTs have the same PCBA but different cabinets: EUT A – S5.1P, EUT B – S5.2P, EUT C – S5.5P. Fundamental field strength test respectively RFS test in frequency range 30 MHz – 1 GHz was made for op. 2/7 (middle channel) for all set-ups. The results of these tests didn't show any significant differences. Thus, the type of the cabinet barely has influence on the FS radiated from PCBA. Nevertheless, the set-up 1 showed slightly higher results than other set-ups. Therefore, it was decided to make fundamental field strength test and radiated FS test with op. 1/5 and op. 3/8 only with set-up 1. The results showed again no significant differences. But op. 2/7 had a slightly higher value of FS than other Ops. Thus, RFS in frequency range 1 GHz – 12.75 GHz was done for set-up 1 op. 2/7 as the one with highest FS. Please see results table in Chapter 7.1.</p> |

6 SUMMARY OF TEST RESULTS

| Test specification |
|--------------------|
| FCC 15.231         |

| Requirement / Test Case              | Test Conditions | Set-up  | Operating mode | Result / Remark                                                                                                                                                                    | Verdict |
|--------------------------------------|-----------------|---------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| Fundamental field strength           | Nominal         | 1, 2, 3 | 1-3, 6-8       | Please see additional explanation in Subchapter 5.8.                                                                                                                               | Pass    |
| Radiated field strength measurements | Nominal         | 1, 2, 3 | 1-3, 6-8       | RFS test for frequency range > 1 GHz was done only for Set-up 1 Op. 1 and 6 (constellations with the highest field strength). Please see additional explanation in Subchapter 5.8. | Pass    |
| Transmit time                        | Nominal         | 1       | 4, 5, 9, 10    | None                                                                                                                                                                               | Pass    |
| Occupied Bandwidth                   | Nominal         | 1       | 4, 5, 9, 10    | None                                                                                                                                                                               | Pass    |

| Notes |
|-------|
| None  |

| Comments and observations |
|---------------------------|
| None                      |

## 7 TEST RESULTS

### 7.1 Fundamental field strength

#### Test equipment (Please see Chapter 8 for exact information of test equipment)

Radiated: C1, R1, A2, SW2

#### Description

The measurement test set-up and test procedure are in accordance with the provisions described in ANSI 63.10: 2013.

The measurement antenna was situated in 3 m distance to the EUT.

RBW for frequency range 30 MHz- 1 GHz: 120 kHz.

See photos in Annex C for test Set-up and block diagram in Chapter 2.9.

#### Limits

According to FCC 15.231(e) Field strength of fundamental:

| Frequency [MHz] | Frequency [MHz] |             | Frequency [MHz] | Frequency [MHz] |
|-----------------|-----------------|-------------|-----------------|-----------------|
|                 | [μV/m]          | [dBμV/m]    |                 |                 |
| 40.66-40.70     | 40.66-40.70     | 40.66-40.70 | 40.66-40.70     | 40.66-40.70     |
| 70-130          | 70-130          | 70-130      | 70-130          | 70-130          |
| 130-174         | 130-174         | 130-174     | 130-174         | 130-174         |
| 174-260         | 174-260         | 174-260     | 174-260         | 174-260         |
| 260-470         | 260-470         | 260-470     | 260-470         | 260-470         |
| Above 470       | Above 470       | Above 470   | Above 470       | Above 470       |

Measurement Level = Reading Level + Correction Factor.

Limit(μV/m@433.9MHz):

$X_{11}=260$ ,  $Y_{11}=1500$ ,  $X_{12}=470$ ,  $Y_{12}=5000$

$f(x)=mx+b$ ,  $m=(5000-1500)/(470-260)=3500/210=16.66$ ,  $b=f(x)-mx=5000-16.66*470=-2833.33$

$\Rightarrow f(x)=16.66*x-2833.33 \Rightarrow$

$f(433.9)=16.66*433.9-2833.33=4398.33$

$f(315)=16.66*315-2833.33=4398.33$

Limit dBμV/m RMS/Peak:

433.92 MHz: Average/RMS Limit =  $20\text{LOG}(4398.33) = 72.86$  dBμV/m. Peak Limit = RMS Limit + 20 dB=92.86 dBμV/m.

315 MHz: Average/RMS Limit =  $20\text{LOG}(2414.57) = 67.65$  dBμV/m. Peak Limit = RMS Limit + 20 dB=87.65 dBμV/m.

#### Results Peak Detector\*

| Set./ Op.    | Peak field strength, [dBμV/m] | Limit Peak, [dBμV/m] | Margin [dB] | DC CorFac**, [dB] | AV field strength, [dBμV/m] | Limit AV, [dBμV/m] | Margin [dB] | Verdict |
|--------------|-------------------------------|----------------------|-------------|-------------------|-----------------------------|--------------------|-------------|---------|
| Set.1, Op. 2 | 75.12                         | 92.86                | 17.74       | -10.96            | 64.16                       | 72.86              | 8.70        | Pass    |
| Set.2, Op. 2 | 74.5                          | 92.86                | 18.36       | -10.96            | 63.54                       | 72.86              | 9.32        | Pass    |
| Set.3, Op. 2 | 74.65                         | 92.86                | 18.21       | -10.96            | 63.69                       | 72.86              | 9.17        | Pass    |
| Set.1, Op. 1 | 74.66                         | 92.86                | 18.2        | -10.96            | 63.70                       | 72.86              | 9.16        | Pass    |
| Set.1, Op. 3 | 74.33                         | 92.86                | 18.53       | -10.96            | 63.37                       | 72.86              | 9.49        | Pass    |
| Set.1, Op. 7 | 69.57                         | 87.66                | 18.0868     | -10.96            | 58.61                       | 67.66              | 9.04        | Pass    |
| Set.2, Op. 7 | 69.2                          | 87.66                | 18.4568     | -10.96            | 58.24                       | 67.66              | 9.41        | Pass    |
| Set.3, Op. 7 | 69.35                         | 87.66                | 18.3068     | -10.96            | 58.39                       | 67.66              | 9.26        | Pass    |
| Set.1, Op. 6 | 69.29                         | 87.66                | 18.3668     | -10.96            | 58.33                       | 67.66              | 9.32        | Pass    |

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|               |       |       |         |        |       |       |      |      |
|---------------|-------|-------|---------|--------|-------|-------|------|------|
| Set. 1, Op. 8 | 69.05 | 87.66 | 18.6068 | -10.96 | 58.09 | 67.66 | 9.56 | Pass |
|---------------|-------|-------|---------|--------|-------|-------|------|------|

\* Please see measurement plots in Annex A.  
\*\* Please see Plot 3.2 in Annex A:  $20 \cdot \text{LOG}(\text{DC}/100) = 20 \cdot \text{LOG}(0.2832) = -10.96 \text{ dB}$  (wors case DC)

## 7.2 Radiated field strength measurements

### Test equipment

#### Frequency range 9 kHz – 30 MHz

Measurement in a semianechoic room with the distance between the EUT and the reference point of the antenna 3 m (see photos in Annex B). The measurement was done with software R&S EMC 32 V11.00.

Radiated: A1, C1, R1, SW2

#### Frequency range 30 MHz – 1 GHz

Measurement in a semianechoic room with the distance between the EUT and the reference point of the antenna 3 m (see photos in Annex B). The measurement was done with software R&S EMC 32 V11.00.

Radiated: A2, C1, R1, SW2

#### Frequency range 1 GHz – 12.75 GHz

Measurement in a fully anechoic room with the distance between the EUT and the reference point of the antenna 3 m (see photos in Annex B). The measurement was done directly with spectrum analyzer.

Radiated: A3, Amp2, C1, R1, F4, SW 2

### Description

The measurement test set-up and test procedure are in accordance with the provisions described in ANSI 63.10: 2013.

The measurement antenna was situated in 3 m distance to the EUT.

RBW for frequency range 9 kHz- 30 MHz: 200 Hz, 9 kHz.

RBW for frequency range 30 MHz- 1 GHz: 120 kHz.

RBW for frequency range 1 GHz- 5 GHz: 1 MHz.

See photos in Annex C for test Set-up and block diagram in Chapter 2.9.

### Limits

According to FCC 15.209(a):

| Frequency (MHz) | Magnetic field strength (HField)<br>( $\mu\text{A/m}$ )** | Field strength (microvolts/meter) | Measurement distance (meters) |
|-----------------|-----------------------------------------------------------|-----------------------------------|-------------------------------|
| 0.009-0.490*    | 6.37/F (F in kHz)                                         | 2400/F(kHz)                       | 300                           |
| 0.490-1.705*    | 63.7/F (F in kHz)                                         | 24000/F(kHz)                      | 30                            |
| 1.705-30.0*     | 0.08                                                      | 30                                | 30                            |

\* Limit line was corrected due to measurement distance of 3 m

\*\* the measurement was done with dBuV/m units. Please see the appropriate dBuV/m limits in the same table

### Limits

According to FCC 15.231(e) Field strength of spurious emission:

| Frequency<br>[MHz] | Field strength@3m   |                | Measurement<br>distance<br>[meters] | Remarks              |
|--------------------|---------------------|----------------|-------------------------------------|----------------------|
|                    | [ $\mu\text{V/m}$ ] | [dBuV/m]       |                                     |                      |
| 40.66-40.70        | 100                 | 40             | 3                                   | Linear interpolation |
| 70-130             | 50                  | 33.98          |                                     |                      |
| 130-174            | 50 to 150           | 33.98 to 43.52 |                                     |                      |
| 174-260            | 150                 | 43.52          |                                     |                      |
| 260-470            | 150 to 500          | 43.52 to 53.98 |                                     |                      |
| Above 470          | 500                 | 53.98          |                                     |                      |

### Results\*

| Op./ Set. | Frequency | Detector | Test<br>distance<br>[m] | Level<br>[dB $\mu\text{V/m}$ ] | Limit<br>[dB $\mu\text{V/m}$ ] | Margin<br>[dB] | Verdict |
|-----------|-----------|----------|-------------------------|--------------------------------|--------------------------------|----------------|---------|
|-----------|-----------|----------|-------------------------|--------------------------------|--------------------------------|----------------|---------|

|                                                                                                   |                   |            |   |            |    |       |             |
|---------------------------------------------------------------------------------------------------|-------------------|------------|---|------------|----|-------|-------------|
| Op.1-3,<br>Set.1-3, 6-8                                                                           | 9 kHz – 30 MHz    | Peak       | 3 | Noise only |    |       | <b>Pass</b> |
| Set.1, Op. 2                                                                                      | 30 MHz – 1 GHz    | Quasi-Peak | 3 | 39.58      | 46 | 6.42  | <b>Pass</b> |
| Set.2, Op. 2                                                                                      | 30 MHz – 1 GHz    | Quasi-Peak | 3 | 40.05      | 46 | 5.95  | <b>Pass</b> |
| Set.3, Op. 2                                                                                      | 30 MHz – 1 GHz    | Quasi-Peak | 3 | 36.34      | 46 | 9.66  | <b>Pass</b> |
| Set.1, Op. 1                                                                                      | 30 MHz – 1 GHz    | Quasi-Peak | 3 | 40.48      | 46 | 5.52  | <b>Pass</b> |
| Set.1, Op. 3                                                                                      | 30 MHz – 1 GHz    | Quasi-Peak | 3 | 40.38      | 46 | 5.62  | <b>Pass</b> |
| Set.1, Op. 7                                                                                      | 30 MHz – 1 GHz    | Quasi-Peak | 3 | 39.76      | 46 | 6.24  | <b>Pass</b> |
| Set.2, Op. 7                                                                                      | 30 MHz – 1 GHz    | Quasi-Peak | 3 | 37.77      | 46 | 8.23  | <b>Pass</b> |
| Set.3, Op. 7                                                                                      | 30 MHz – 1 GHz    | Quasi-Peak | 3 | 38.86      | 46 | 7.14  | <b>Pass</b> |
| Set.1, Op. 6                                                                                      | 30 MHz – 1 GHz    | Quasi-Peak | 3 | 39.78      | 46 | 6.22  | <b>Pass</b> |
| Set.1, Op. 8                                                                                      | 30 MHz – 1 GHz    | Quasi-Peak | 3 | 39.23      | 46 | 6.77  | <b>Pass</b> |
| Set.1, Op. 2                                                                                      | 1 GHz – 12.75 GHz | Peak       | 3 | 61.86      | 74 | 12.14 | <b>Pass</b> |
| Set.1, Op. 2                                                                                      | 1 GHz – 12.75 GHz | RMS        | 3 | 50.9**     | 54 | 3.1   | <b>Pass</b> |
| Set.1, Op. 7                                                                                      | 1 GHz – 12.75 GHz | Peak       | 3 | 48.99      | 74 | 25.01 | <b>Pass</b> |
| Set.1, Op. 7                                                                                      | 1 GHz – 12.75 GHz | RMS        | 3 | 46.79      | 54 | 7.21  | <b>Pass</b> |
| All Readings below 1 GHz are Quasi-Peak or Peak detector, above 1 GHz with Peak and RMS detector. |                   |            |   |            |    |       |             |

\* Please see measurement plots in Annex A.

\*\*\* the limit for average detector is 54 dBuV/m. There are two values above this limit, measured with peak detector (M1: 61.86 dBuV/m at 1.301750 GHz, M2: 59.35 dBuV/m at 3.471150 GHz). It is the 3<sup>rd</sup> and 8<sup>th</sup> harmonic of the main signal. Please see chapter to OBW measurement. Correction factor is used to get an average value. Correction factor =  $20 \cdot \log(0.2832) = -10.96$  dB (please see Chapter to Transmit time measurements).

=> M1\_average value=61.86 dBuV/m - 10.96 dB = **50.9** dBuV/m

=> M2\_average value=59.35 dBuV/m - 10.96 dB = **48.39** dBuV/m

### 7.3 Transmit time

#### Test equipment (Please see Chapter 8 for exact information of test equipment)

Radiated: R4, A4, C3

#### Description

Please see test set-up photos in Annex C.  
Measurement was done radiated.

#### Limits

##### FCC 15.231(e):

Devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

##### FCC 15.231(a)(4):

Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition.

#### Results\*

| Plot No | Set./ Op. | Frequency, [MHz] | Measured value, [ms] | Limit**, [sec] | Result |
|---------|-----------|------------------|----------------------|----------------|--------|
| 3.3     | 1, 4      | 433.92           | 912.291              | <1             | Pass   |
| 3.1     | 1, 4      | 433.92           | 29.27                | >27.36         | Pass   |
| 3.6     | 1, 5      | 433.92           | 914                  | <1             | Pass   |
| 3.1     | 1, 5      | 433.92           | 29.38                | >27.42         | Pass   |
| 3.9     | 1, 9      | 315              | 912                  | <1             | Pass   |
| 3.7     | 1, 9      | 315              | 29.25                | >27.36         | Pass   |
| 3.12    | 1, 10     | 315              | 914                  | <1             | Pass   |
| 3.10    | 1, 10     | 315              | 29.37                | >27.42         | Pass   |

\* Please see measurement plots in Annex A.

\*\* The manufacturer is responsible for not exceeding this requirement.

## 7.4 Occupied Bandwidth

### Test equipment (Please see Chapter 8 for exact information of test equipment)

Radiated: R4, A4, C3

### Description

The measurement test set-up and test procedure are in accordance with the provisions described in ANSI 63.10: 2013.

Please see test set-up photos in Annex C and block diagram in Chapter 2.9.

Please see Plots in Annex A for spectrum analyzer settings.

Measurement was done radiated.

### Limits

The bandwidth of the emission shall be not wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be not wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

### Results\*

| Set./ Op.     | Frequency, [MHz] | Measured value<br>(99% BW), [kHz]  | Limit, [kHz] | Result      |
|---------------|------------------|------------------------------------|--------------|-------------|
| Set.1, Op. 4  | 433.92           | 153.442                            | 1084.8       | <b>Pass</b> |
| Set.1, Op. 5  | 433.92           | 65.671                             | 1084.8       | <b>Pass</b> |
| Set.1, Op. 9  | 315              | 140.092                            | 787.5        | <b>Pass</b> |
| Set.1, Op. 10 | 315              | 56.806                             | 787.5        | <b>Pass</b> |
| Set./ Op.     | Frequency, [MHz] | Measured value<br>(20dB BW), [kHz] | Limit, [kHz] | Result      |
| Set.1, Op. 4  | 433.92           | 140.8                              | 1084.8       | <b>Pass</b> |
| Set.1, Op. 5  | 433.92           | 28.8                               | 1084.8       | <b>Pass</b> |
| Set.1, Op. 9  | 315              | 140                                | 787.5        | <b>Pass</b> |
| Set.1, Op. 10 | 315              | 29.6                               | 787.5        | <b>Pass</b> |

\* Please see measurement plots in Annex A.

## 8 MEASUREMENT EQUIPMENT

| No                        | Equipment                            | Type                           | Manufacturer                    | Serial No. | Int. No.  | Last Calibration | Next Calibration |
|---------------------------|--------------------------------------|--------------------------------|---------------------------------|------------|-----------|------------------|------------------|
| <b>Antennas (A):</b>      |                                      |                                |                                 |            |           |                  |                  |
| 1.                        | Active Loop Antenna                  | HFH2-Z2E                       | Rohde & Schwarz                 | 100108     | LAB000108 | 2023-05-05       | 2026-05-05       |
| 2.                        | Ultrabroadband antenna               | HL562E                         | Rohde & Schwarz                 | 102005     | LAB000150 | 2022-12-22       | 2025-12-22       |
| 3.                        | Double-Ridged Waveguide Horn Antenna | HF-907                         | Rohde & Schwarz                 | 102899     | LAB000151 | 2023-05-15       | 2026-05-15       |
| 4.                        | Rod Antenna                          | -                              | -                               | -          | LAB000290 | -                | -                |
| 5.                        | Horn Antenna (2.6 GHz – 3.95 GHz)    | PE9863/SF-10                   | Pasternack                      | -          | LAB000312 | 2021-01-13       | -                |
| 6.                        | Horn Antenna (3.95 GHz – 5.85 GHz)   | PE9861/SF-10                   | Pasternack                      | -          | LAB000264 | 2020-09-29       | -                |
| 7.                        | Horn Antenna (10 GHz – 15 GHz)       | PE9855 SF-20                   | Pasternack                      | -          | LAB000263 | 2020-09-29       | -                |
| 8.                        | Horn Antenna (12.4 GHz – 18 GHz)     | 62-HA20-A-SMF                  | TTE Europe                      | -          | LAB000282 | 2020-09-29       | -                |
| 9.                        | Horn Antenna (17.6 GHz – 26.7 GHz)   | 20240-20                       | Flann Microwave Ltd             | 266402     | LAB000127 | 2020-06-29       | -                |
| 10.                       | Horn Antenna (26.4 GHz – 40.1 GHz)   | 22240-20                       | Flann Microwave Ltd             | 270447     | LAB000129 | 2020-06-29       | -                |
| 11.                       | Horn Antenna (33 GHz – 50.1 GHz)     | 23240-20                       | Flann Microwave Ltd             | 273430     | LAB000132 | 2020-07-01       | -                |
| 12.                       | Horn Antenna (49.9 GHz – 75.8 GHz)   | 25240-20                       | Flann Microwave Ltd             | 272860     | LAB000133 | 2020-07-01       | -                |
| 13.                       | Horn Antenna (60.5 GHz – 91.5 GHz)   | 26240-20                       | Flann Microwave Ltd             | 273417     | LAB000135 | 2020-07-01       | -                |
| 14.                       | Horn Antenna (73.8 GHz – 114 GHz)    | 27240-20                       | Flann Microwave Ltd             | 273368     | LAB000138 | 2020-07-01       | -                |
| 15.                       | Horn Antenna (114 GHz – 173 GHz)     | 29240-20                       | Flann Microwave Ltd             | 273382     | LAB000139 | 2020-07-01       | -                |
| 16.                       | Horn Antenna (145 GHz – 220 GHz)     | 30240-20                       | Flann Microwave Ltd             | 273390     | LAB000178 | 2020-08-01       | -                |
| 17.                       | Horn Antenna (217 GHz – 330 GHz)     | 32240-20                       | Flann Microwave Ltd             | 273469     | LAB000152 | 2020-08-01       | -                |
| 18.                       | Horn Antenna (49.9 GHz – 75.8 GHz)   | 25240-20                       | Flann Microwave Ltd             | 272861     | LAB000134 | 2020-07-01       | -                |
| 19.                       | Horn Antenna (60.5 GHz – 91.5 GHz)   | 26240-20                       | Flann Microwave Ltd             | 273418     | LAB000136 | 2020-08-01       | -                |
| <b>Amplifiers (Amp)*:</b> |                                      |                                |                                 |            |           |                  |                  |
| 1.                        | Pre-Amplifier                        | BBV 9718 C                     | Schwarzbeck Mess-Elektronik OHG | 84         | LAB000169 | -                | -                |
| 2.                        | Low noise amplifier                  | BZ-01000900-111550-202320      | B&Z Technologies                | 24336      | LAB000296 | -                | -                |
| 3.                        | Low noise amplifier                  | BZ-08001800-180855-202020      | B&Z Technologies                | 22105      | LAB000297 | -                | -                |
| 4.                        | Low noise amplifier                  | BZ-18004000-270845-252525      | B&Z Technologies                | 22449      | LAB000298 | -                | -                |
| <b>Attenuator (Att)*:</b> |                                      |                                |                                 |            |           |                  |                  |
| 1.                        | Attenuator                           | 25081-20 (49.9 GHz - 75.8 GHz) | Flann Microwave Ltd             | 234411     | LAB000229 | -                | -                |

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|                                  |                                                    |                                   |                             |            |           |            |            |
|----------------------------------|----------------------------------------------------|-----------------------------------|-----------------------------|------------|-----------|------------|------------|
| 2.                               | Attenuator                                         | 27081-20<br>(73.8 GHz – 112 GHz ) | Flann Microwave Ltd         | 270004     | LAB000230 | -          | -          |
| <b>RF Cables (Cab)*:</b>         |                                                    |                                   |                             |            |           |            |            |
| 1.                               | Coaxial cable                                      | LU7-022-1000                      | Rosenberger                 | 33         | LAB000153 | -          | -          |
| 2.                               | Coaxial cable                                      | LU7-022-1000                      | Rosenberger                 | 34         | LAB000153 | -          | -          |
| 3.                               | Coaxial cable                                      | SF101/1.5m                        | Huber & Suhner              | 503987/1   | LAB000165 | -          | -          |
| <b>Chambers (C):</b>             |                                                    |                                   |                             |            |           |            |            |
| 1.                               | Semi/Fully Anecoic Chamber                         | Babylon 5 (SAC 5)                 | Albatross Projects GmbH     | 20168.PRB  | LAB000235 | 2024-02-28 | 2026-02-28 |
| 2.                               | Climatic chamber                                   | T-65/50                           | CTS GmbH                    | 204002     | LAB000110 | 2024-06-07 | 2025-06-07 |
| 3.                               | Shielding Cover                                    | CMU-Z11                           | Rohde & Schwarz             | 100876     | LAB000039 | -          | -          |
| 4.                               | Climatic chamber                                   | T-70/350                          | CTS GmbH                    | 194027     | LAB000066 | 2024-07-01 | 2025-07-01 |
| 5.                               | Shielded room                                      | Sputnik 1<br>(Schirmkabine)       | Albatross Projects GmbH     | -          | LAB000257 | -          | -          |
| 6.                               | Semi/Fully Anecoic Chamber                         | Atlas 5 (SAC 5)                   | Albatross Projects GmbH     | P31018     | LAB000492 | -          | -          |
| <b>Corner Reflector (CR):</b>    |                                                    |                                   |                             |            |           |            |            |
| 1.                               | Trihedral Corner Reflector                         | SAJ-080-S1                        | ERAVANT                     | 04756-01   | LAB000201 | -          | -          |
| <b>Directional coupler (DC):</b> |                                                    |                                   |                             |            |           |            |            |
| 1.                               | Directional coupler                                | CPL-5230-10-SMA-79                | Midwest Microwave           | -          | LAB000672 | -          | -          |
| <b>Distance meter (DM):</b>      |                                                    |                                   |                             |            |           |            |            |
| 1.                               | Laser distance meter                               | GLM 50 C                          | Bosch                       | -          | -         | -          | -          |
| 2.                               | Laser distance meter                               | GLM 120 C                         | Bosch                       | -          | -         | -          | -          |
| <b>Filter (F)*:</b>              |                                                    |                                   |                             |            |           |            |            |
| 1.                               | High-pass filter<br>(84 GHz – 110 GHz)             | 10-WHPF-84.5-UG387                | TTE                         | -          | LAB000299 | -          | -          |
| 2.                               | High-pass filter<br>(7 GHz – 23 GHz)               | HPF 7-23                          | AtlantRF                    | -          | LAB000444 | -          | -          |
| 3.                               | High-pass filter<br>(3.3 GHz – 12.75 GHz)          | HPF 3.3-11                        | AtlantRF                    | -          | LAB000382 | -          | -          |
| 4.                               | High-pass filter<br>(1.3 GHz – 12.75 GHz)          | H1G713G1                          | Microwave Circuits Inc      | 46291      | LAB000443 | -          | -          |
| 5.                               | High-pass filter<br>(1.3 GHz – 12.75 GHz)          | H1G713G1                          | Microwave Circuits Inc      | 1896-01    | LAB000670 | -          | -          |
| 6.                               | Bandstop filter<br>(30MHz – 3GHz for 900 MHz Band) | WRCG876/960-847/989-50/8SS        | Wainwright Instruments GmbH | -          | LAB000671 | -          | -          |
| <b>Harmonic mixers (H):</b>      |                                                    |                                   |                             |            |           |            |            |
| 1.                               | Harmonic Mixer                                     | FS-Z60                            | Rohde & Schwarz             | 101350     | LAB000375 | 2025-04-15 | 2026-04-15 |
| 2.                               | Harmonic Mixer                                     | FS-Z75                            | Rohde & Schwarz             | 102015     | LAB000112 | 2025-03-27 | 2026-03-27 |
| 3.                               | Harmonic Mixer                                     | FS-Z90                            | Rohde & Schwarz             | 102020     | LAB000113 | 2025-05-07 | 2026-05-07 |
| 4.                               | Harmonic Mixer                                     | FS-Z110                           | Rohde & Schwarz             | 102000     | LAB000114 | 2025-03-27 | 2026-03-27 |
| 5.                               | Harmonic Mixer                                     | FS-Z170                           | Rohde & Schwarz             | 100996     | LAB000126 | 2025-03-27 | 2026-03-27 |
| 6.                               | Harmonic Mixer                                     | FS-Z220                           | Rohde & Schwarz             | 101039     | LAB000116 | 2025-04-25 | 2026-04-25 |
| 7.                               | Harmonic Mixer                                     | FS-Z325                           | Rohde & Schwarz             | 101015     | LAB000117 | 2025-04-09 | 2026-04-09 |
| <b>LISN (L):</b>                 |                                                    |                                   |                             |            |           |            |            |
| 1.                               | Two-line V-Network                                 | ENV216                            | Rohde & Schwarz             | 102597     | LAB000220 | 2023-11-07 | 2025-10-28 |
| 2.                               | Two-line V-Network                                 | ENV216                            | Rohde & Schwarz             | 102598     | LAB000217 | 2024-06-06 | 2025-06-06 |
| <b>Multimeters (M):</b>          |                                                    |                                   |                             |            |           |            |            |
| 1.                               | Multimeter                                         | U1242B                            | Keysight                    | MY59240021 | LAB000187 | 2024-06-20 | 2026-06-20 |
| 2.                               | Multimeter                                         | U1242B                            | Keysight                    | MY59160026 | LAB000018 | 2024-09-06 | 2025-09-05 |
| <b>Multipliers (Mp):</b>         |                                                    |                                   |                             |            |           |            |            |
| 1.                               | Multiplier                                         | SMZ75                             | Rohde & Schwarz             | 101307     | -         | 2018-03-15 | -          |
| 2.                               | Multiplier                                         | SMZ110                            | Rohde & Schwarz             | 100001     | -         | 2020-05-09 | -          |

| Oscilloscopes (O):                   |                                   |                               |                        |                                |           |            |            |
|--------------------------------------|-----------------------------------|-------------------------------|------------------------|--------------------------------|-----------|------------|------------|
| 1.                                   | Oscilloscope                      | RTE 1104                      | Rohde & Schwarz        | 1317.2500K04<br>-<br>101439-Rn | LAB000849 | 2025-01-31 | 2026-01-31 |
| Power Supply (P):                    |                                   |                               |                        |                                |           |            |            |
| 1.                                   | Power Supply                      | PS 2042-10 B                  | Elektro-Automatic GmbH | 2878350263                     | LAB000190 | -          | -          |
| 2.                                   | Power Supply                      | PS 2042-10 B                  | Elektro-Automatic GmbH | 2878350322                     | LAB000192 | -          | -          |
| 3.                                   | Power Supply                      | E3640A                        | Agilent                | MY40005693                     | LAB000036 | -          | -          |
| Power meters (PM):                   |                                   |                               |                        |                                |           |            |            |
| 1.                                   | Power meter                       | NRP-Z81                       | Rohde & Schwarz        | 106194                         | LAB000120 | -          | -          |
| 2.                                   | Power meter                       | NRP110T                       | Rohde & Schwarz        | 101151                         | LAB000119 | 2025-05-16 | 2026-05-16 |
| Receivers and Spectrumanalyzers (R): |                                   |                               |                        |                                |           |            |            |
| 1.                                   | Test Receiver, SAC5               | ESW-26                        | Rohde & Schwarz        | 101517                         | LAB000363 | 2025-01-10 | 2026-01-10 |
| 2.                                   | Test Receiver                     | ESW-26                        | Rohde & Schwarz        | 101481                         | LAB000236 | 2023-07-09 | 2025-07-09 |
| 3.                                   | Spectrum Analyzer 1 Hz – 50 GHz   | FSW-50                        | Rohde & Schwarz        | 101450                         | LAB000111 | 2024-07-19 | 2025-07-19 |
| 4.                                   | Spectrum Analyzer 2 Hz – 43 GHz   | FSW-43                        | Rohde & Schwarz        | 101391                         | LAB000289 | 2024-06-04 | 2025-06-04 |
| Signal Generators (SG):              |                                   |                               |                        |                                |           |            |            |
| 1.                                   | Signal generator 8 kHz – 50 GHz   | SMA100B                       | Rohde & Schwarz        | 103838                         | LAB000118 | 2024-06-28 | 2025-06-28 |
| 2.                                   | Vector Signal Generator           | SMW200A                       | Rohde & Schwarz        | 109775                         | LAB000870 | 2023-10-18 | 2026-10-18 |
| 3.                                   | Signal generator 100 kHz – 20 GHz | SMB100A                       | Rohde & Schwarz        | 178175                         | LAB000276 | 2024-04-03 | 2025-04-03 |
| Software (SW):                       |                                   |                               |                        |                                |           |            |            |
| No                                   | Type                              | Name                          | Manufacturer           | Version                        | Int. No.  | Build      | Rev        |
| 1.                                   | Software                          | R&S Power Viewer              | Rohde & Schwarz        | 11.3, 3.2.2020                 | -         | 7338       | 3230       |
| 2.                                   | Software                          | R&S EMC32                     | Rohde & Schwarz        | 11.20                          | -         | -          | -          |
| 3.                                   | Software                          | R&S Elektra EMC test software | Rohde & Schwarz        | 13.00                          | -         | -          | -          |

\* The gain values of Amp and attenuation values of Cab and Att are remeasured annually internal.

9 MEASUREMENT UNCERTAINTIES

| Test case                     | Measurement uncertainty*         |
|-------------------------------|----------------------------------|
| Radiated field strength       | $\leq \pm 6 \text{ dB}$          |
| Occupied bandwidth            | $\pm 100 \text{ kHz}$            |
| Time domain measurement       | $\pm 2.32 \text{ ms}$            |
| DC and low frequency voltages | $\pm 3 \%$                       |
| Temperature                   | $\pm 1 \text{ }^{\circ}\text{C}$ |
| Humidity                      | $\pm 3 \%$                       |

\*) The indicated expanded measurement uncertainty corresponds to the standard measurement uncertainty for the measurement results multiplied by the coverage factor  $k = 2$ . The true value is located in the corresponding interval with a probability of 95 %.

END OF THE REPORT

# Annex A

Measurement plots

part of / in addition to

***Test report no.:*** 24100656-44703-0

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|     |                                                |    |
|-----|------------------------------------------------|----|
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## **1 Fundamental field strength**

### **1.1 Set-up 1, Op. 2**

Please see Plot 2.2.1.

### **1.2 Set-up 2, Op. 2**

Please see Plot 2.2.2.

### **1.3 Set-up 3, Op. 2**

Please see Plot 2.2.3.

### **1.4 Set-up 1, Op. 1**

Please see Plot 2.2.4.

### **1.5 Set-up 1, Op. 3**

Please see Plot 2.2.5.

### **1.6 Set-up 1, Op. 7**

Please see Plot 2.2.6.

### **1.7 Set-up 2, Op. 7**

Please see Plot 2.2.7.

### **1.8 Set-up 3, Op. 7**

Please see Plot 2.2.8.

### **1.9 Set-up 1, Op. 6**

Please see Plot 2.2.9.

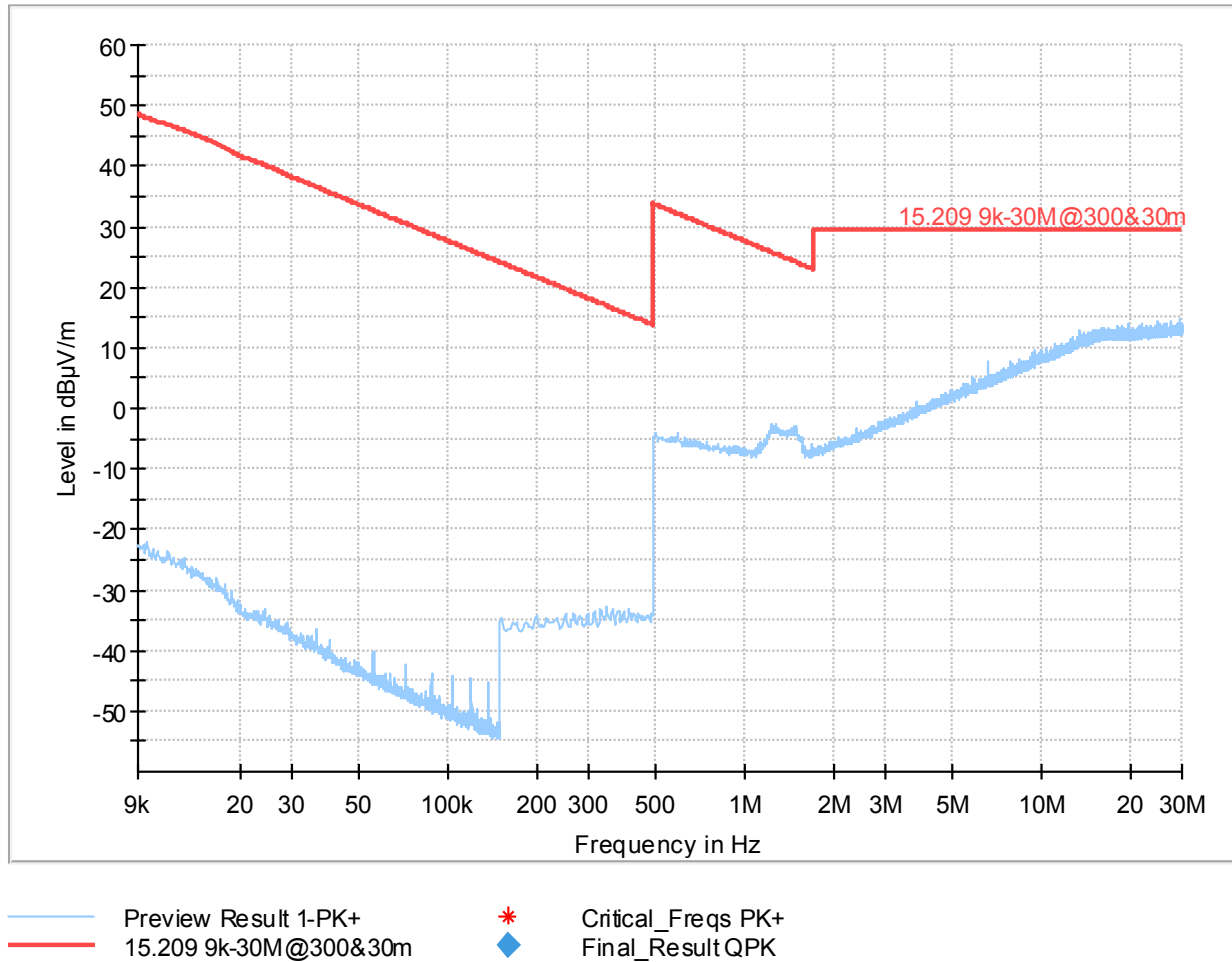
### **1.10 Set-up 1, Op. 8**

Please see Plot 2.2.10.

## 2 General Limit - Radiated field strength emissions, 9 kHz - 5 GHz

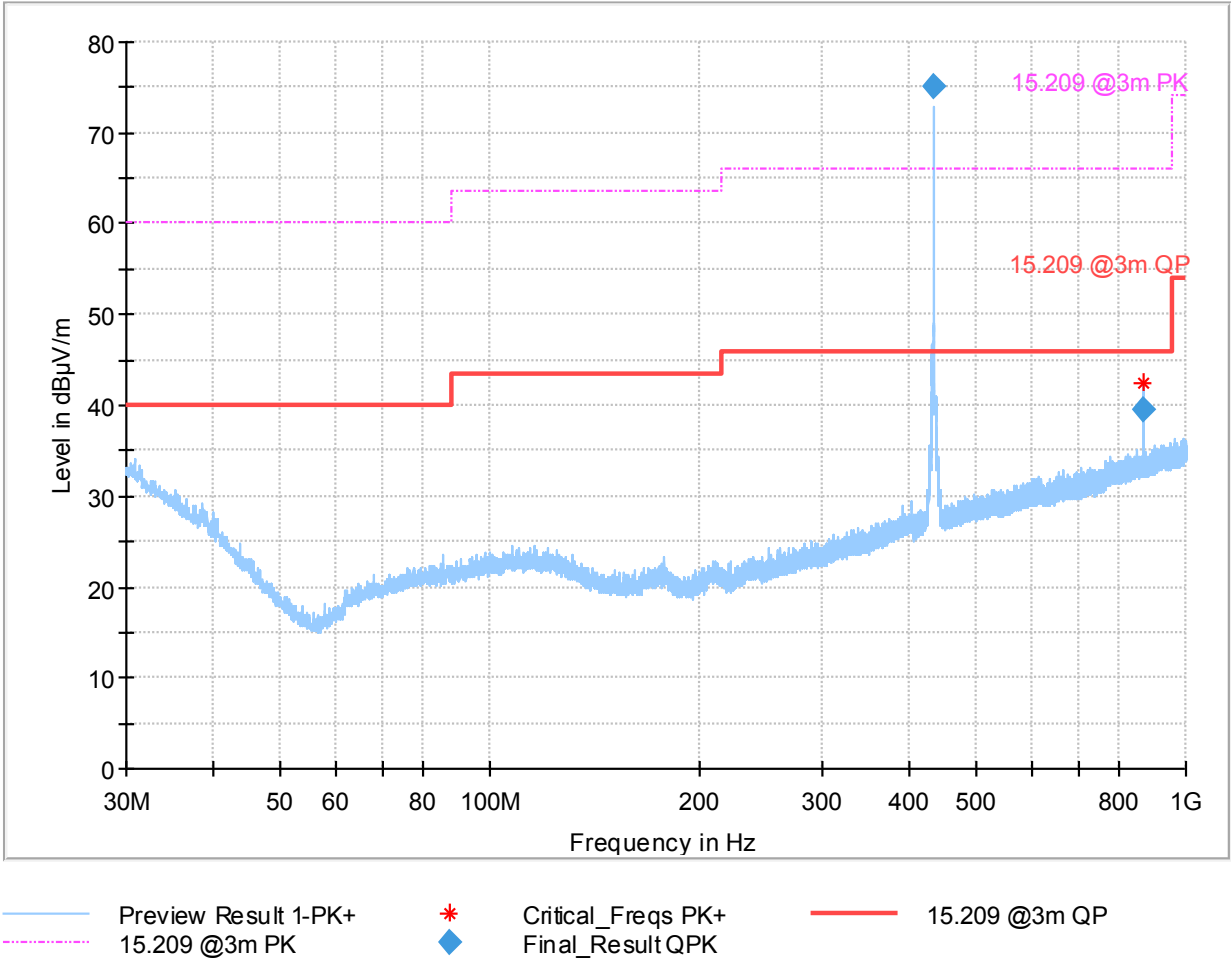
### 2.1 Radiated field strength measurements ( $f < 30$ MHz)

#### 2.1.1 Set-up 1-3, 9 kHz – 30 MHz, Op. 1-3/6-8, EUT lying + standing



2.2 Radiated field strength measurements (30 MHz < f < 1000 MHz)

2.2.1 Lying, Set-up 1, Op. 2, lying + standing (2 pos.)

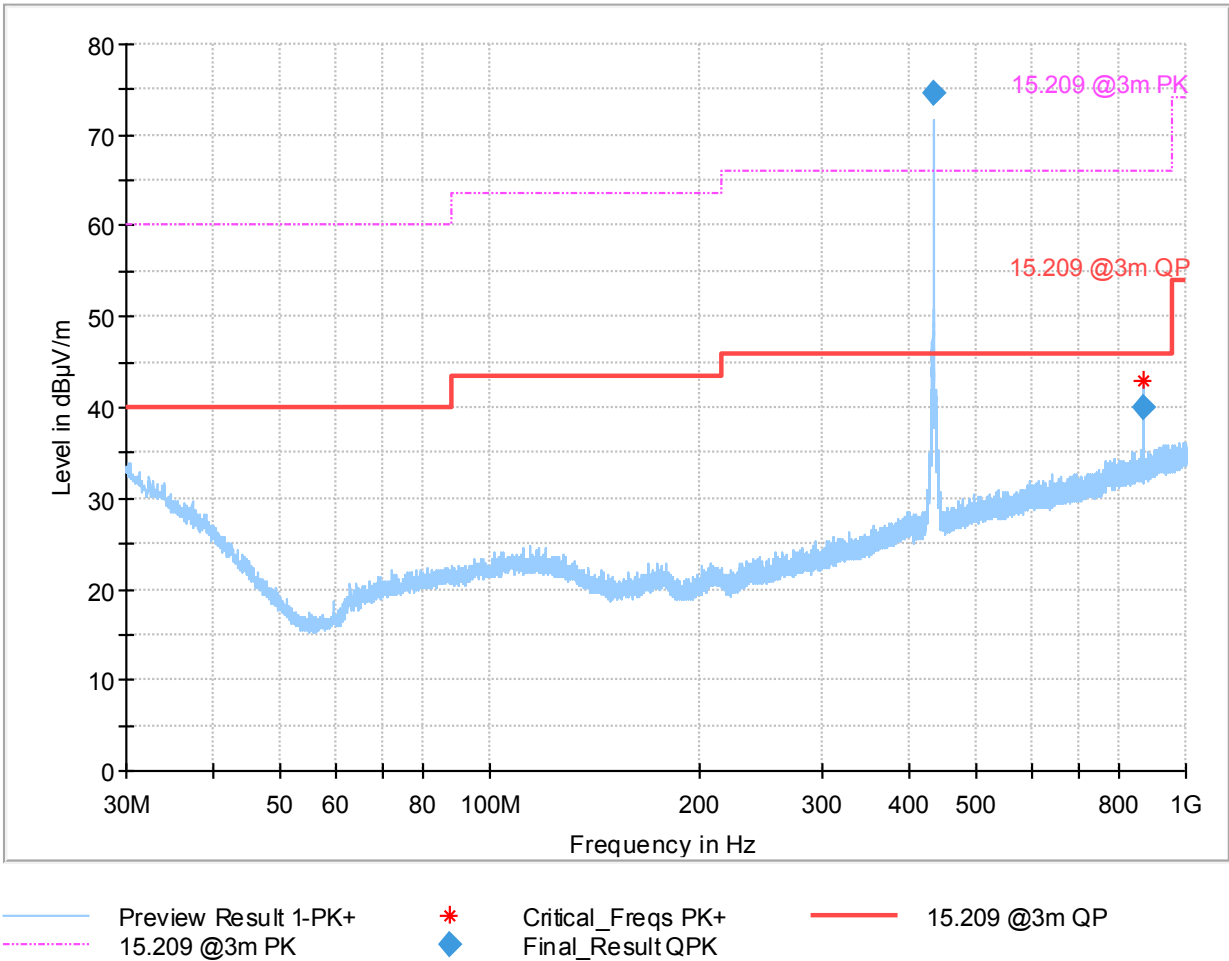


Final\_Result

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|
| 433.925000      | 75.12              | 46.00          | -29.12      | 100.0           | 120.000         | 138.0       | V   | 207.0         |
| 867.855000      | 39.58              | 46.00          | 6.42        | 100.0           | 120.000         | 100.0       | H   | -3.0          |

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2.2.2 Lying, Set-up 2, Op. 2, lying + standing (2 pos.)

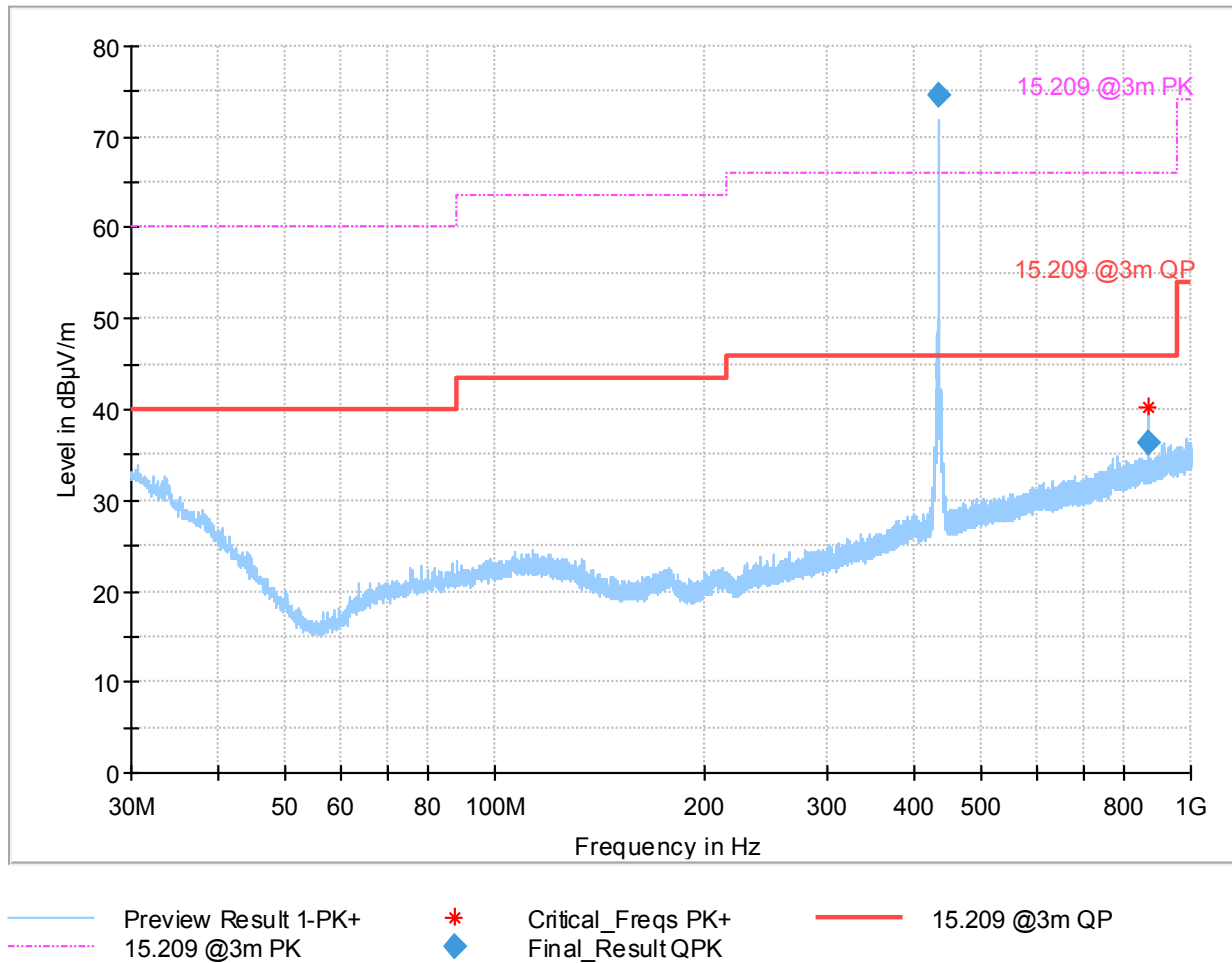


Final Result

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|
| 433.925000      | 74.50              | 46.00          | -28.50      | 100.0           | 120.000         | 142.0       | V   | 208.0         |
| 867.825000      | 40.05              | 46.00          | 5.95        | 100.0           | 120.000         | 103.0       | H   | 0.0           |

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### 2.2.3 Lying, Set-up 3, Op. 2, lying + standing (2 pos.)

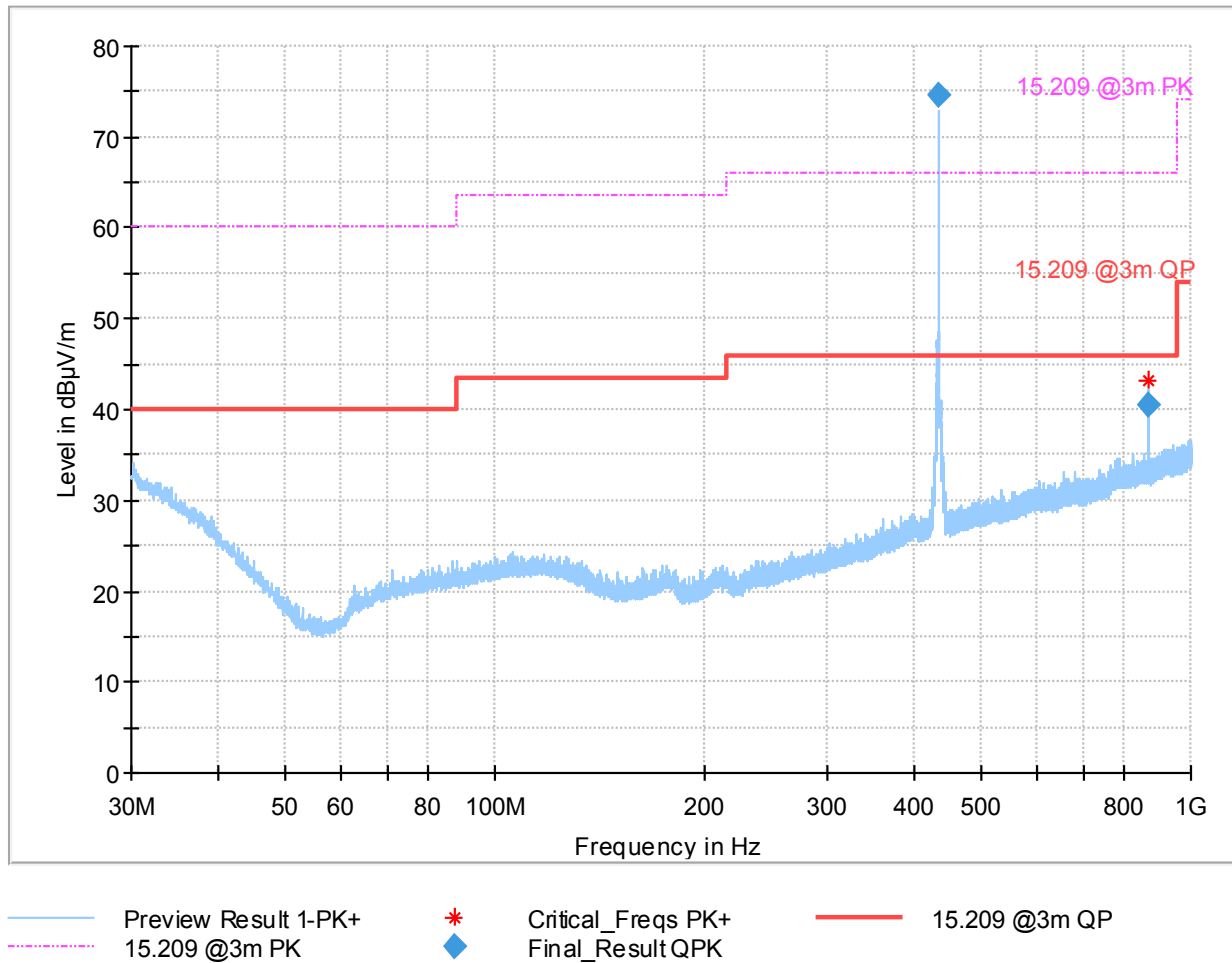


### Final Result

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|
| 433.925000      | 74.65              | 46.00          | -28.65      | 100.0           | 120.000         | 128.0       | V   | 203.0         |
| 867.825000      | 36.34              | 46.00          | 9.66        | 100.0           | 120.000         | 100.0       | H   | 165.0         |

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## 2.2.4 Lying, Set-up 1, Op. 1, lying + standing (2 pos.)

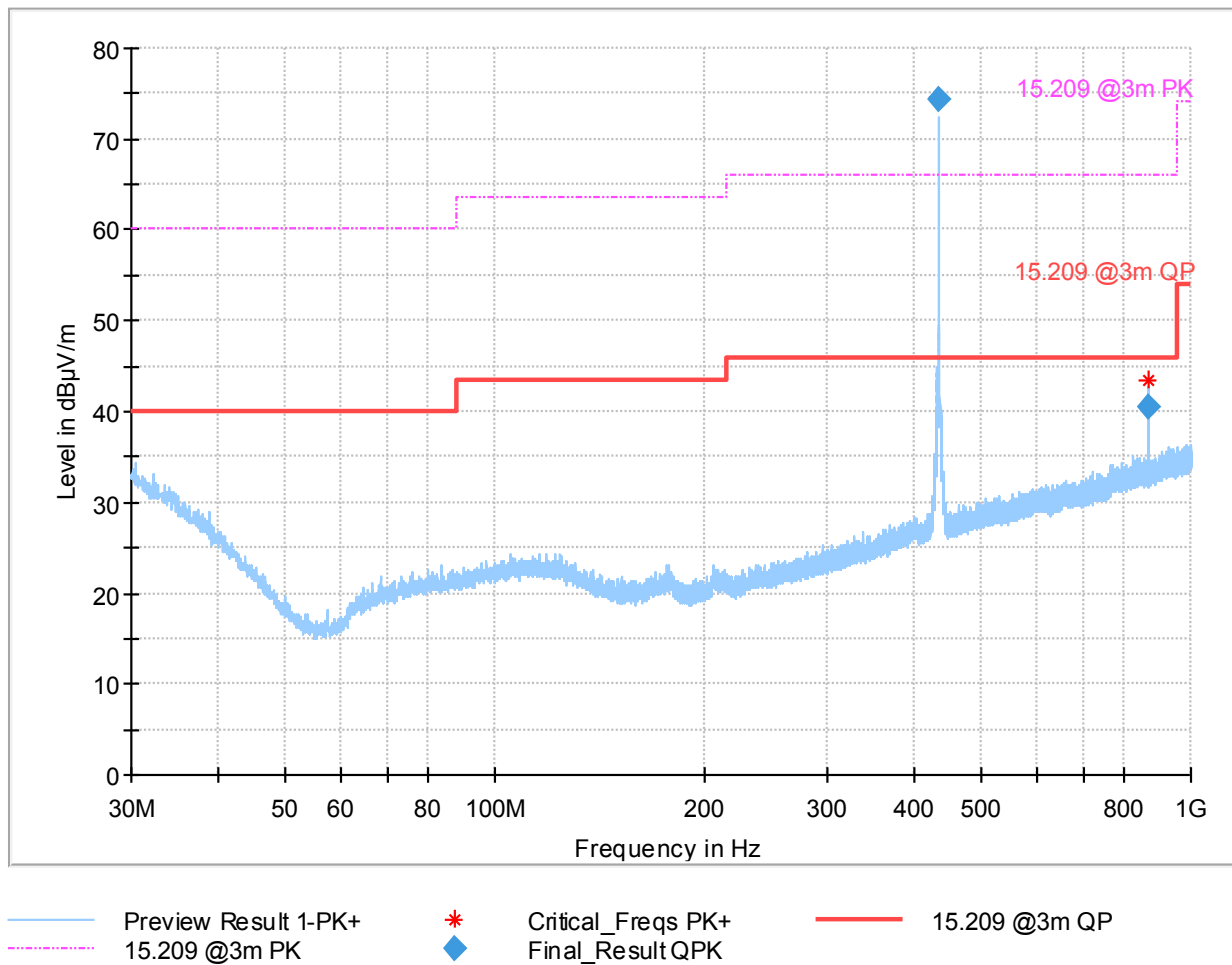


## Final Result

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|
| 433.875000      | 74.66              | 46.00          | -28.66      | 100.0           | 120.000         | 130.0       | V   | 28.0          |
| 867.750000      | 40.48              | 46.00          | 5.52        | 100.0           | 120.000         | 100.0       | H   | 188.0         |

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## 2.2.5 Lying, Set-up 1, Op. 3, lying + standing (2 pos.)

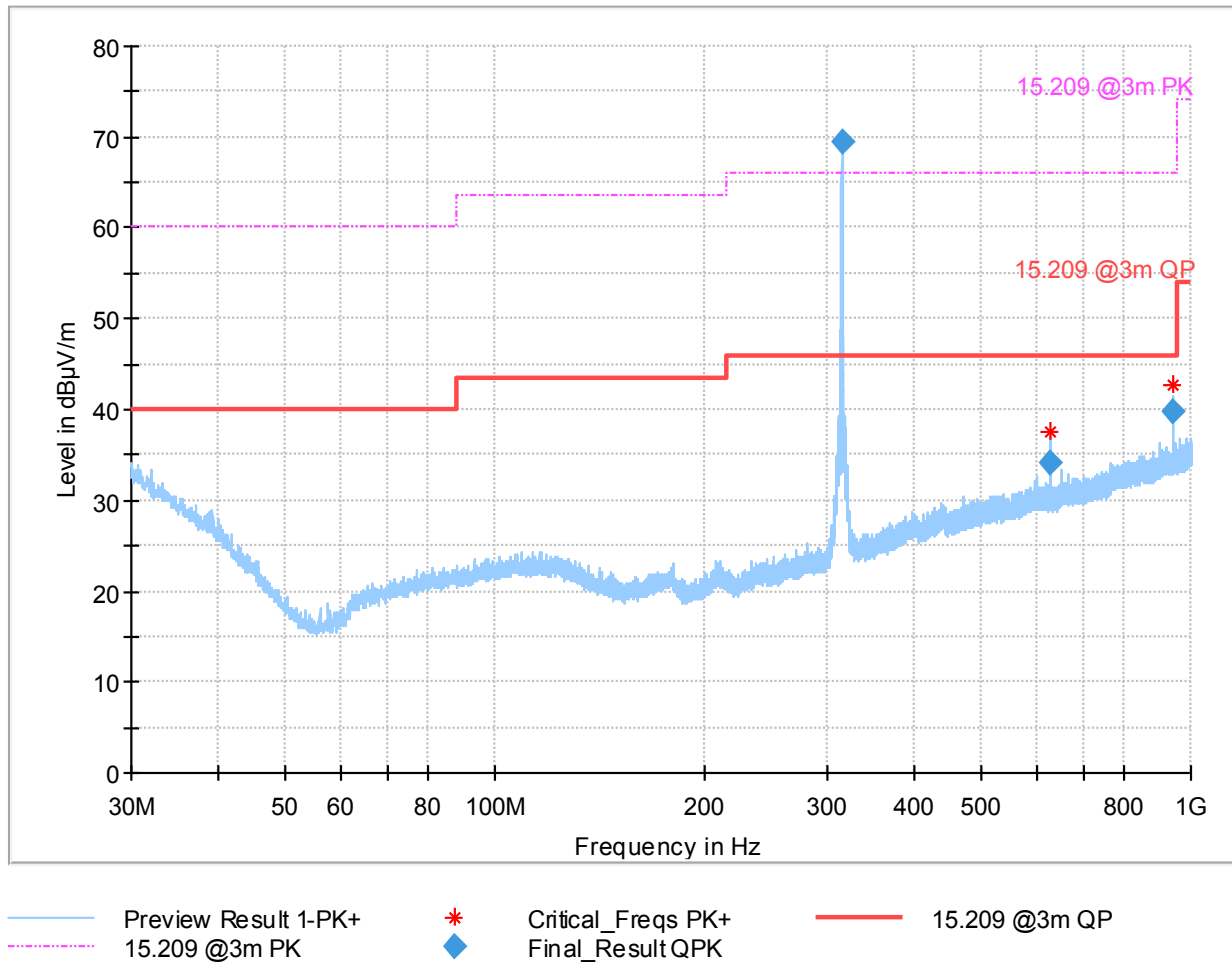


## Final Result

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|
| 433.950000      | 74.33              | 46.00          | -28.33      | 100.0           | 120.000         | 128.0       | V   | 27.0          |
| 867.925000      | 40.38              | 46.00          | 5.62        | 100.0           | 120.000         | 100.0       | H   | 192.0         |

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## 2.2.6 Lying, Set-up 1, Op. 7, lying + standing (2 pos.)

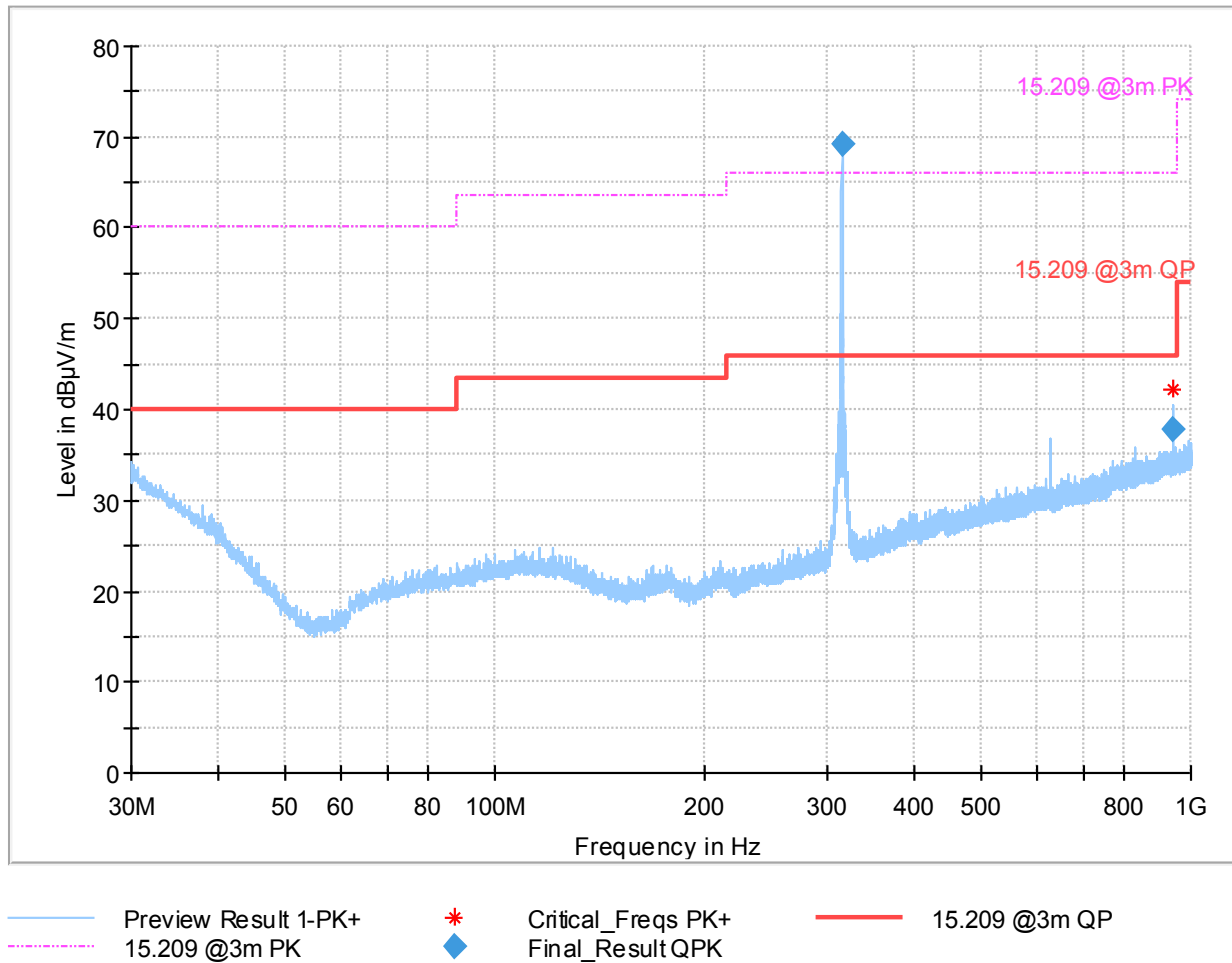


## Final Result

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|
| 315.000000      | 69.57              | 46.00          | -23.57      | 100.0           | 120.000         | 100.0       | H   | 34.0          |
| 630.000000      | 34.18              | 46.00          | 11.82       | 100.0           | 120.000         | 100.0       | V   | 187.0         |
| 945.000000      | 39.76              | 46.00          | 6.24        | 100.0           | 120.000         | 148.0       | H   | -16.0         |

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## 2.2.7 Lying, Set-up 2, Op. 7, lying + standing (2 pos.)

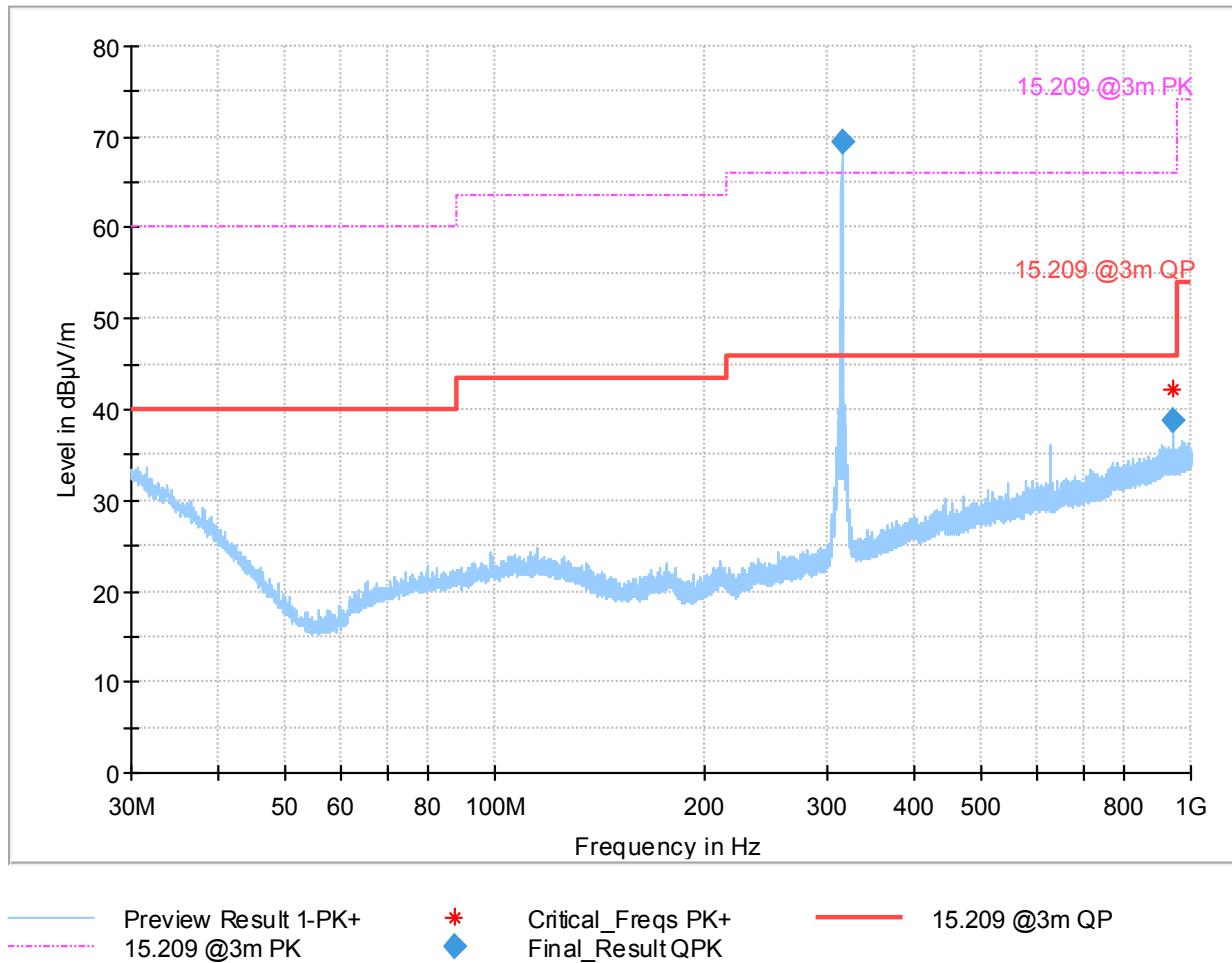


## Final Result

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|
| 315.000000      | 69.20              | 46.00          | -23.20      | 100.0           | 120.000         | 100.0       | H   | 31.0          |
| 945.000000      | 37.77              | 46.00          | 8.23        | 100.0           | 120.000         | 136.0       | H   | -10.0         |

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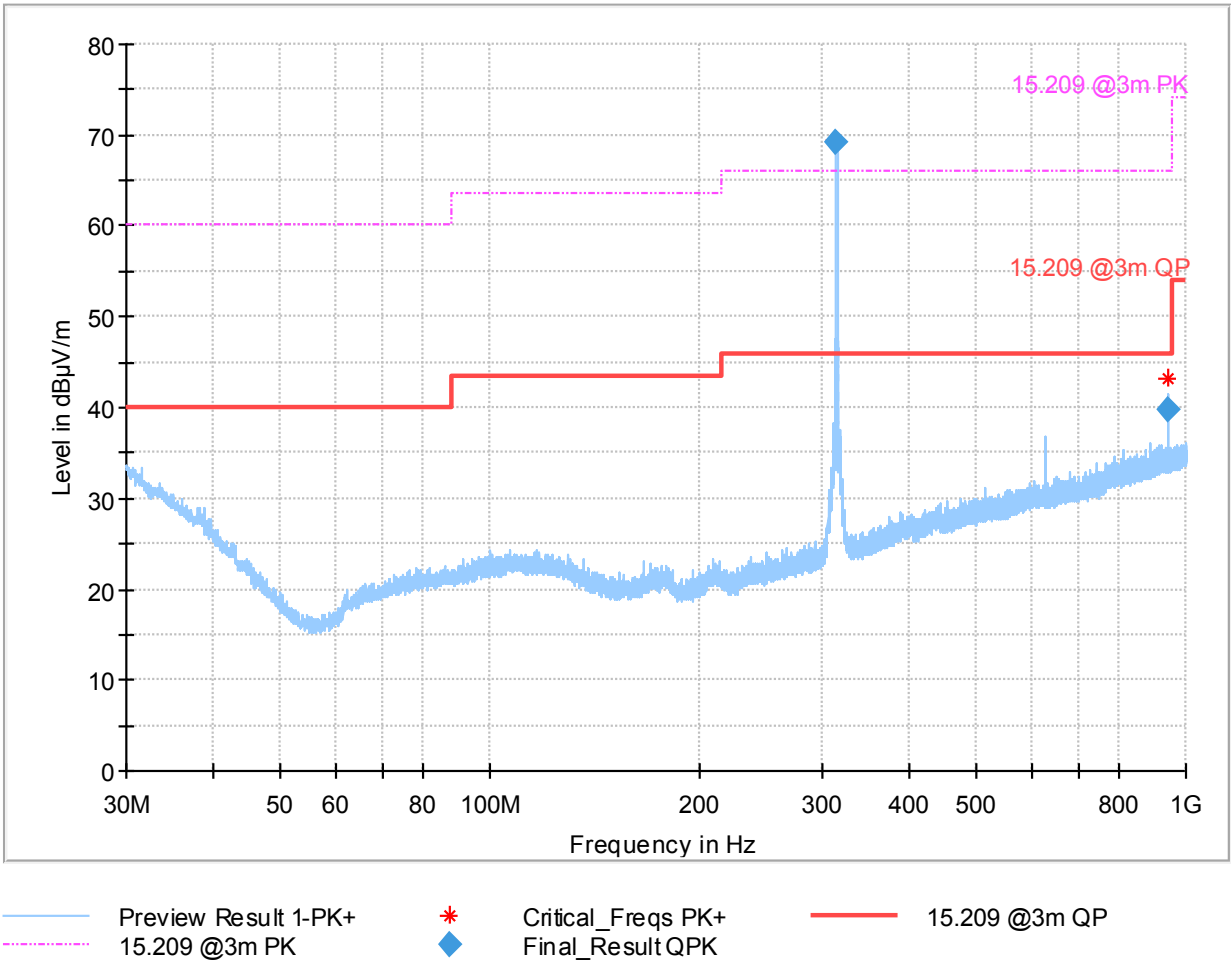
## 2.2.8 Lying, Set-up 3, Op. 7, lying + standing (2 pos.)



## Final Result

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|
| 315.000000      | 69.35              | 46.00          | -23.35      | 100.0           | 120.000         | 100.0       | H   | 29.0          |
| 945.000000      | 38.86              | 46.00          | 7.14        | 100.0           | 120.000         | 151.0       | H   | 341.0         |

2.2.9 Lying, Set-up 1, Op. 6, lying + standing (2 pos.)

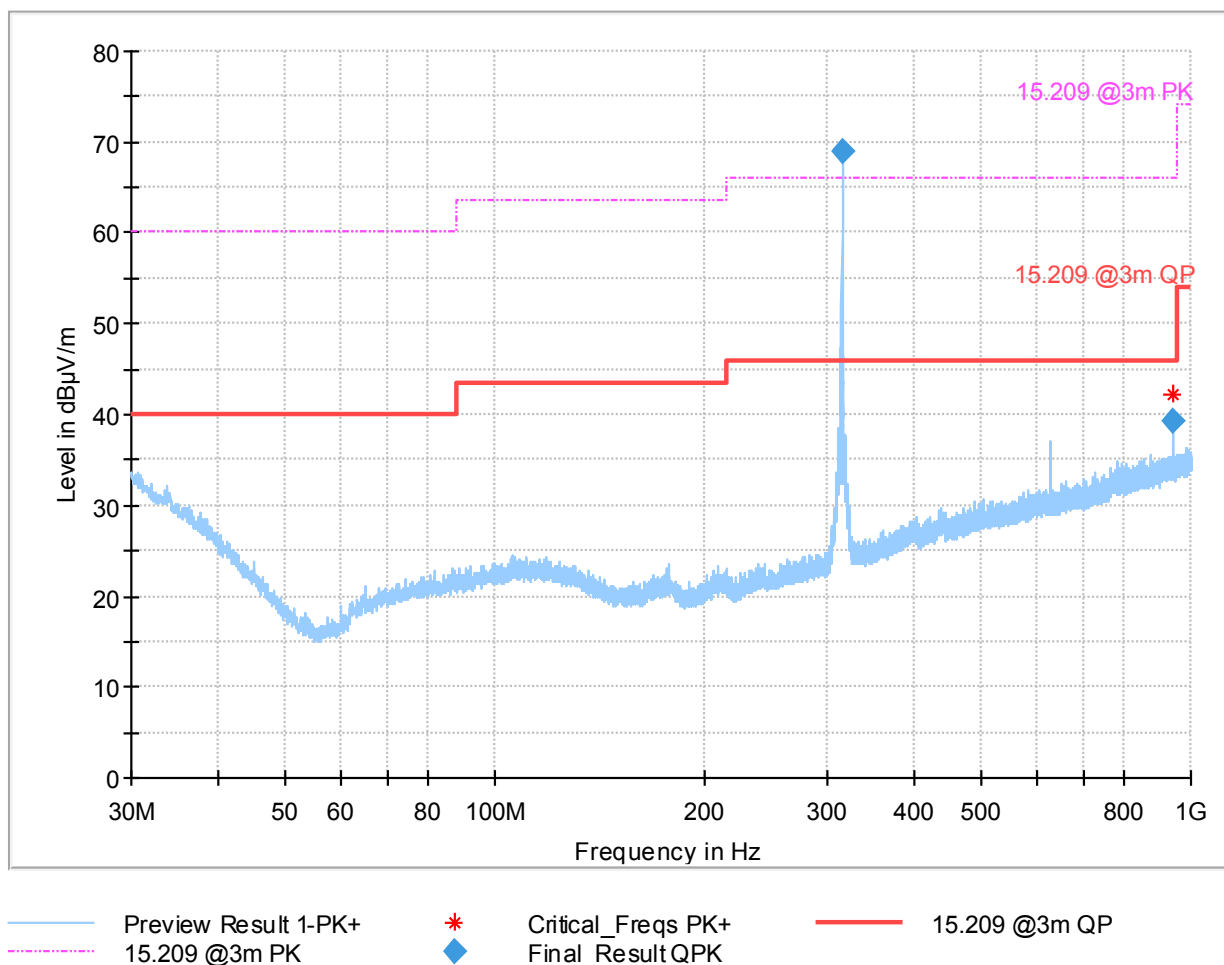


Final Result

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|
| 314.950000      | 69.29              | 46.00          | -23.29      | 100.0           | 120.000         | 100.0       | H   | 28.0          |
| 944.875000      | 39.78              | 46.00          | 6.22        | 100.0           | 120.000         | 151.0       | H   | -3.0          |

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## 2.2.10 Lying, Set-up 1, Op. 8, lying + standing (2 pos.)

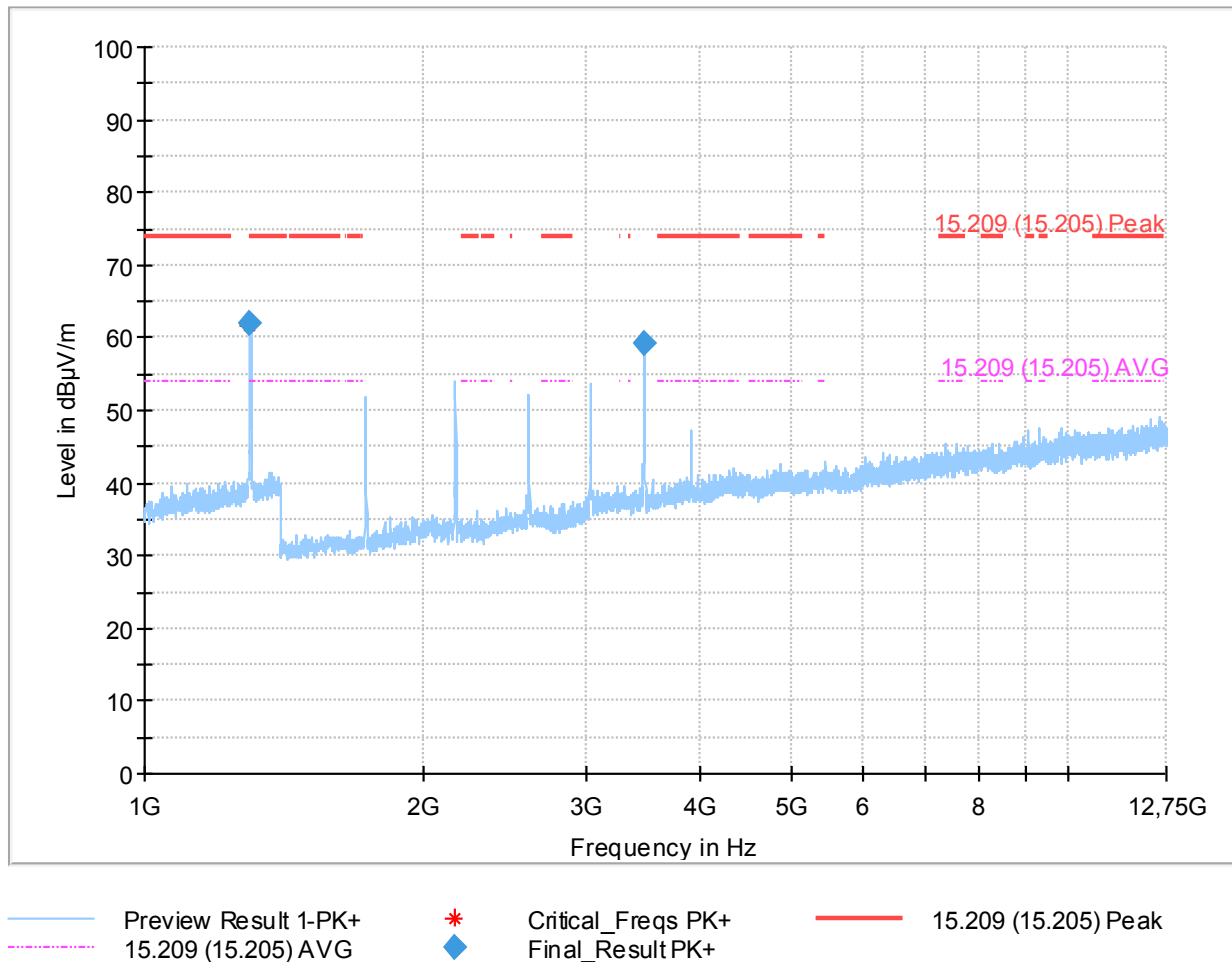


## Final Result

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|
| 315.050000      | 69.05              | 46.00          | -23.05      | 100.0           | 120.000         | 100.0       | H   | 31.0          |
| 945.100000      | 39.23              | 46.00          | 6.77        | 100.0           | 120.000         | 148.0       | H   | -14.0         |

## 2.3 Radiated field strength measurements (1 GHz < f < 12.75 GHz)

### 2.3.1 960 MHz – 1400 MHz, Set-up 1, Op. 2, lying + standing, Peak detector\*



## Final\_Result

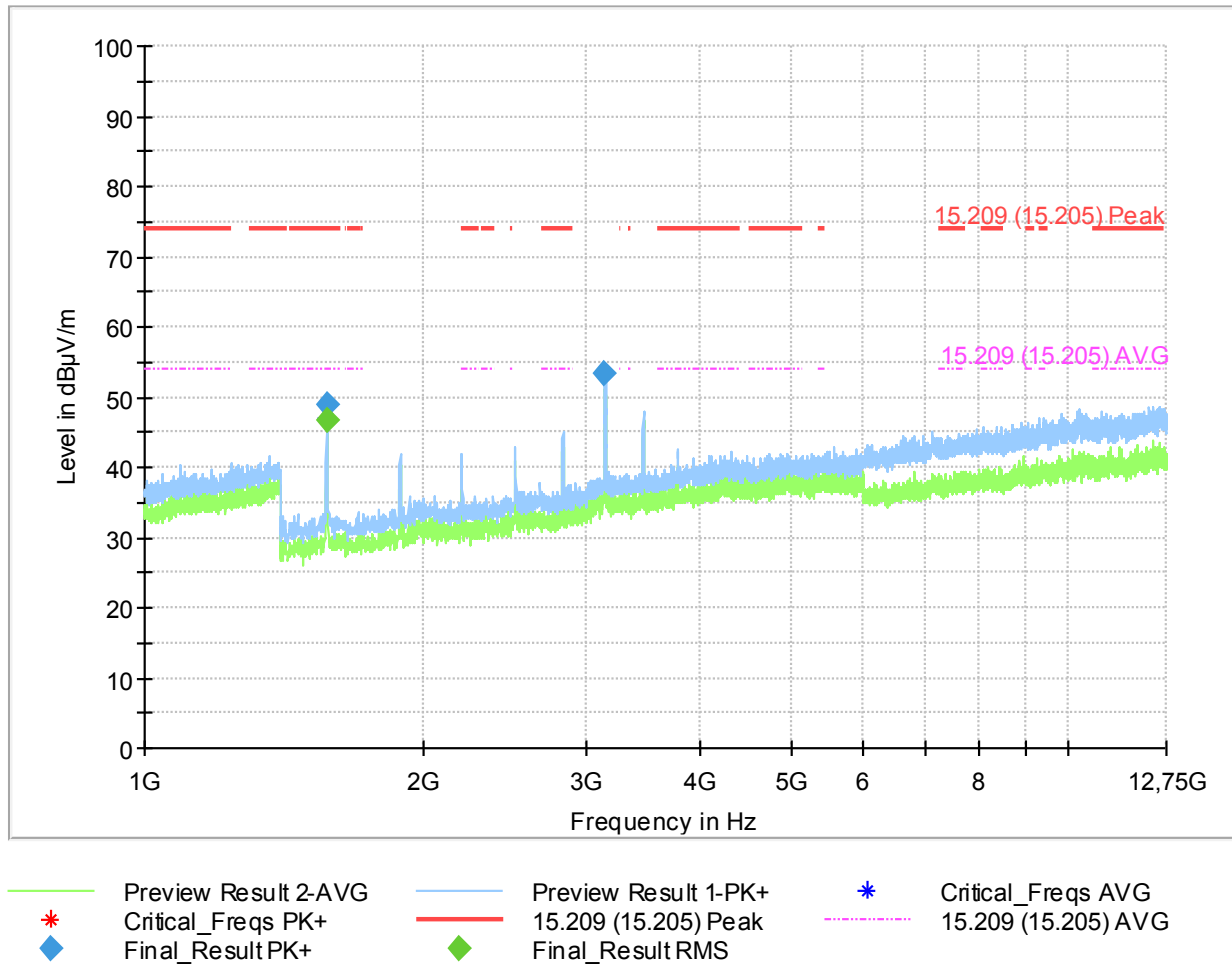
| Frequency (MHz) | MaxPeak (dBμV/m) | RMS (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol |
|-----------------|------------------|--------------|----------------|-------------|-----------------|-----------------|-------------|-----|
| 1301.750000     | 61.86            | ---          | 74.00          | 12.14       | 1000.0          | 1000.000        | 150.0       | H   |
| 3471.150000     | 59.35            | ---          | ---            | ---         | 1000.0          | 1000.000        | 150.0       | H   |

\* the limit for average detector is 54 dBμV/m. There are two values above this limit, measured with peak detector (M1: 61.86 dBμV/m at 1.301750 GHz, M2: 59.35 dBμV/m at 3.471150 GHz). It is the 3<sup>rd</sup> and 8<sup>th</sup> harmonic of the main signal. Please see chapter to OBW measurement. Correction factor is used to get an average value. Correction factor =  $20 \cdot \log(\text{DC}/100) = 20 \cdot \log(0.2832) = -10.96$  dB (please see Chapter to Transmit time measurements).

=> M1\_average value = 61.86 dBμV/m - 10.96 dB = **50.9** dBμV/m

=> M2\_average value = 59.35 dBμV/m - 10.96 dB = **48.39** dBμV/m

### 2.3.2 960 MHz – 1400 MHz, Set-up 1, Op. 7, lying + standing, Peak+AVG detector



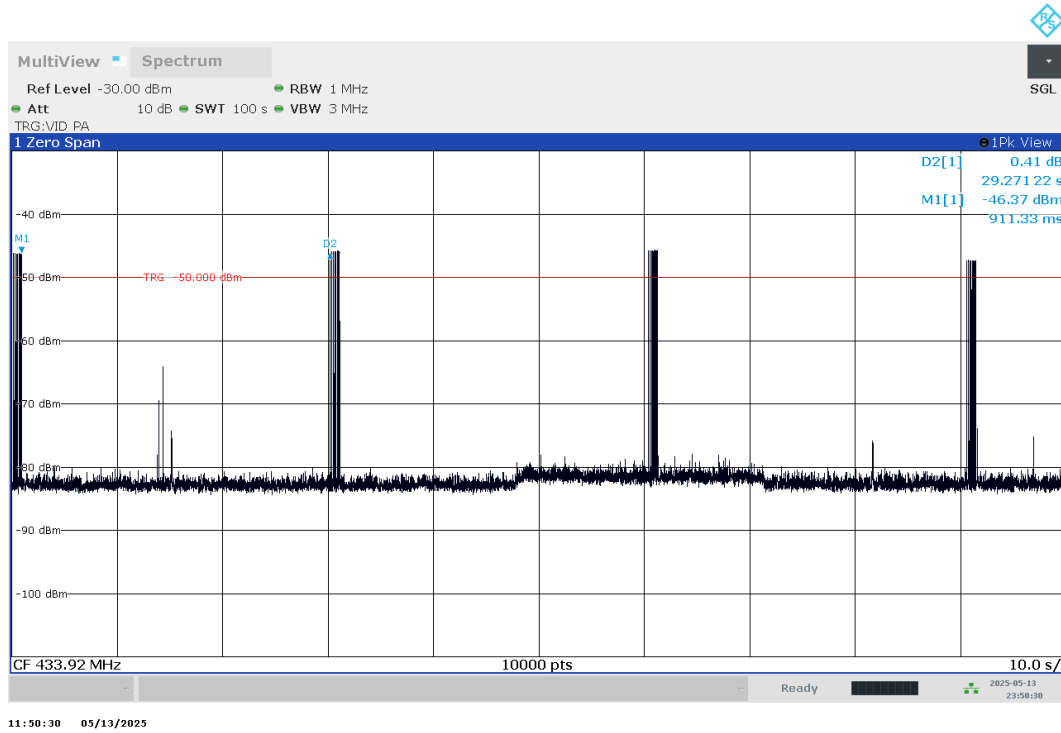
### Final\_Result

| Frequency (MHz) | MaxPeak (dBµV/m) | RMS (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol |
|-----------------|------------------|--------------|----------------|-------------|-----------------|-----------------|-------------|-----|
| 1575.050000     | ---              | 46.79        | 54.00          | 7.21        | 1000.0          | 1000.000        | 150.0       | V   |
| 1575.050000     | 48.99            | ---          | 74.00          | 25.01       | 1000.0          | 1000.000        | 150.0       | H   |
| 3150.300000     | 53.35            | ---          | ---            | ---         | 1000.0          | 1000.000        | 150.0       | V   |

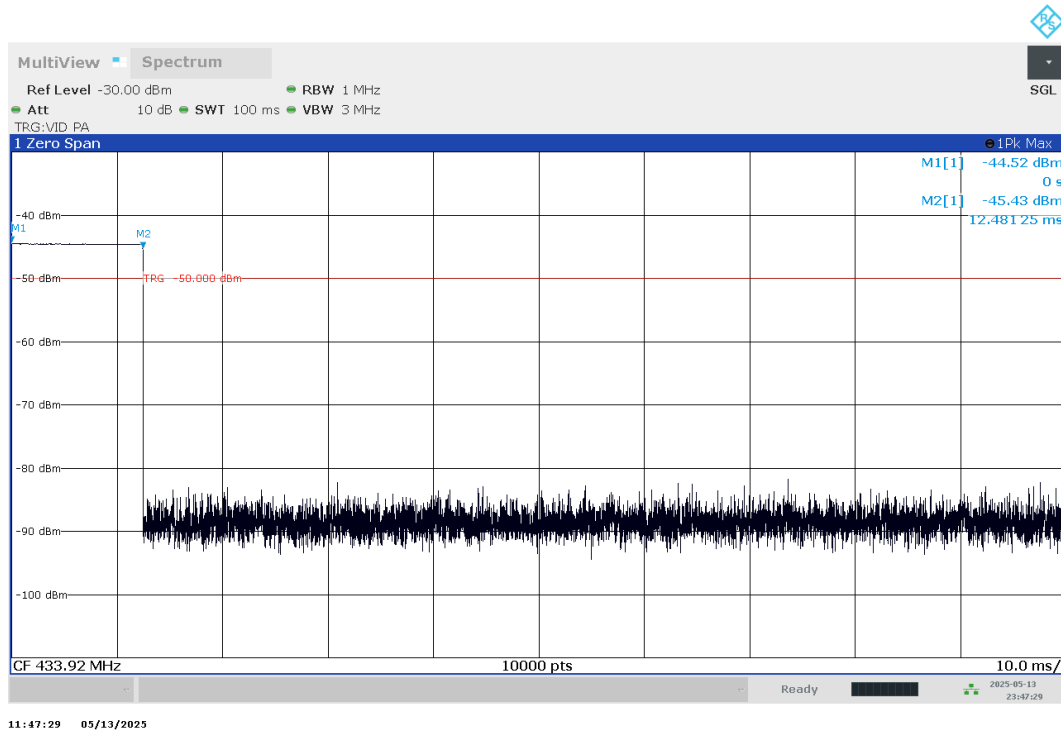
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### 3 Transmit time

#### 3.1 Set-up 1, Op. mode 4, Measurement time 100 s

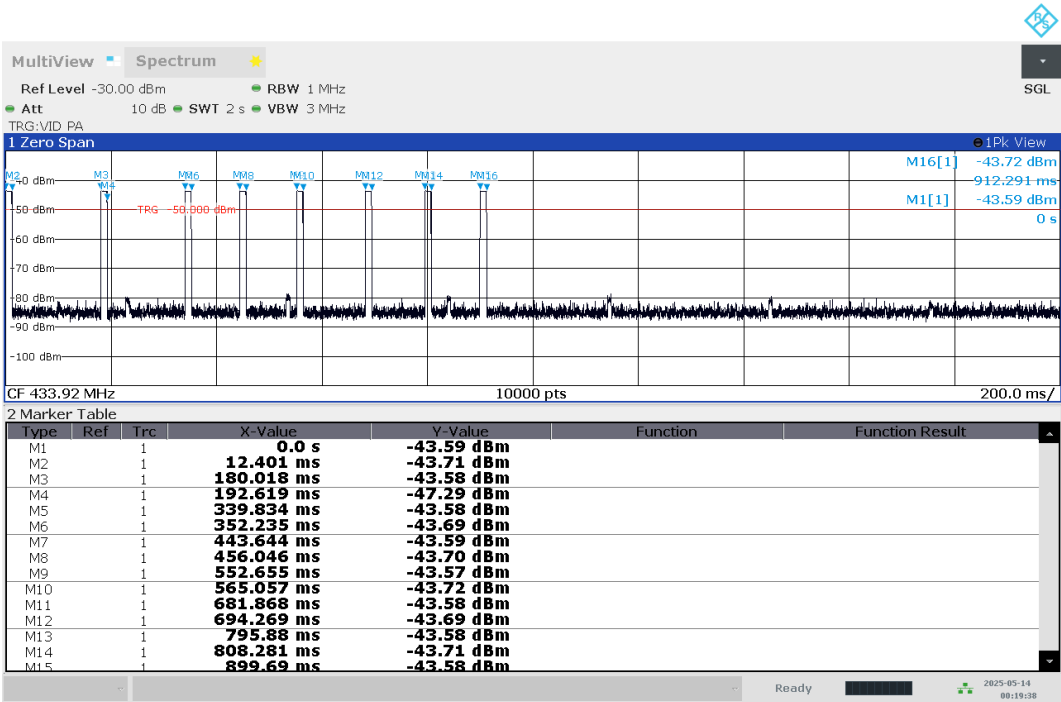


#### 3.2 Set-up 1, Op. mode 4, Measurement time 100 ms

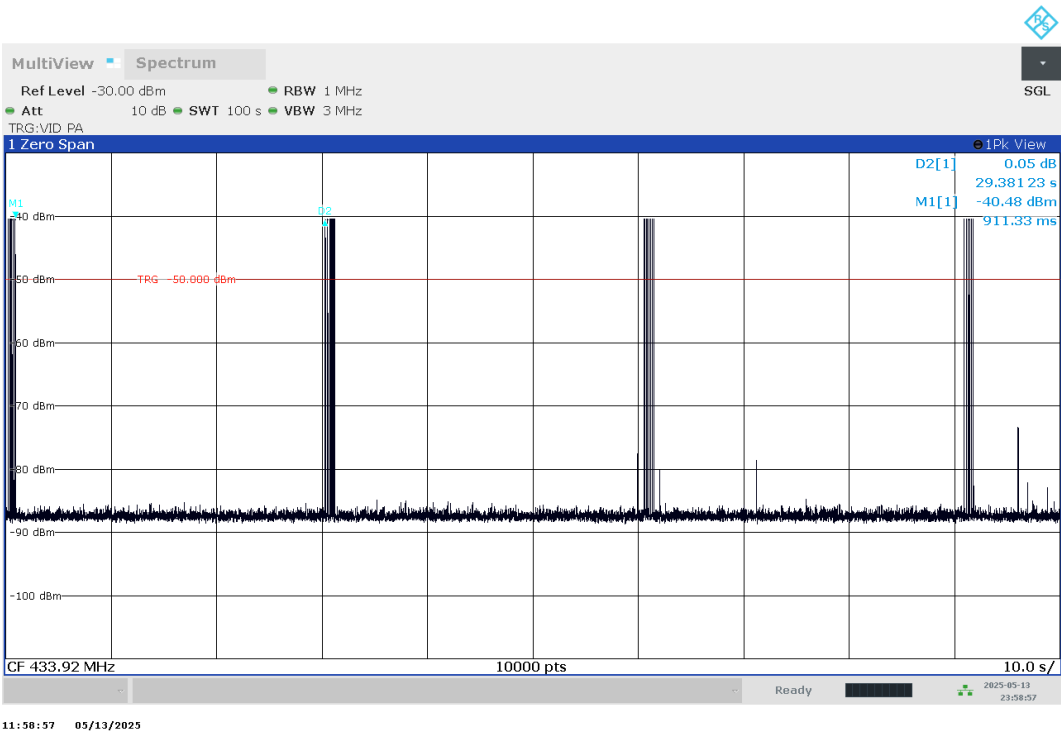


DC= 12.48%

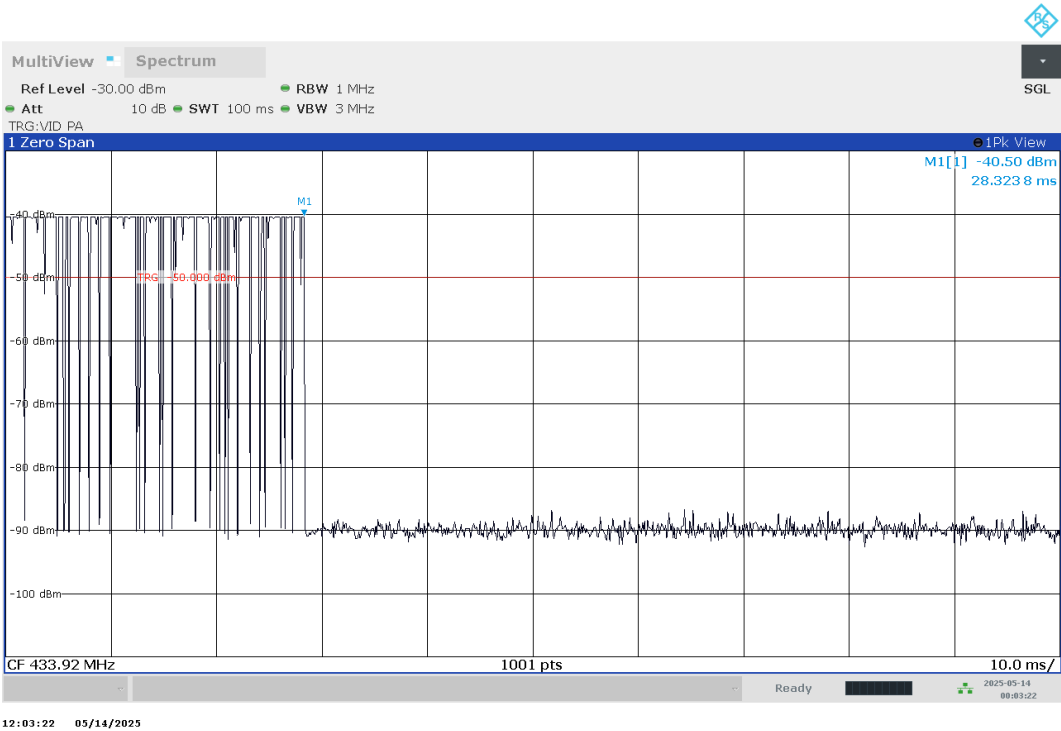
3.3 Set-up 1, Op. mode 4, Measurement time 2 s



3.4 Set-up 1, Op. mode 5, Measurement time 100 s

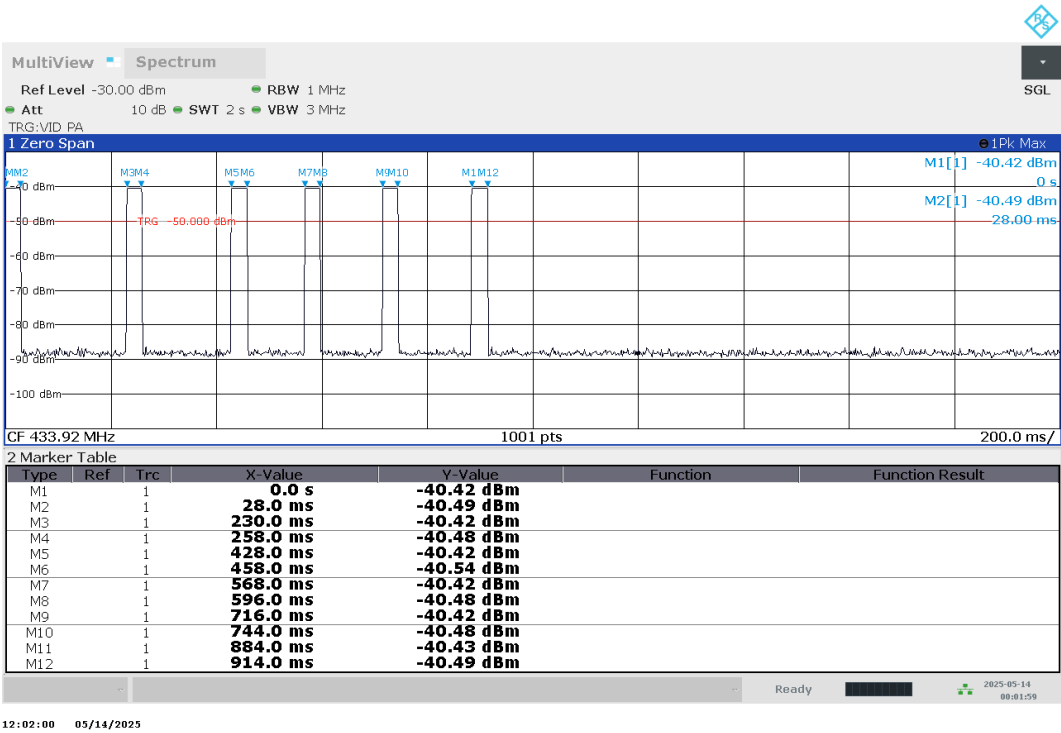


3.5 Set-up 1, Op. mode 5, Measurement time 100 ms



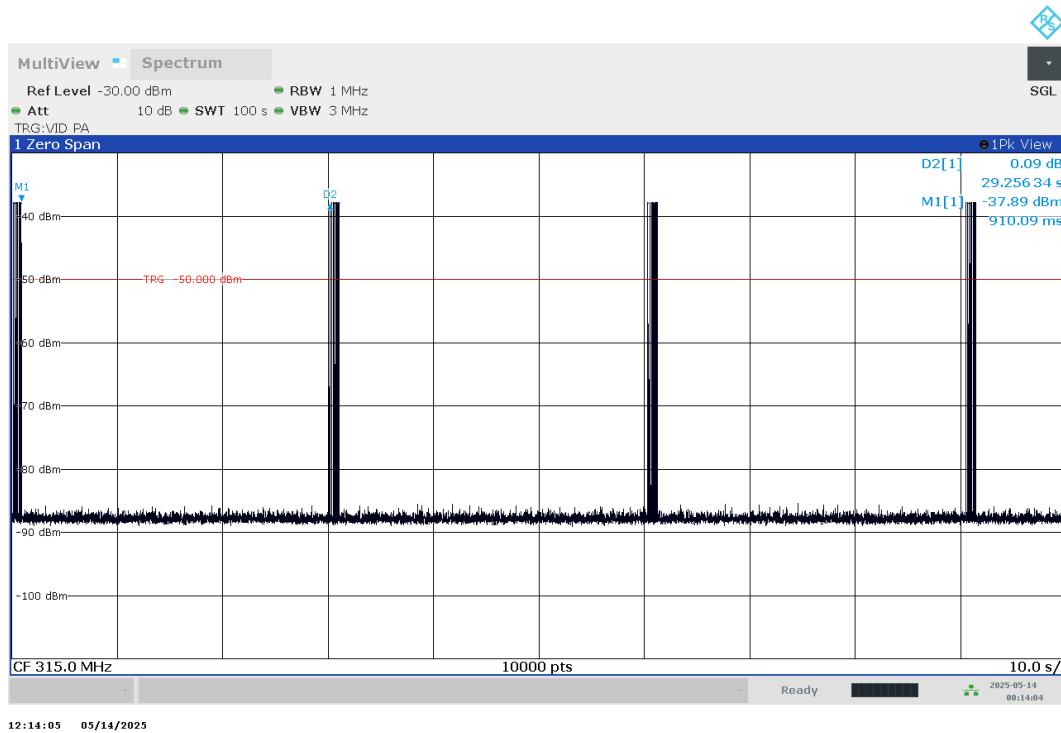
DC= 28.32%

3.6 Set-up 1, Op. mode 5, Measurement time 2 s

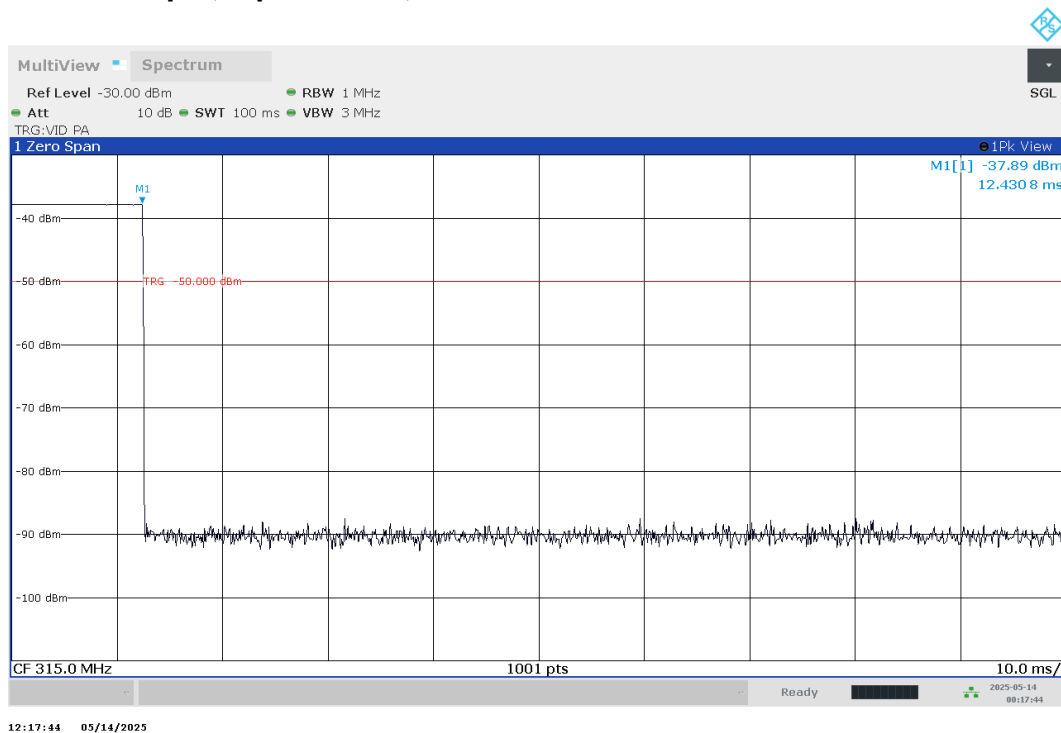


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### 3.7 Set-up 1, Op. mode 9, Measurement time 100 s



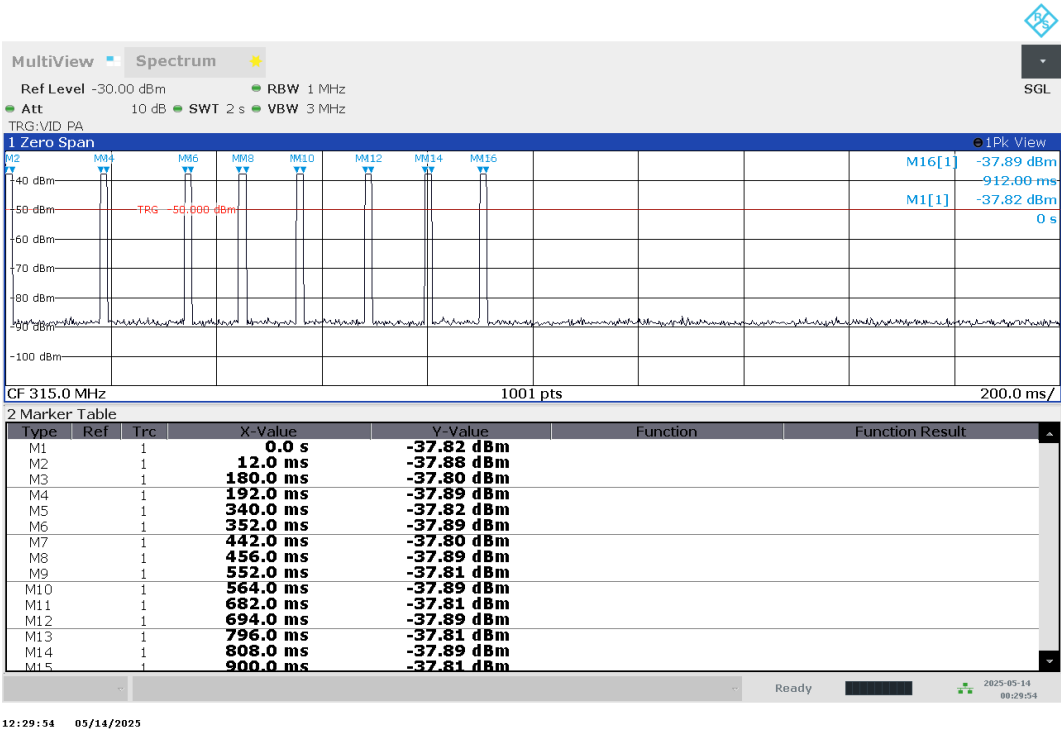
### 3.8 Set-up 1, Op. mode 9, Measurement time 100 ms



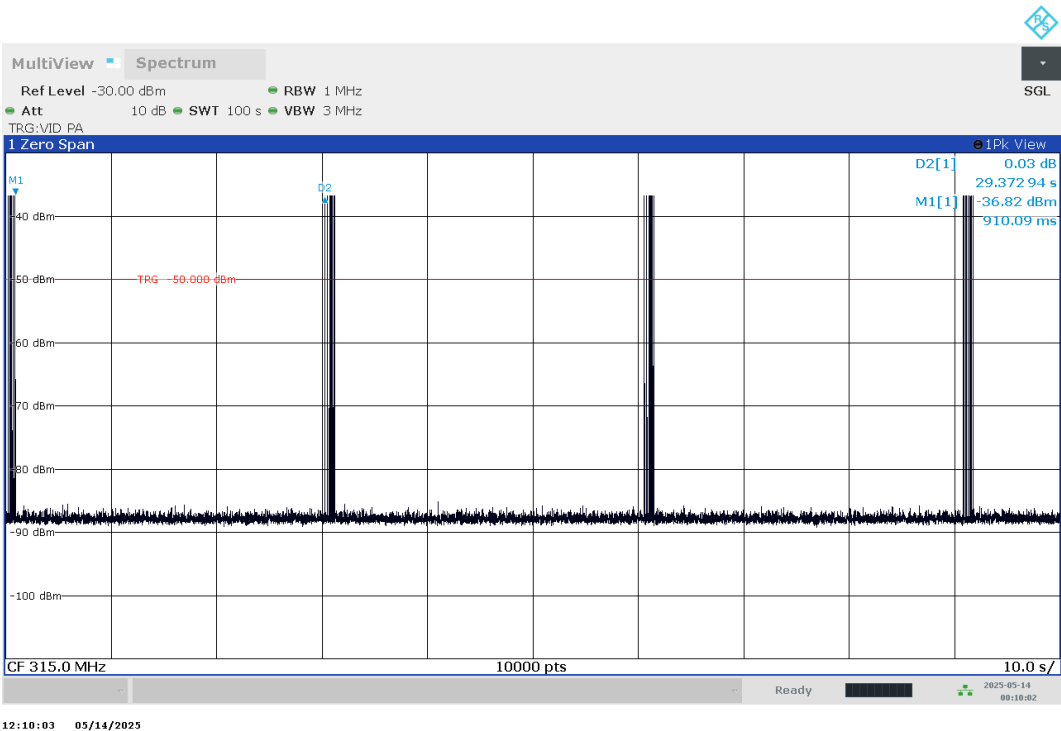
DC= 12.43%

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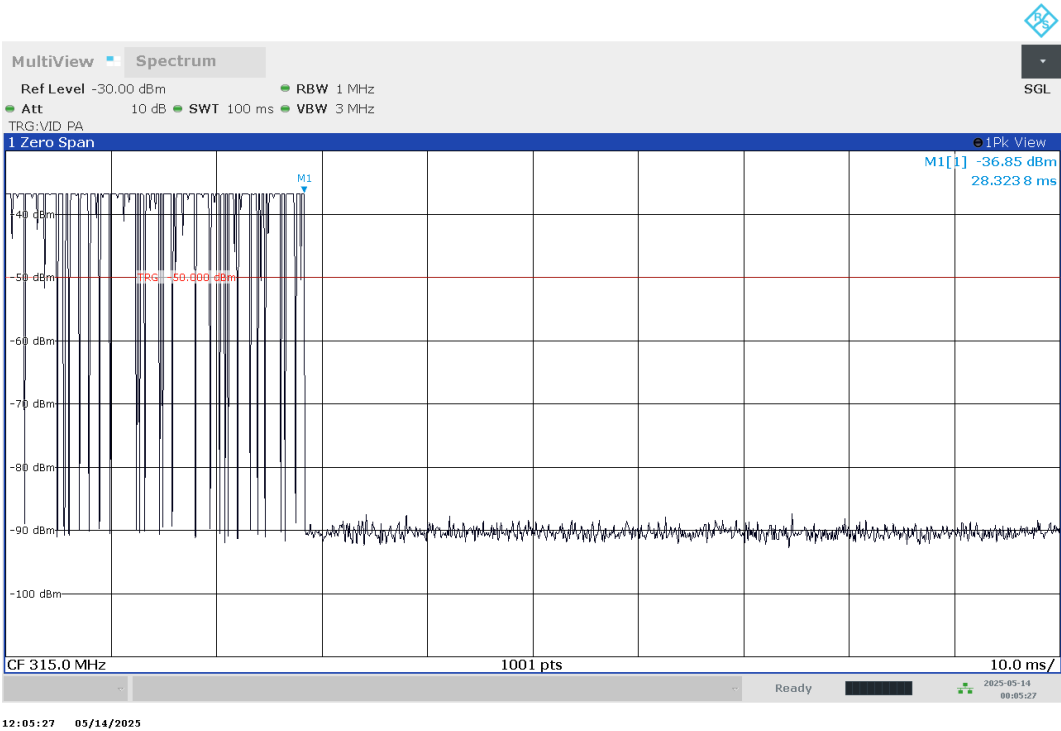
3.9 Set-up 1, Op. mode 9, Measurement time 2 s



3.10 Set-up 1, Op. mode 10, Measurement time 100 s

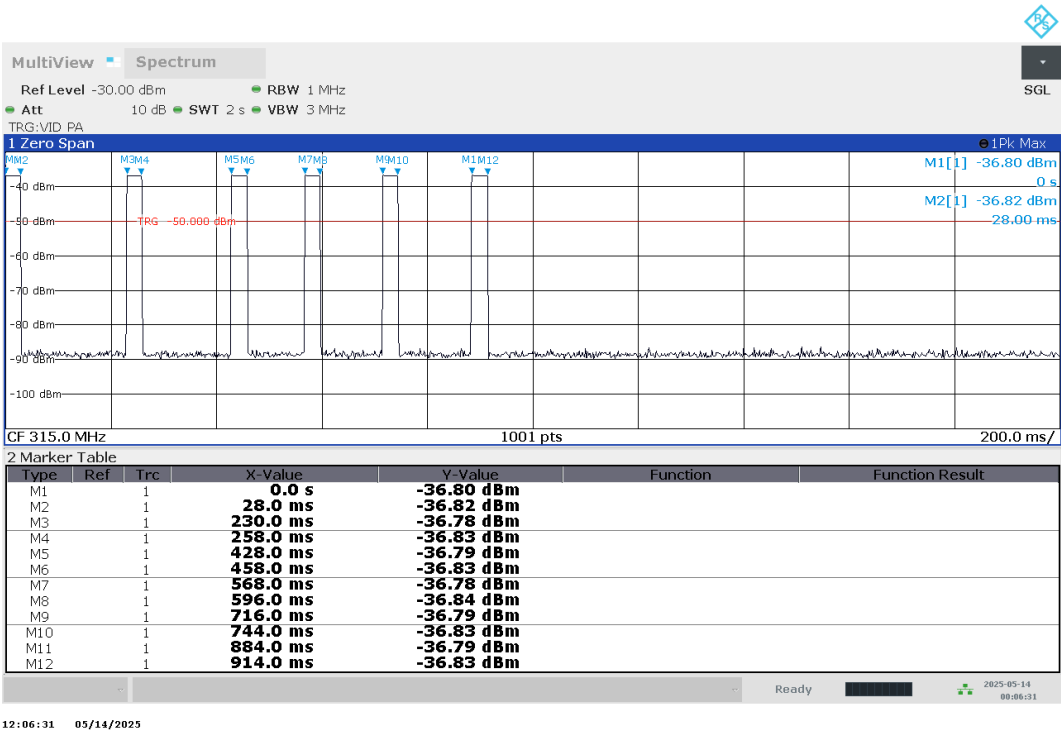


3.11 Set-up 1, Op. mode 10, Measurement time 100 ms



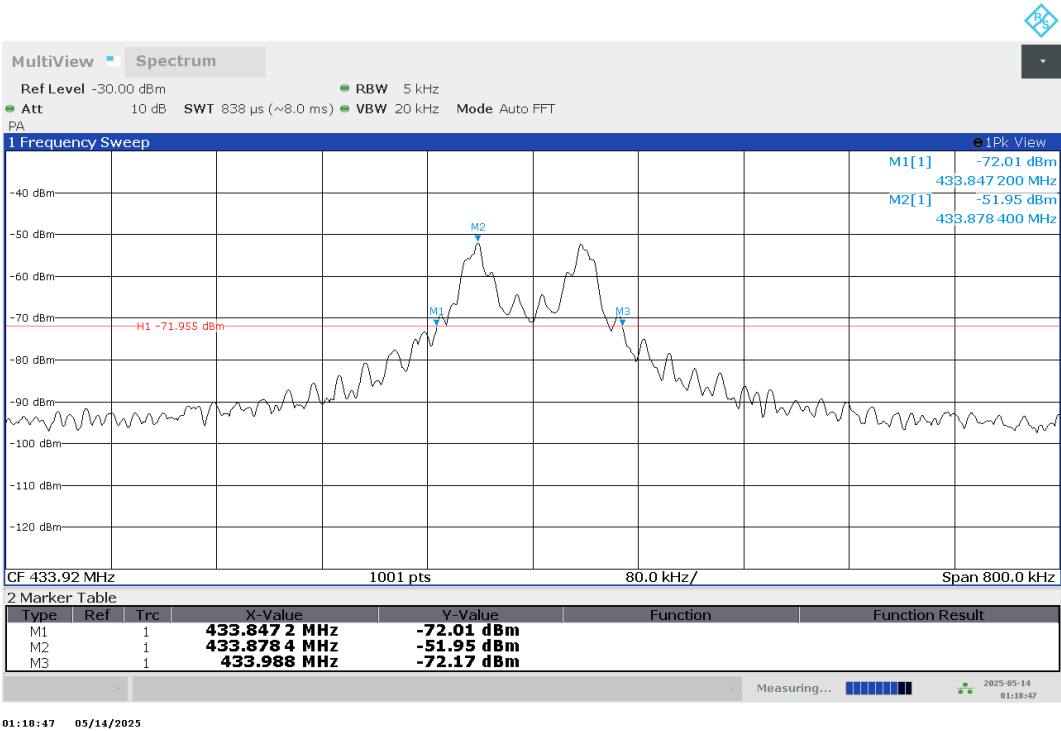
DC= 28.32 %

3.12 Set-up 1, Op. mode 10, Measurement time 2 s

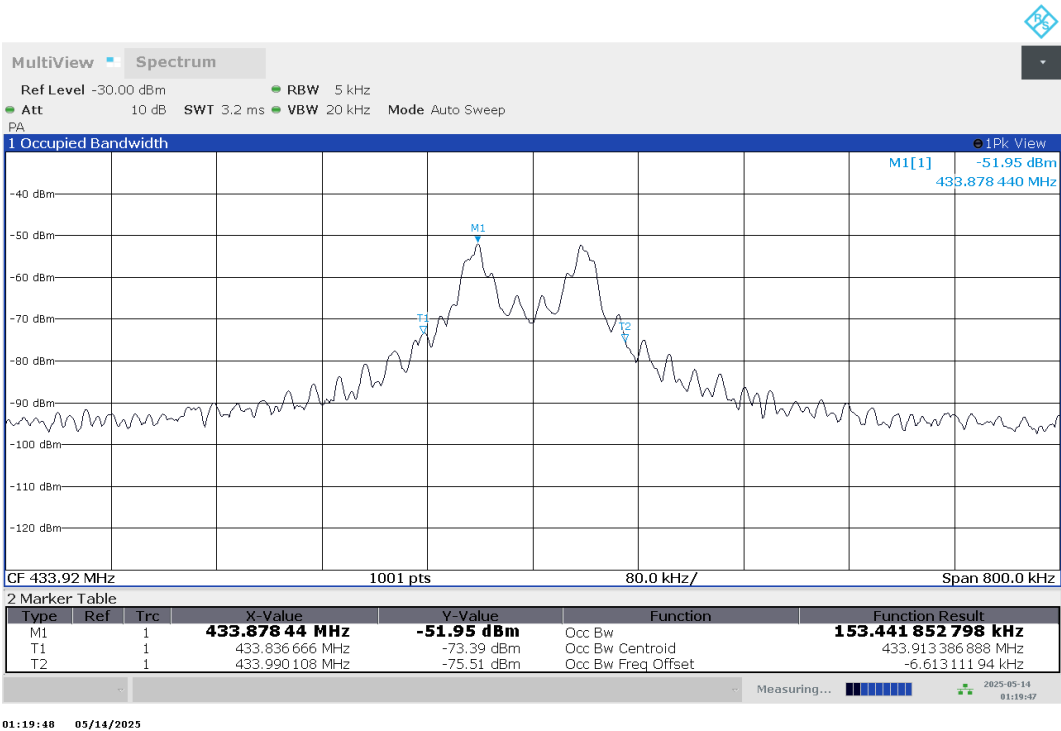


4 Occupied Bandwidth

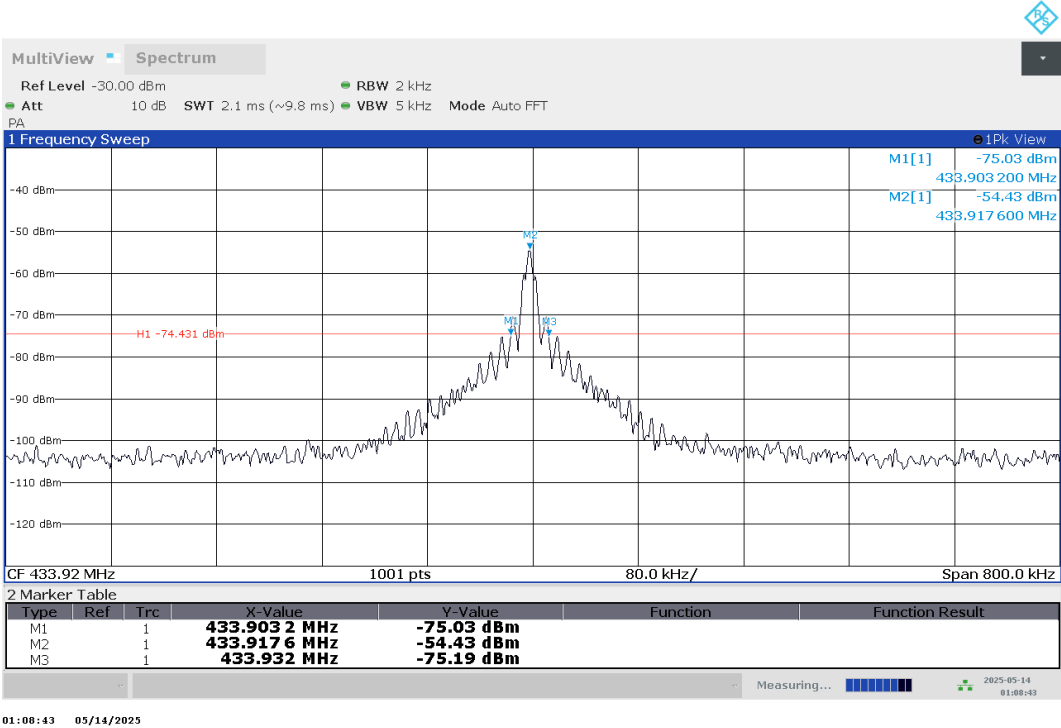
4.1 20 dB bandwidth, set-up 1, op. 4



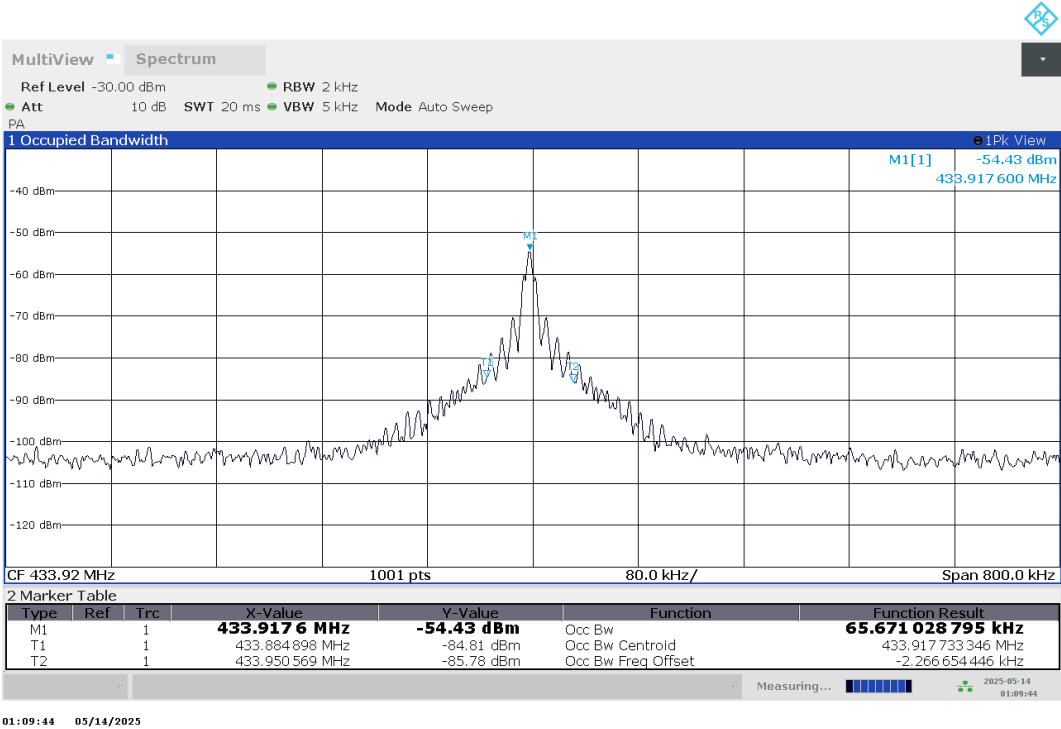
4.2 99 % occupied bandwidth, set-up 1, op. 4



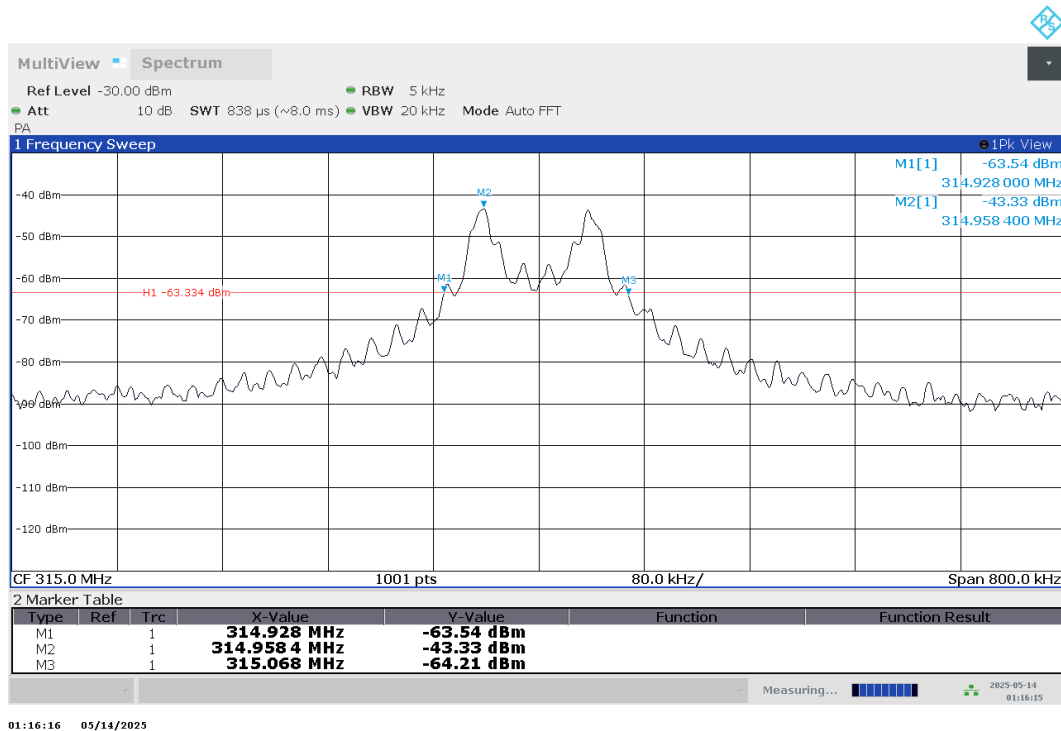
4.3 20 dB bandwidth, set-up 1, op. 5



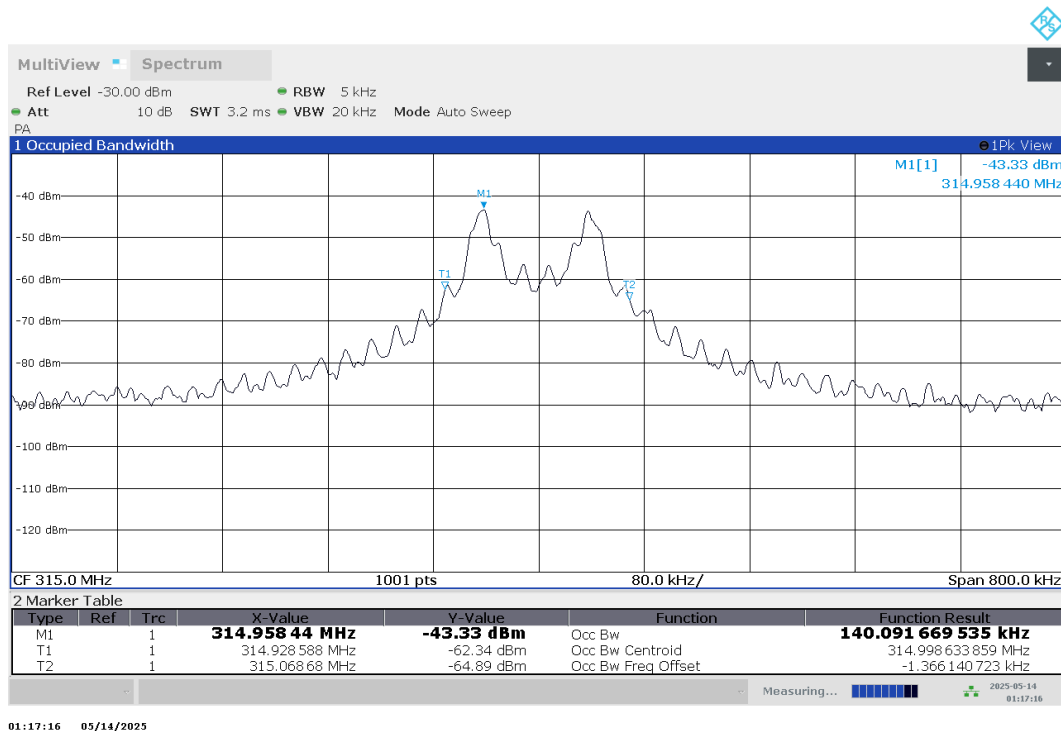
4.4 99 % occupied bandwidth, set-up 1, op. 5



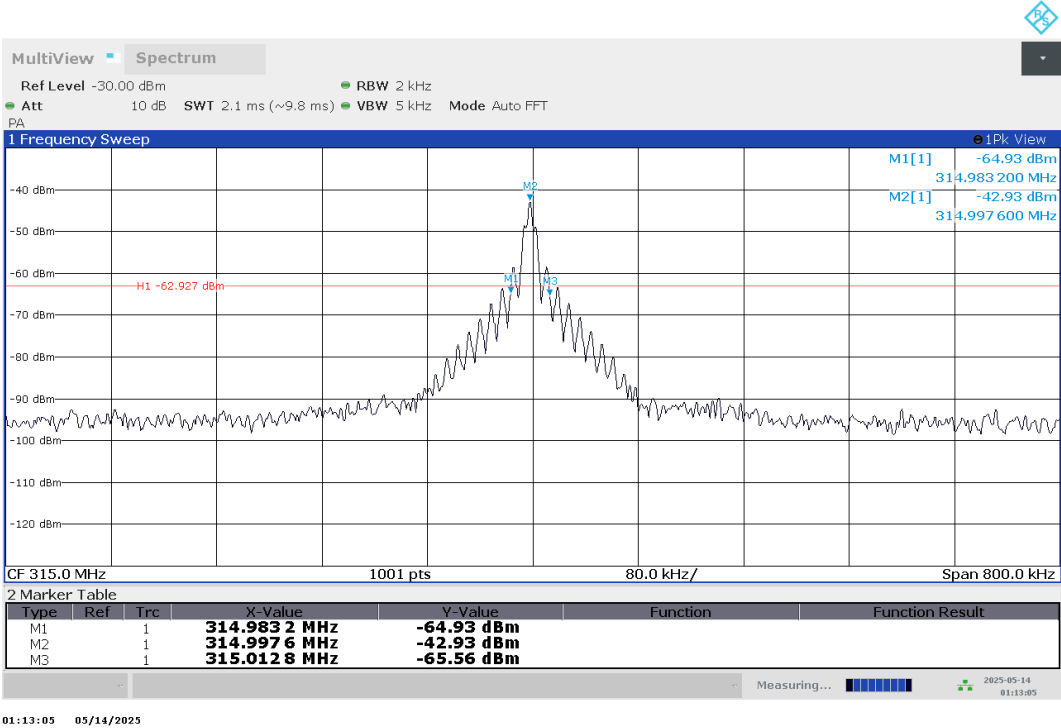
#### 4.5 20 dB bandwidth, set-up 1, op. 9



#### 4.6 99 % occupied bandwidth, set-up 1, op. 9



4.7 20 dB bandwidth, set-up 1, op. 10



4.8 99 % occupied bandwidth, set-up 1, op. 10

