



BNetzA-CAB-21/21-21

# Test Report

**Test report no.:** 21126722-25228-1

**Date of issue:** 2022-05-02

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

## Applicant

*Continental Automotive GmbH*

## Manufacturer

*Continental Automotive GmbH*

## Test Item

*TIS-09DL*

## Radio Frequency Testing according to:

**Title 47**

**FCC Regulations Subpart 15C**

§15.231

Tested by *B.Sc. Piotr Sardyko*  
(name, function, signature) *Deputy Test Lab Manager Radio*

  
signature

Approved by *Andreas Bender*  
(name, function, signature) *Deputy Managing Director*

  
signature

**Applicant and Test item details**

<b>Applicant</b>	Continental Automotive GmbH Siemensstrasse 12, 93055 Regensburg, Germany
<b>Manufacturer</b>	Continental Automotive GmbH Siemensstrasse 12, 93055 Regensburg, Germany
<b>Test item description</b>	Tyre Pressure Monitoring Sensor
<b>Model/Type reference</b>	TIS-09DL

<b>FCC ID</b>	KR5TIS-09DL
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**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 adjoined to its use.

Decision rule: Binary Statement for Simple Acceptance Rule according ILAC-G8:09/2019

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## 2 GENERAL INFORMATION

### 2.1 Administrative details

Testing laboratory	<b>IBL-Lab GmbH</b> Heinrich-Hertz-Allee 7 66386 Sankt Ingbert / Germany Fon: +49 6894 38938-0 Fax: +49 6894 38938-99 URL: <a href="http://www.ib-lenhardt.de">www.ib-lenhardt.de</a> E-Mail: <a href="mailto:info@ib-lenhardt.de">info@ib-lenhardt.de</a>
Accreditation	The testing laboratory is accredited by Deutsche Akkreditierungsstelle GmbH (DAkKS) in compliance with DIN EN ISO/IEC 17025:2018.  Scope of testing and registration number: <ul style="list-style-type: none"> <li>Electromagnetic Compatibility and Telecommunication (FCC requirements) <a href="#">D-PL-21375-01-03</a></li> <li>Telekommunikation (TK) <a href="#">D-PL-21375-01-05</a></li> </ul> ISED Company Number 27156 Testing Laboratory CAB Identifier DE0020  Website DAkKS: <a href="https://www.dakks.de/">https://www.dakks.de/</a>  The Deutsche Akkreditierungsstelle GmbH (DAkKS) is also a signatory to the <a href="#">ILAC Mutual Recognition Arrangement</a>
Date of receipt of test samples	2022-04-04
Start – End of tests	2022-04-05 – 2022-04-06

### 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

**-1: Page 8-9:** description of operational modes is made more detailed.

**Annex A, Plot 3.3.:** additional comments are made to the plot.

This test report **21126722-25228-1** replaces the previous test report **21126722-25228-0**.

## 2.6 Further documents

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

Measurement plots:	21126722-25228-1_Annex A
EUT photographs:	21126722-25228-1_Annex B
Test setup photographs:	21126722-25228-1_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).

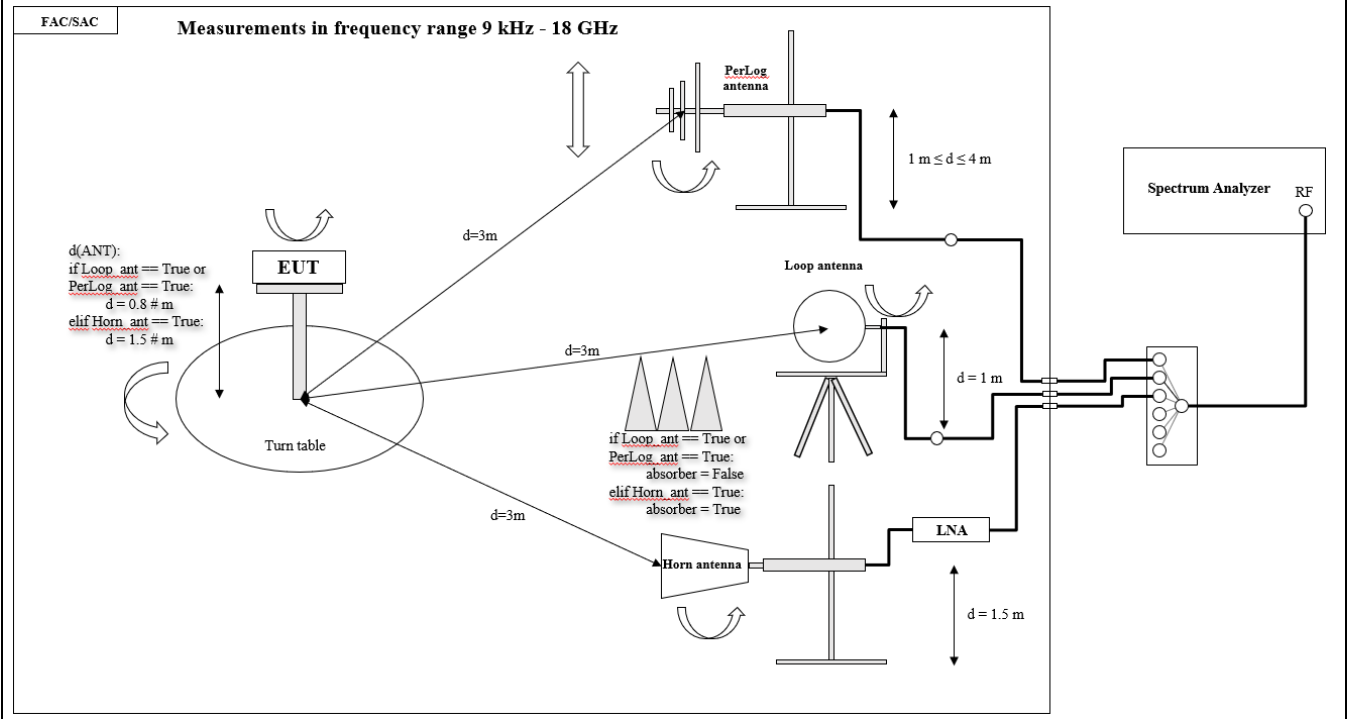
(Instrument) Firmware Version: **4.61**

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

Temperature	20°C ± 5°C
Relative humidity	25-75 % r.H.
Barometric Pressure	860-1060 mbar
Power supply	3V DC (external) or 3V battery

### 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\*

The tire pressure monitoring system monitors a vehicle's tire pressure whilst driving or stationary. An electronic unit (wheel unit) inside each tire, mounted to the valve stem, periodically measures the actual tire pressure. By means of RF communication, this pressure information is transmitted to the RF receiver.

\*: declared by the applicant

### 5.2 Technical Data of Equipment\*

Number of channel:	1
Channel bandwidth:	102 kHz (99 % OBW)
Type of modulation:	Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK)
Channel tested:	$f_{cent}$ : 433.92 MHz
Spectrum Access Mechanism:	Duty Cycle
Antenna Type:	Internal
Antenna connector:	None
Type of power source:	DC power supply
Test source voltage:	Vmin: 2.1 VDC, Vnom: 3 VDC, Vmax: 3.2 VDC

\*: declared by the applicant

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

Short designation	EUT Model	EUT Description	Serial number	Hardware status	Software status
EUT A	TIS-09DL	TPMS	N/A	V1	V1
EUT B	TIS-09DL	TPMS	N/A	V1	V1

\*: declared by the applicant

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

AE short designation	EUT Name (if available)	EUT Description	Serial number (if available)	Software (if used)
AE1	-	LF 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 Mode	Continuous wave. Not modulated.



op. 2	LFD_force_RF_Tx	Normal mode. ASK + FSK modulation at the same time. This mode shows Tx sequence (not periodic) where the Tx duration is the highest in a 100ms window. Thus, this mode was used for determination of averaging factor. Also, BW measurements was done with this mode.
op. 3	LFD_force_TE	ASK + FSK modulation at the same time. Emission of burst during 4 minutes 16s periodic Tx. It is the mode, where Tx sequence is done periodically and when silent period is the smallest. Thus, this mode is a worst case mode for Transmit time test.

\*: declared by the applicant

5.6 Test Item Set-ups Description	
set. 1	EUT A
set. 2	EUT B

5.7 Normal est conditions			
Temperatur, [°C]		Voltage, [V]	
Tnom	20 ± 5	Vnom	3

5.8 Additional Information	
<b>Test items differences</b>	EUT A was used for radiated measurements. And EUT B- for conducted.
<b>Additional application considerations to test a component or sub-assembly</b>	None

## 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	1	None	Pass
Radiated field strength measurements	Nominal	1	1	None	Pass
Transmit time	Nominal	2	2,3	None	Pass
Occupied Bandwidth	Nominal	2	2	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

#### 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]	Field strength@3m		Measurement distance [meters]	Remarks
	[µV/m]	[dBµV/m]		
40.66-40.70	1000	60	3	Linear interpolation
70-130	500	53.98		
130-174	500 to 1500	53.98 to 63.52		
174-260	1500	63.52		
260-470	1500 to 5000	63.52 to 73.98		
Above 470	5000	73.98		

Measurement Level = Reading Level + Correction Factor.

Limit(uV/m@433.9MHz):

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

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

$\Rightarrow f(x)=16.66*x-2833.33 \Rightarrow f(433.9)=16.66*433.9-2833.33=4398.33$

Limit dBµV/m RMS/Peak:

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

#### Results\*

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. 1	80.44	92.86	12.42	-7.62**	72.82	72.86	0.04	Pass

\* Please see measurement plots in Annex A.

\*\* Please see Plot 3.3 in Annex A.

## 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

#### 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

#### Frequency range 1 GHz – 5 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, F4, R1

### 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: 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)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490*	2400/F(kHz)	300
0.490-1.705*	24000/F(kHz)	30
1.705-30.0*	30	30

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

### Limits

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

Frequency [MHz]	Field strength@3m		Measurement distance [meters]	Remarks
	[ $\mu$ V/m]	[dB $\mu$ V/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\*

No	Op./ Set.	Frequency	Detector	Test distance [m]	Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]	Verdict
1	Set.1, Op. 1	9 kHz – 30 MHz	Quasi-Peak	3	44.78	50.04**	5.26	Pass

2	Set.1, Op. 1	30 MHz – 1 GHz	Quasi-Peak	3	32.14	40	7.86	<b>Pass</b>
3	Set.1, Op. 1	960 MHz – 1.4 GHz	Peak	3	40.48	74	33.52	<b>Pass</b>
4	Set.1, Op. 1	960 MHz – 1.4 GHz	RMS	3	37.13-3.8***= 33.33	54	20.67	<b>Pass</b>
5	Set.1, Op. 1	1.4 GHz – 5 GHz	Peak	3	56.57	74	17.43	<b>Pass</b>
6	Set.1, Op. 1	1.4 GHz – 5 GHz	RMS	3	55.44-3.8***= 51.66	54	2.36	<b>Pass</b>

All Readings below 1 GHz are Quasi-Peak detector, above 1 GHz- with Peak and RMS detector.

\* Please see measurement plots in Annex A.

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

\*\*\* Please see plot 3.3 in Annex A. Correction factor was used:

$10 \cdot \text{LOG}(\text{DC}@100\text{ms\_Op.2} / \text{DC}@100\text{ms\_Op.1}) =$

$10 \cdot \text{LOG}(0.416/1) = -3.8$

### 7.3 Transmit time

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

Radiated: R4

**Description**

Please see test set-up photos in Annex C.  
 Please see Plots in Annex A for spectrum analyzer settings.  
 Measurement was done conducted.

**Limits**

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.

**Results\***

Plot No	Set./ Op.	Frequency, [MHz]	Measured value, [ms]	Limit**, [sec]	Result
3.2	2,3	433.92	518	1	Pass
3.1	2,3	433.92	16000	30*0.518=15.54	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: R1

### 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.

Please see Plots in Annex A for spectrum analyzer settings.

Measurement was done conducted.

### 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 (20 dB BW), [kHz]	Limit, [MHz]	OBW 99%, [kHz]	Result
Set.1, Op. 1	433.92	104	1.0848	101.37	Pass

\* 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	2020-03-25	2023-03-25
2.	Ultrabroadband antenna	HL562E	Rohde & Schwarz	102005	LAB000150	2020-07-05	2023-07-05
3.	Double-Ridged Waveguide Horn Antenna	HF-907	Rohde & Schwarz	102899	LAB000151	2020-04-23	2023-04-23
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	-	-



2.	Attenuator	27081-20 (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	SAC5	Albatross Projects GmbH	20168.PRB	LAB000235	2021-08-24	2022-08-24
2.	Climatic chamber	T-65/50	CTS GmbH	204002	LAB000110	2021-06-18	2022-06-18
3.	Shielding Cover	CMU-Z11	Rohde & Schwarz	100876	LAB000039	-	-
4.	Climatic chamber	T-70/350	CTS GmbH	194027	LAB000066	2021-06-30	2022-06-30
<b>Corner Reflector (CR):</b>							
1.	Trihedral Corner Reflector	SAJ-080-S1	ERAVANT	04756-01	LAB000201	-	-
<b>Filter (F):</b>							
1.	High-pass filter (84 GHz – 110 GHz)	10-WHPF- 84.5-UG387	TTE	-	LAB000299	-	-
2.	High-pass filter (7 GHz – 23 GHz)	HPF 7-23	AtlantRF	-	LAB000444	-	-
3.	High-pass filter (3.3 GHz – 12.75 GHz)	HPF 3.3-11	AtlantRF	-	LAB000382	-	-
4.	High-pass filter (1.3 GHz – 12.75 GHz)	H1G713G1	Microwave Circuits Inc	46291	LAB000443	-	-
<b>Harmonic mixers (H):</b>							
1.	Harmonic Mixer	FS-Z75	Rohde & Schwarz	102015	LAB000112	2021-03-31	2022-03-31
2.	Harmonic Mixer	FS-Z90	Rohde & Schwarz	102020	LAB000113	2021-03-31	2022-03-31
3.	Harmonic Mixer	FS-Z110	Rohde & Schwarz	102000	LAB000114	2021-04-08	2022-04-08
4.	Harmonic Mixer	FS-Z170	Rohde & Schwarz	100996	LAB000126	2021-05-18	2022-05-18
5.	Harmonic Mixer	FS-Z220	Rohde & Schwarz	101039	LAB000116	2021-05-04	2022-05-04
6.	Harmonic Mixer	FS-Z325	Rohde & Schwarz	101015	LAB000117	2021-05-19	2025-05-19
<b>Multimeters (M):</b>							
1.	Multimeter	U1242B	Keysight	MY59240021	LAB000187	2020-06-24	2022-06-24
2.	Multimeter	U1242B	Keysight	MY59160026	LAB000018	2020-06-24	2022-06-29
<b>Multipliers (Mp):</b>							
1.	Multiplier	SMZ75	Rohde & Schwarz	101307	-	2018-03-15	-
2.	Multiplier	SMZ110	Rohde & Schwarz	100001	-	2020-05-09	-
<b>Power Supply (P):</b>							
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	-	-
<b>Power meters (PM):</b>							
1.	Power meter	NRP-Z81	Rohde & Schwarz	106194	LAB000120	2021-05-04	2022-05-04
<b>Receivers and Spectrumanalyzers (R):</b>							
1.	Test Receiver, SAC5	ESW-26	Rohde & Schwarz	101517	LAB000363	2022-02-03	2023-02-03

2.	Test Receiver	ESW-26	Rohde & Schwarz	101481	LAB000236	2021-07-01	2022-07-01
3.	Spectrum Analyzer 1 Hz – 50 GHz	FSW-50	Rohde & Schwarz	101450	LAB000111	2021-07-22	2022-07-22
4.	Spectrum Analyzer 2 Hz – 43 GHz	FSW-43	Rohde & Schwarz	101391	LAB000289	2021-07-02	2022-07-02
<b>Signal Generators (SG):</b>							
1.	Signal generator 8 kHz – 50 GHz	SMA100B	Rohde & Schwarz	103838	LAB000118	2020-07-08	2022-07-08
2.	Vector Signal Generator	SMW200A	Rohde & Schwarz	108822	LAB000288	-	-

\* 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	$\leq \pm 6$ dB
Occupied bandwidth	$\pm 100$ kHz
Time domain measurement	$\pm 2.32$ ms
DC and low frequency voltages	$\pm 3$ %
Temperature	$\pm 1$ °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

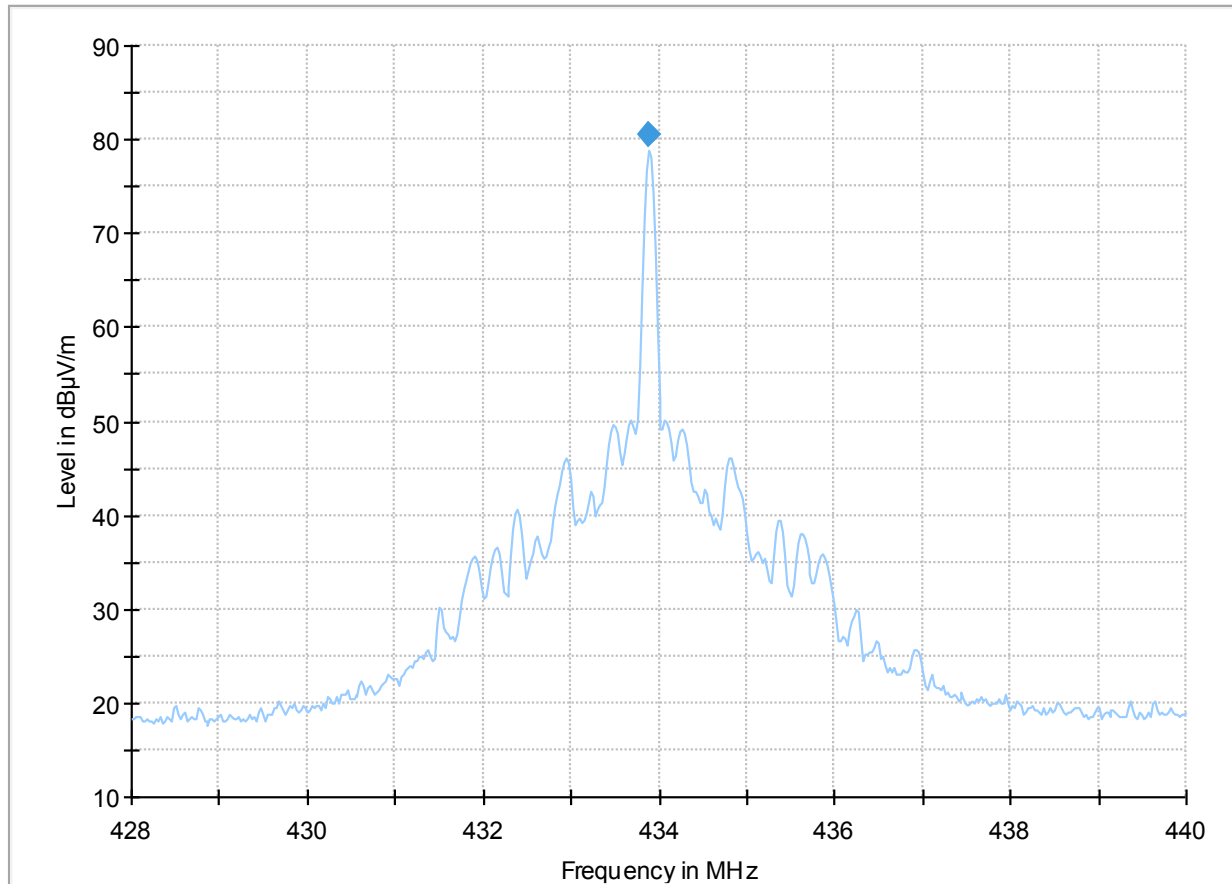
***Test report no.:*** 21126722-25228-1

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# 1 Fundamental field strength

## 1.1 Lying + standing, Set-up 1, Op. 1



— Preview Result 1-PK+    
 \* Critical\_Freqs PK+    
 ◆ Final\_Result QPK

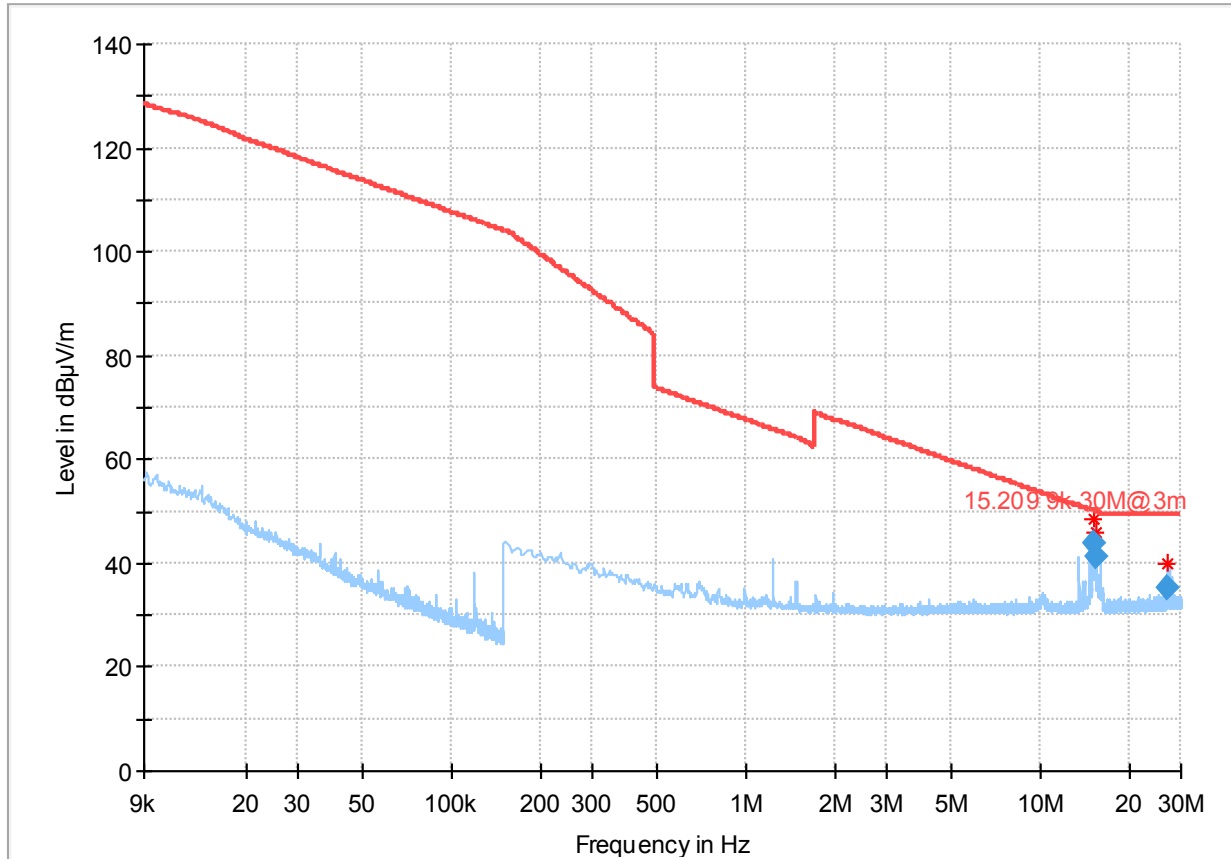
### Final\_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
433.875000	80.44	92.86	12.42	100.0	120.000	122.0	V	174.0

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

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

#### 2.1.1 Lying, Set-up 1, Op. 1



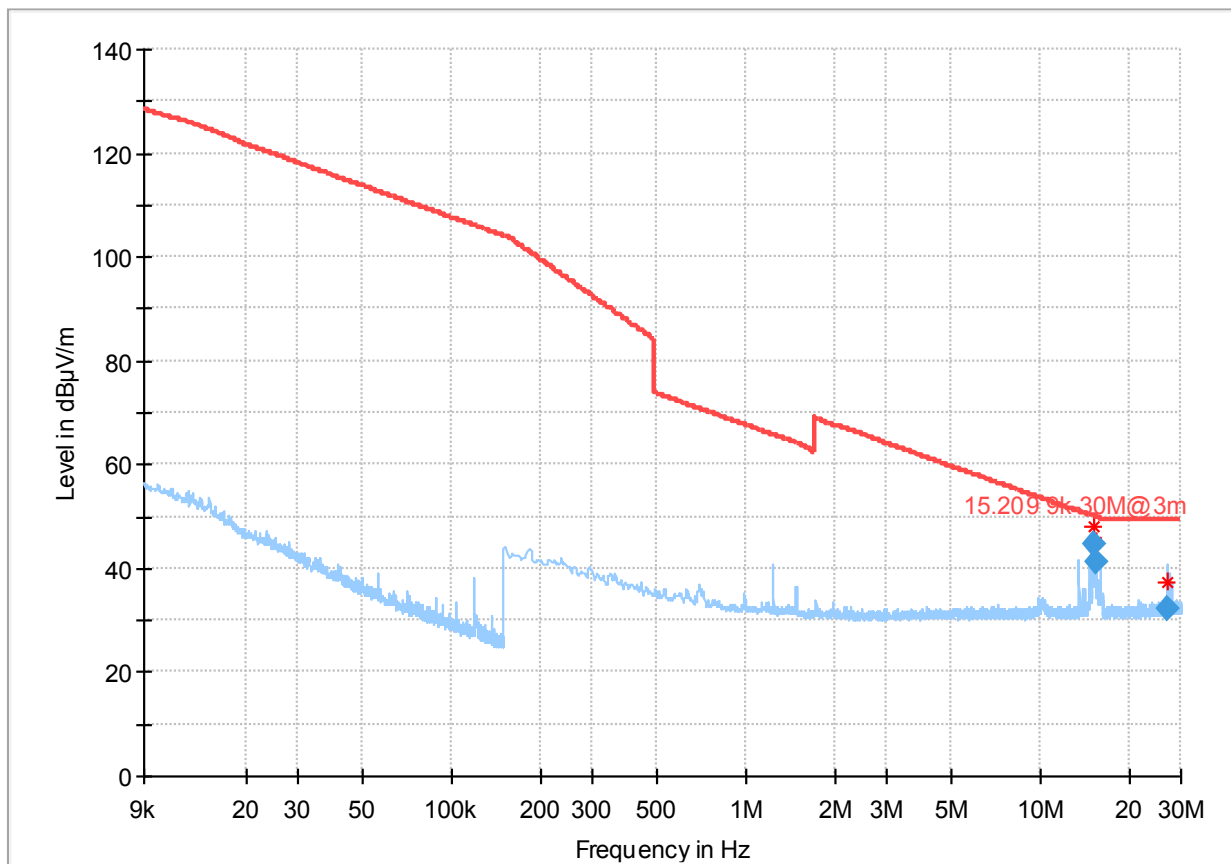
— Preview Result 1-PK+  
— 15.209 9k-30M@3m

\* Critical\_Freqs PK+  
◆ Final\_Result QPK

### Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Pol	Azimuth (deg)	Corr. (dB/m)
15.306000	43.68	50.04	6.36	100.0	9.000	V	318.0	20.5
15.551250	41.11	50.03	8.92	100.0	9.000	V	318.0	20.5
27.107250	35.27	49.54	14.27	100.0	9.000	V	201.0	20.7

2.1.2 Standing, Set-up 1, Op. 1



— Preview Result 1-PK+  
— 15.209 9k-30M@3m
 \* Critical\_Freqs PK+  
◆ Final\_Result QPK

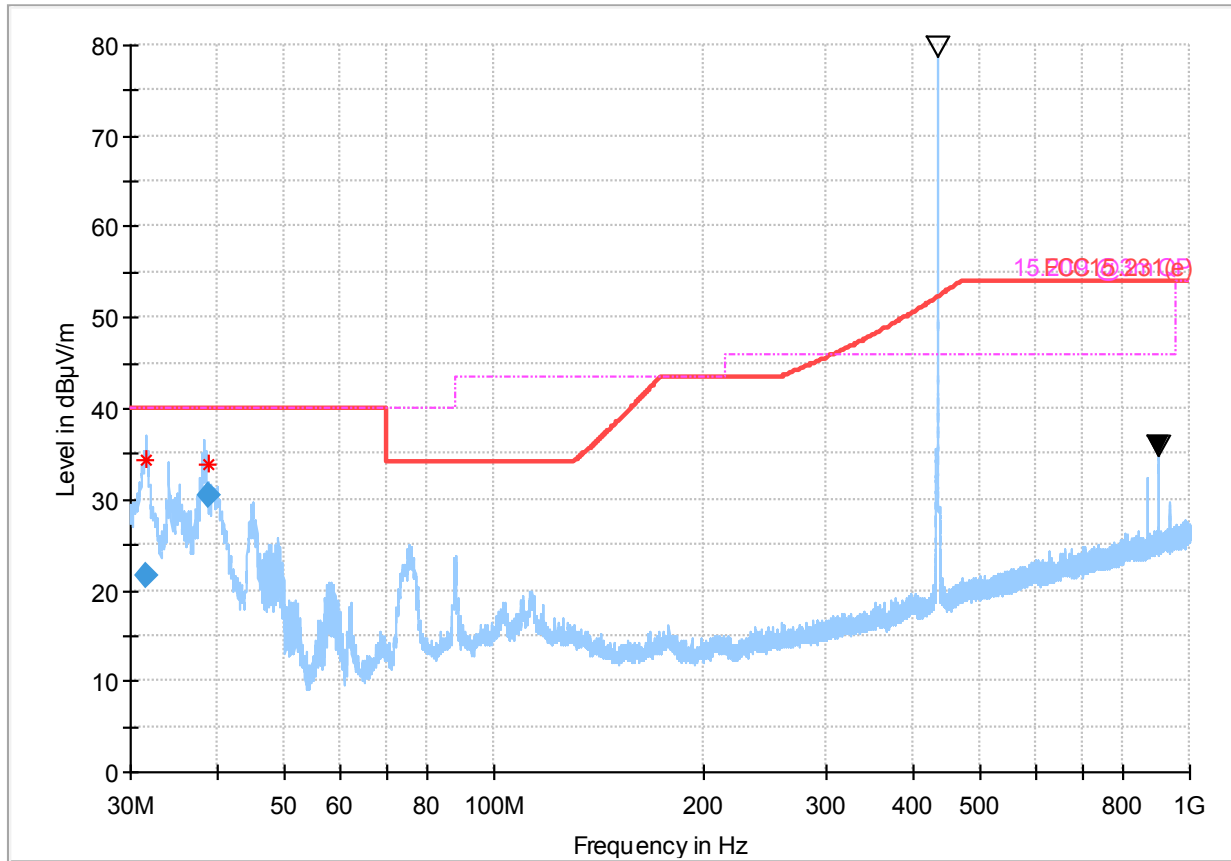
**Final Result**

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Pol	Azimuth (deg)	Corr. (dB/m)
15.301500	44.78	50.04	5.26	100.0	9.000	V	300.0	20.5
15.549000	41.04	50.03	8.99	100.0	9.000	V	21.0	20.5
27.107250	32.06	49.54	17.48	100.0	9.000	V	183.0	20.7



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

### 2.2.1 Lying, Set-up 1, Op. 1

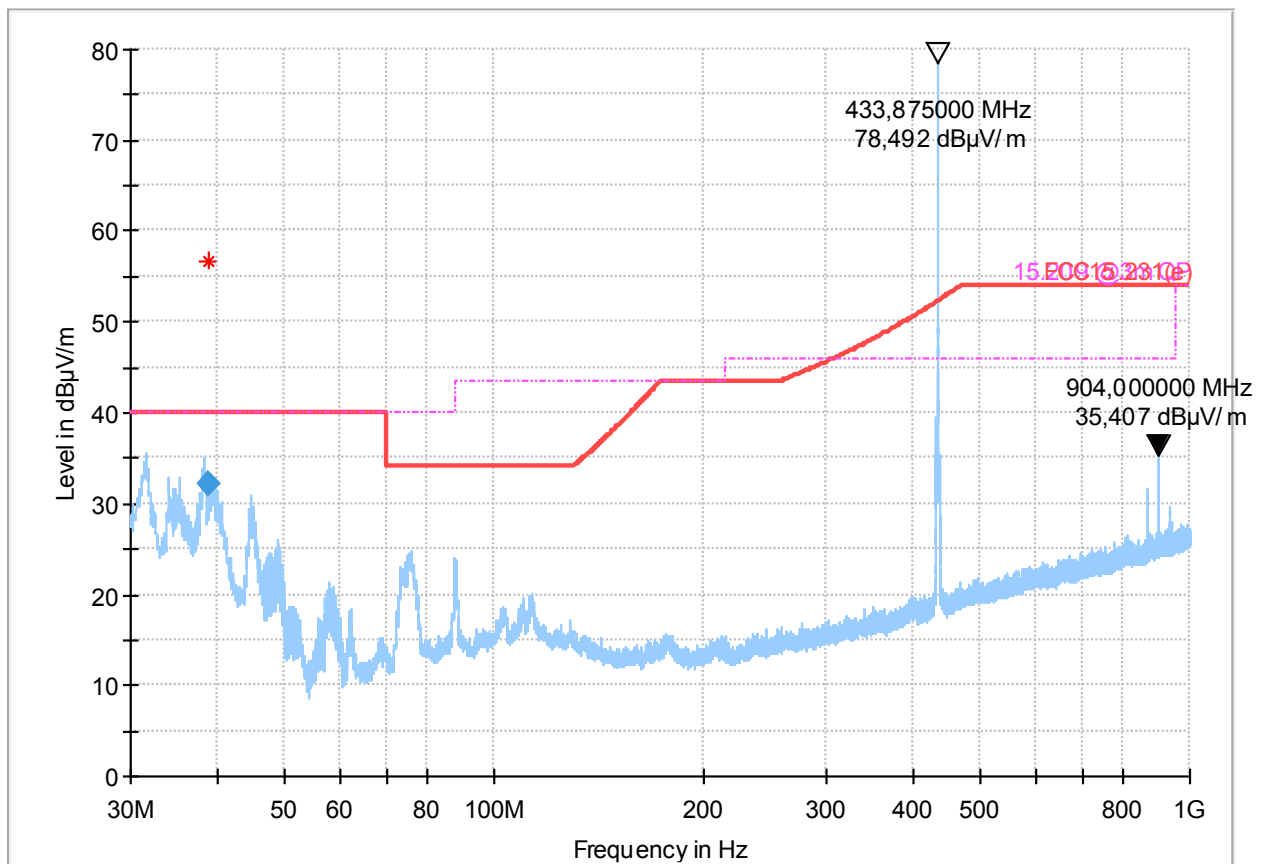


— Preview Result 1-PK+  
- - - 15.209 @3m QP
 \* Critical\_Freqs PK+  
◆ Final\_Result QPK
 — FCC15.231(e)

### Final\_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
31.650000	21.56	40.00	18.44	100.0	120.000	295.0	H	15.0
38.775000	30.52	40.00	9.48	100.0	120.000	103.0	V	150.0

2.2.2 Standing, Set-up 1, Op. 1



— Preview Result 1-PK+      \* Critical\_Freqs PK+      — FCC15.231(e)  
- - - 15.209 @3m QP      ◆ Final\_Result QPK

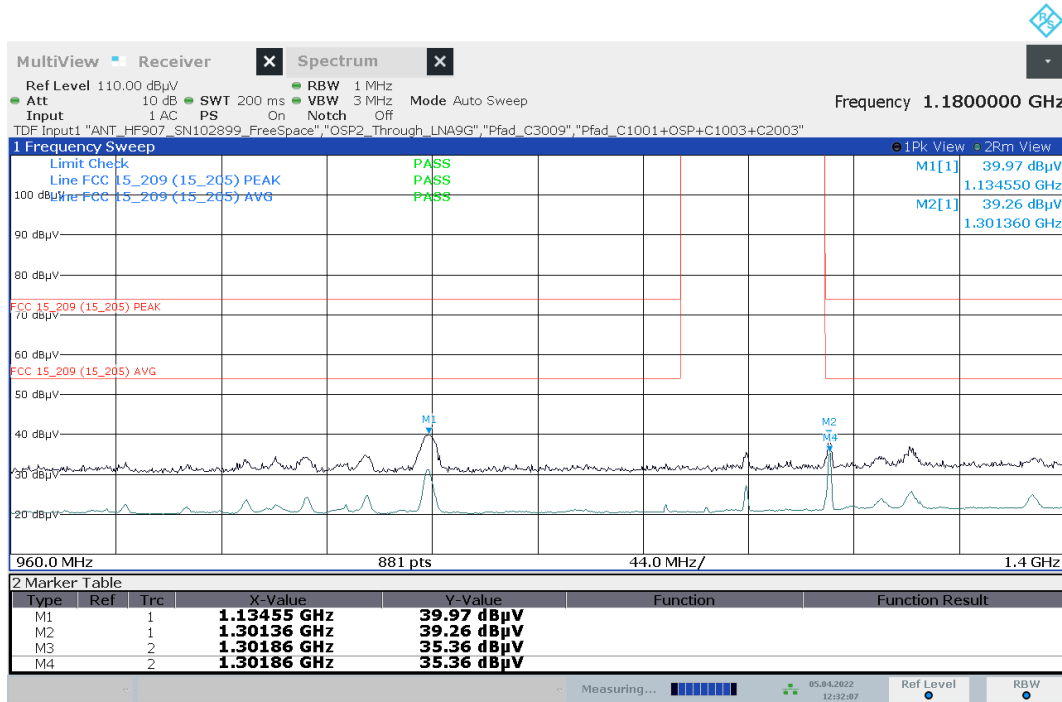
**Final Result**

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
38.750000	32.14	40.00	7.86	100.0	120.000	174.0	V	323.0

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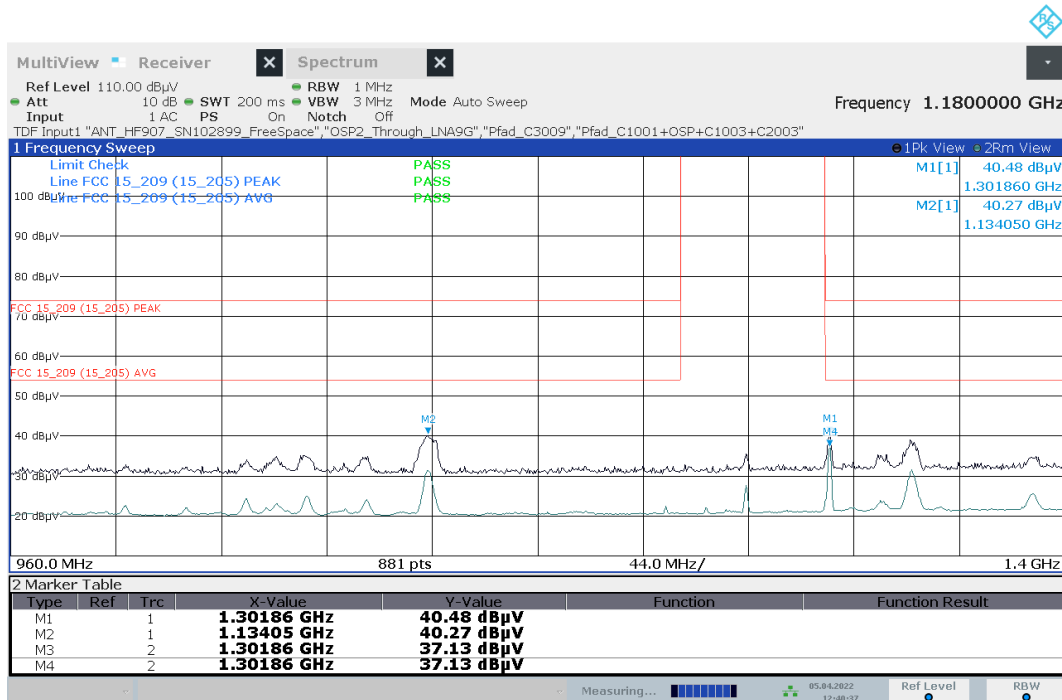
## 2.3 Radiated magnetic field strength measurements (1 GHz < f < 5 GHz)

### 2.3.1 960 MHz – 1400 MHz, Set-up 1, Op. 1, lying



12:32:07 05.04.2022

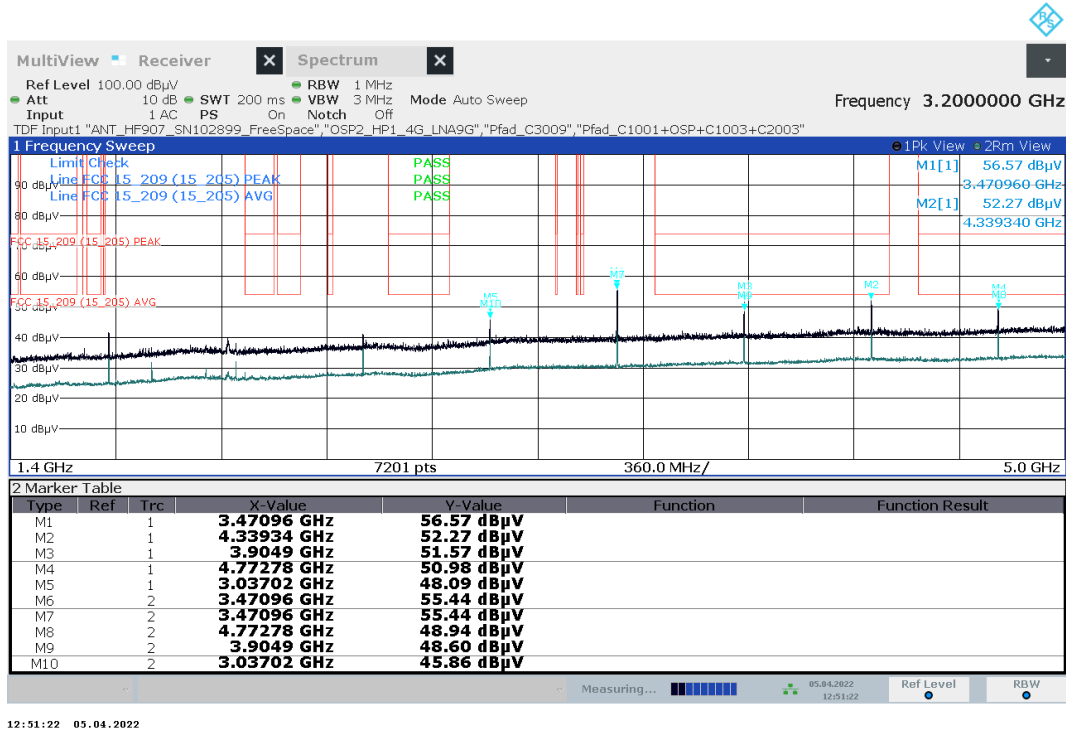
### 2.3.2 960 MHz – 1400 MHz, Set-up 1, Op. 1, standing



12:40:38 05.04.2022

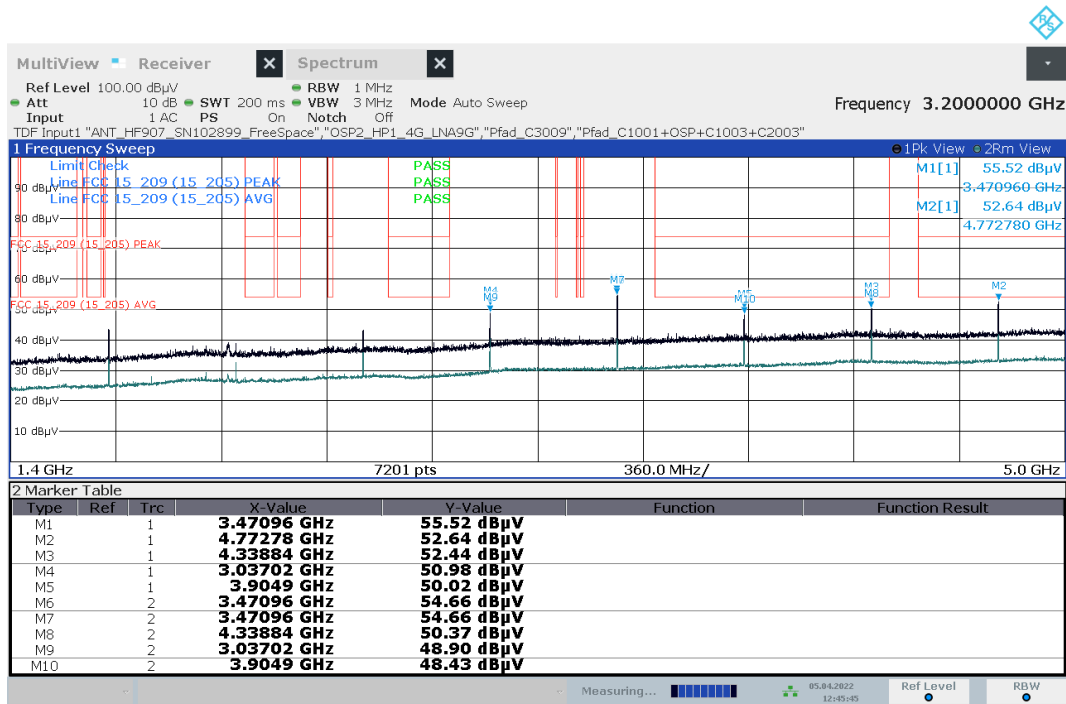
Annex A of TR no.: 21126722-25228-1

2.3.3 1400 MHz – 5000 MHz, Set-up 1, Op. 1, lying



12:51:22 05.04.2022

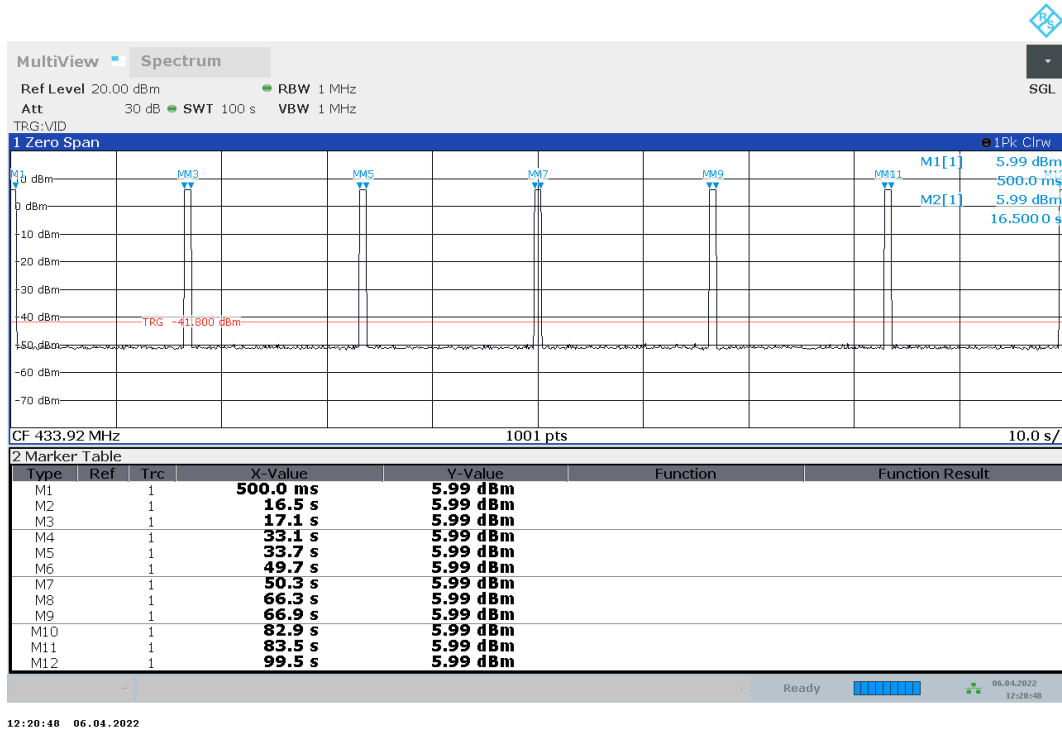
2.3.4 1400 MHz – 5000 MHz, Set-up 1, Op. 1, standing



12:45:46 05.04.2022

### 3 Transmit time

#### 3.1 Set-up 2, Op. mode 3, Measurement time 100 s



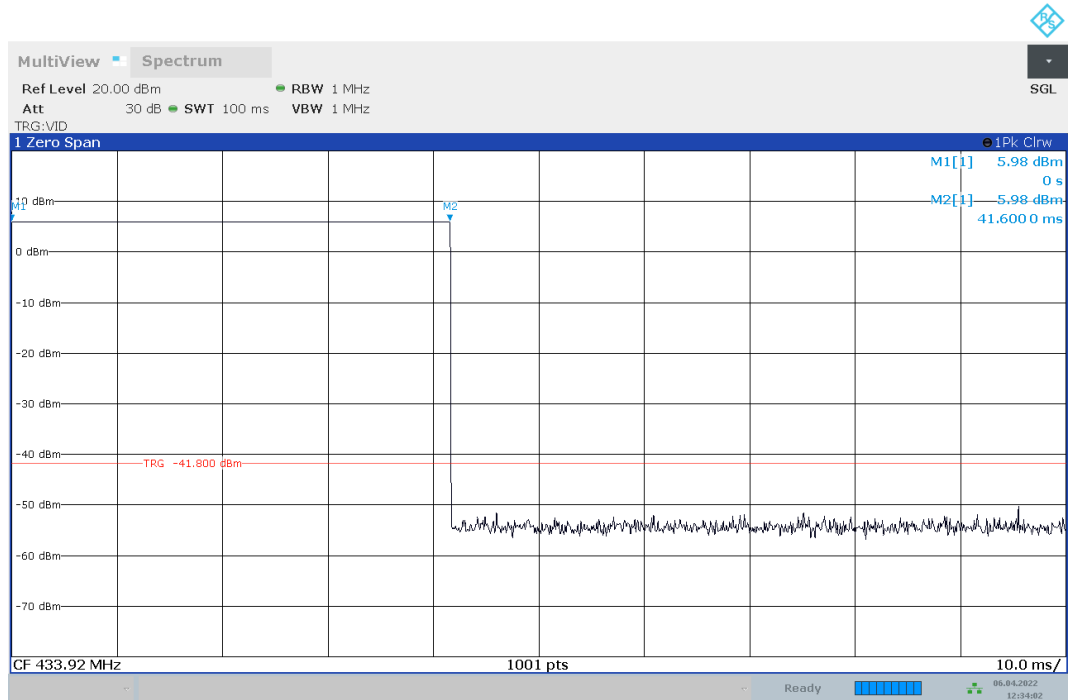
12:20:48 06.04.2022

#### 3.2 Set-up 2, Op. mode 3, Measurement time 1 s



12:23:19 06.04.2022

### 3.3 Set-up 2, Op. mode 2, Measurement time 100 ms, worst case for averaging factor



12:34:03 06.04.2022

Duty cycle (DC) = 41.6 ms / 100 ms = 0.416. Correction/averaging Factor =  $20 \cdot \text{LOG}(\text{DC}) = -7.62$  dB. This measurement is done only for determination of averaging factor. Mode 2 is a worst case in respect of AF.

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## 4 Occupied Bandwidth

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



17:22:07 05.04.2022

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



17:22:37 05.04.2022