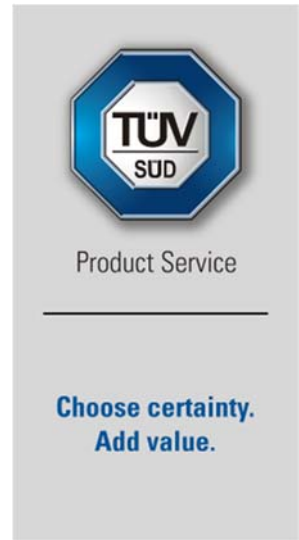


Report on the FCC and IC Testing of the  
 Endress+Hauser SE+Co.KG K-Band Level  
 Probing Radar. Model: FMR50T / FMR51T  
 In accordance with CFR 47, Part 15, Subpart C  
 and ISSED RSS-GEN Issue 5, RSS-211 Issue 2



Prepared for: Endress+Hauser SE+Co.KG  
 Hauptstraße 1  
 79689 Maulburg  
 Germany

FCC ID: LCGFMR5XKT  
 IC : 2519A-5KT

**COMMERCIAL-IN-CONFIDENCE**

Date: 2020-02-05  
 Document Number: TR-20351-65854-02 | Issue: 05

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Project Management	Matthias Stumpe	2020-02-05	 SIGN-ID 326500
Authorised Signatory	Markus Biberger	2020-02-05	 SIGN-ID 326509

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD Product Service document control rules.

**ENGINEERING STATEMENT**

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with CFR 47, Part 15, Subpart C and ISSED RSS-Gen Issue 5 March 2019 Amendment 1, RSS-211 Issue 1 March 2015. The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Matthias Stumpe	2020-02-05	 SIGN-ID 326500

Laboratory Accreditation      Laboratory recognition      Industry Canada test site registration  
 DAkkS Reg. No. D-PL-11321-11-02      Registration No. BNetzA-CAB-16/21-15      3050A-2

**EXECUTIVE SUMMARY**

A sample of this product was tested and found to be compliant with CFR 47, Part 15, Subpart C and ISSED RSS-Gen Issue 5 March 2019 Amendment 1, RSS-211 Issue 1 March 2015.

Trade Register Munich  
 HRB 85742  
 VAT ID No. DE129484267  
 Information pursuant to Section 2(1)  
 DL-InfoV (Germany) at  
[www.tuev-sued.de](http://www.tuev-sued.de)

Managing Directors:  
 Dr. Peter Havel (CEO)  
 Dr. Jens Butenandt  
 Patrick van Welij

Phone: +49 (0) 9421 55 22-0  
 Fax: +49 (0) 9421 55 22-99  
[www.tuev-sued.de](http://www.tuev-sued.de)

TÜV SÜD Product Service GmbH  
 Äußere Frühlingsstraße 45  
 94315 Straubing  
 Germany



## Contents

<b>1</b>	<b>Report Summary .....</b>	<b>2</b>
1.1	Report Modification Record.....	2
1.2	Introduction.....	2
1.3	Brief Summary of Results .....	3
1.4	Product Information .....	4
1.5	Deviations from the Standard.....	8
1.6	EUT Modification Record .....	8
1.7	Test Location.....	9
<b>2</b>	<b>Test Setups .....</b>	<b>10</b>
<b>3</b>	<b>Test Details .....</b>	<b>14</b>
3.1	AC Power Line Conducted Emissions .....	14
3.2	Fundamental Emission 99% Bandwidth .....	17
3.3	Frequency stability .....	19
3.4	Unwanted emissions .....	26
3.5	Restricted bands of operation .....	47
3.6	Exposure of Humans to RF Fields .....	56
<b>4</b>	<b>Measurement Uncertainty .....</b>	<b>57</b>



# 1 Report Summary

## 1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
1	First Issue	2019-09-24
2	RSS-211 added to test report	2019-11-29
3	“Radar mounted to the tank” added to the Operation Mode and Test Setup 3.2.4 RSS-211 added to test report Chapter “Test Setups” added to test report	2019-12-16
4	Clause 5.3 of RSS-211 added to the Brief Summary of Results Limitation table of clause 5.3 added into the section 3.4	2019-12-17
5	Chapter “Exposure of Humans to RF Fields” revised”.	2020-02-05

**Table 1**

## 1.2 Introduction

Applicant	Endress+Hauser SE+Co.KG
Manufacturer	Endress+Hauser SE+Co.KG
Model Number(s)	FMR50T, FMR51T
Serial Number(s)	N/A
Hardware Version(s)	N/A
Software Version(s)	N/A
Number of Samples Tested	2
Test Specification/Issue/Date	CFR 47, Part 15, Subpart C ISED RSS-Gen Issue 5 March 2019 Amendment 1 RSS-211 Issue 1 March 2015
Test Plan/Issue/Date	---
Order Number	120/1017713879
Date	2019-07-16
Date of Receipt of EUT	2019-07-30
Start of Test	2019-07-30
Finish of Test	2019-12-04
Name of Engineer(s)	Matthias Stumpe
Related Document(s)	ANSI C63.10 (2013) KDB 890966 D01 Meas level Probing Radars v01r01

### 1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with CFR 47, Part 15, Subpart C / ISED RSS-211 Issue 1 is shown below.

Section	Specification Clause	Test Description	Result	Comments/Base Standard
Configuration and Mode: Measurement with pulsed signal				
2.1	15.207 / 8.8 / NA	Conducted limits	Pass	ANSI C63.10 (2013)
2.2		Fundamental Emission 99% Bandwidth	Pass	ANSI C63.10 (2013)
2.3	15.215 / 8.11 / NA	Frequency stability	Pass	ANSI C63.10 (2013)
2.4	15.209 / 8.9 / 5.3	Unwanted emissions	Pass	ANSI C63.10 (2013)
2.5	15.205 / 8.10 / NA	Restricted bands of operation	Pass	ANSI C63.10 (2013)
2.6	FCC 47 CFR Part 1.1310 RSS-102 Issue 5	Exposure of Humans to RF Fields	Pass	NA

**Table 2**



**1.4 Product Information**

**1.4.1 Technical Description**

<b>Equipment characteristics</b>	
Type designation:	FMR50T / FMR51T
Parts of the system:	---
Options and accessories:	---
Type of equipment:	K-Band Level Probing Radar
Serial number:	NA
Manufacturer:	Endress+Hauser SE+Co.KG
Application frequency range:	24.05 GHz - 29.0 GHz
Operating frequency:	25.2 GHz
Type of modulation:	1G50P0NAN
Pulse train / width:	558.54 ns / 2.04 ns
Channel spacing:	N/A
Designation of emissions	1G50P0NAN
Power supply:	External DC supply
	Nominal: 24.0 V DC (10.2 to 34.6 V DC)
	Nominal frequency: 0 Hz (DC)
Highest internal frequency:	240 MHz, 76 GHz for Radar
Version of EUT:	N/A

<b>Technical Description</b>
The Equipment Under Test (EUT) is a level probing radar with different operational modes and configurations. EUT is operating in K-Band (24.05 GHz - 29.0 GHz ) with a pulsed signal. Radar is using HART protocol on DC supply interface (Highway Addressable Remote Transducer).

<b>Operation Mode(s)</b>
Normal operation mode: Measurement with pulsed signal, Radar mounted to the tank



Product Service

<b>Equipment Test Configurations</b>			
<b>Configuration</b>	<b>Basis</b>	<b>Antenna</b>	<b>Mode</b>
P1	FMR50T	Horn 40mm/1-1/2", PVDF encapsulated	TLPR
P3	FMR51T	Horn 40mm/1-1/2"	TLPR

TLPR: Tank Level Probing Radar – Operation only inside enclosure (storage tank). No intentional emission to open-air environments



**Marking Plate**

Made in Germany, 79689 Maulburg, Hauptstr. 1		<b>Endress+Hauser</b>	
<b>Micropilot</b>		IP68 / 66 Type 4X / 6P Encl.	
Order code: FMR50-1020/0			
Ser. no.: 12345678901234			
Ext. ord. cd.: FMR50-AAACAABMGGF+			
10.4...35 V DC / 2-wire 4...20 mA HART			
Tp max: 130°C MWP: 3 bar		FCC ID LCGFMR5XKT	
M20x1.5 / M16x1.5			
Ta: -40...+80 °C Ta > 60 °C: $T_{Ta} + 20 K$			
Mat.: PVDF			
FW: 01.02.02 Dev.Rev.:3 ex works		→	
0700		= if modification see sep. label Patents →	
		Date: 2019-09	

Made in Germany, 79689 Maulburg, Hauptstr. 1		<b>Endress+Hauser</b>	
<b>Micropilot</b>		IP68 / 66 Type 4X / 6P Encl.	
Order code: FMR50-7E90/0		CRN OF15872.5C	
Ser. no.: 12345678901234			
Ext. ord. cd.: FMR50-AAACAABMGGF+			
10.4...35 V DC / 2-wire 4...20 mA HART			MODEL FMR50T IC:2519A-5KT
Tp max: 130°C MWP: 3 bar			
M20x1.5 / M16x1.5			
Ta: -40...+80 °C Ta > 60 °C: $T_{Ta} + 20 K$			
Mat.: PVDF			
FW: 01.02.02 Dev.Rev.:3 ex works		→	
0700		= if modification see sep. label Patents →	
		Date: 2019-09	



**Marking Plate**

Made in Germany, 79689 Maulburg, Hauptstr. 1 <b>Micropilot</b>		<b>Endress+Hauser</b>	
Order code: FMR51-1LK7/0 Ser. no.: 12345678901234 Ext. ord. cd.: FMR51-AAACAABAA5RVJ+		IP68 / 66 Type 4X / 6P Encl.	
10.4...35 V DC / 2-wire 4...20 mA HART		FCC ID LCGFMR5XKT	
Tp max: 150°C      MWP: 40 bar M20x1.5 / M16x1.5 Ta: -40...+80 °C Ta > 60 °C: (T ≥ Ta + 20 K)		FW: 01.02.02    Dev.Rev.:3    ex works 0700	
CE		X = if modification    Patents → see sep. label Date: 2019-09	

Made in Germany, 79689 Maulburg, Hauptstr. 1 <b>Micropilot</b>		<b>Endress+Hauser</b>	
Order code: FMR51-1LK7/0 Ser. no.: 12345678901234 Ext. ord. cd.: FMR51-AAACAABAA5RVJ+		IP68 / 66 Type 4X / 6P Encl. CRN OF 15872.5C	
10.4...35 V DC / 2-wire 4...20 mA HART		MODEL FMR51T IC:2519A-5KT	
Tp max: 150°C      MWP: 40 bar M20x1.5 / M16x1.5 Ta: -40...+80 °C Ta > 60 °C: (T ≥ Ta + 20 K)		FW: 01.02.02    Dev.Rev.:3    ex works 0700	
CE		X = if modification    Patents → see sep. label Date: 2019-09	





**1.5 Deviations from the Standard**

none

**1.6 EUT Modification Record**

The table below details modifications made to the EUT during the test programme.  
The modifications incorporated during each test are recorded on the appropriate test pages.

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
EUT: P1 - Serial Number: N/A			
0	As supplied by the customer	Not Applicable	Not Applicable

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
EUT: P3 - Serial Number: N/A			
0	As supplied by the customer	Not Applicable	Not Applicable

**Table 3**



Product Service

### 1.7 Test Location

TÜV SÜD Product Service conducted the following tests at our Straubing Test Laboratory.

<b>Test Name</b>	<b>Name of Engineer(s)</b>
<b>All configurations - Normal operation mode</b>	
AC Power Line Conducted Emissions	Matthias Stumpe
99% Emission Bandwidth	Matthias Stumpe
Frequency stability	Matthias Stumpe
Unwanted emissions	Matthias Stumpe
Restricted bands of operation	Matthias Stumpe
Exposure of Humans to RF Fields	Matthias Stumpe

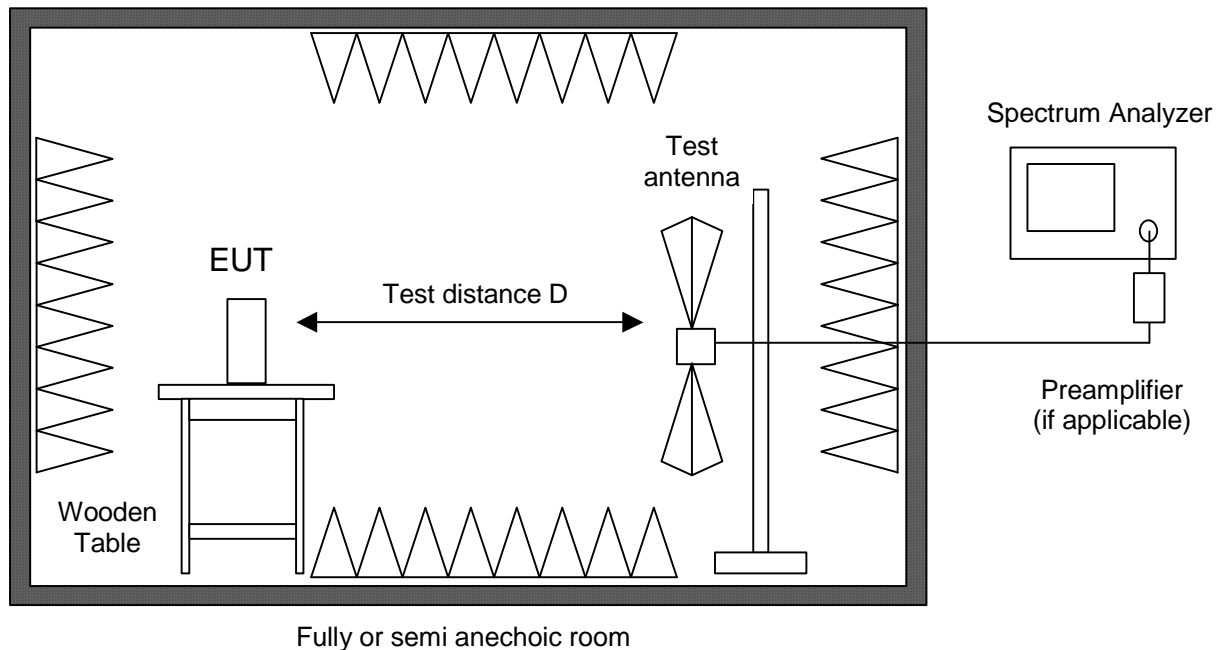
**Table 4**

Office Address:

Äußere Frühlingstraße 45  
94315 Straubing  
Germany

## 2 Test Setups

### 2.1.1.1 Radiated Emission in Fully or Semi Anechoic Room



Radiated emission in fully or semi anechoic room is measured in the frequency range from 30 MHz to the maximum frequency as specified in CFR 47 Part 15 section 15.33.

Measurements are made in both the horizontal and vertical planes of polarization using a spectrum analyzer with the detector function set to peak and resolution as well as video bandwidth set to 100 kHz (below 1 GHz) or 1 MHz (above 1 GHz).

Testing up to 1 GHz is performed with a linear polarized logarithmic periodic antenna combined with a 4:1 broadband dipole ("Trilog broadband antenna"). For testing above 1 GHz horn antennas are used.

All tests below 8.2 GHz are performed at a test distance D of 3 meters. For higher frequencies the test distance may be reduced (e.g. to 1 meter) due to the sensitivity of the measuring instrument(s) and the test results are calculated according to CFR 47 Part 15 section 15.31(f)(1) using an extrapolation factor of 20 dB/decade. If required, preamplifiers are used for the whole frequency range. Special care is taken to avoid overload, using appropriate attenuators and filters, if necessary.

If the radiated emission limits are expressed in terms of the average value of the emission there also is a peak limit corresponding to 20 dB above the maximum permitted average limit. Additionally, if pulsed operation is employed, the average field strength is determined by averaging over one complete pulse train, including blanking intervals, as specified in CFR 47 Part 15 section 15.35(c). If the pulse train exceeds 0.1 second that 0.1 second interval during which the value of the emission is at its maximum is selected for calculation. The pulse train correction is added to the peak value of the emission to get the average value.

Hand-held or body-worn devices are rotated through three orthogonal axes to determine which attitude and configuration produces the highest emission relative to the limit and therefore shall be used for final testing.

During testing the EUT is rotated all around to find the maximum levels of emissions. Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.

For final testing below 1 GHz a semi anechoic room complying with the NSA requirements of ANSI C63.4 for alternative test sites is used (see 2.1.1.2). If prescans are recorded in fully anechoic room they are indicated appropriately.



According to section 13 of KDB558074 the requirement for radiated emissions on the band edges was performed with a reduced bandwidth of 100 kHz instead of 1 MHz.

Radiated emission in the frequency range 9 kHz to 30 MHz is measured using an active loop antenna. First the whole spectrum of emission caused by the equipment is recorded at a distance of 3 meters in a fully or semi anechoic room with the detector of the spectrum analyzer or EMI receiver set to peak. This configuration is also used for recording the spectrum of intentional radiators.

Hand-held or body-worn devices are rotated through three orthogonal axes to determine which attitude and configuration produces the highest emission relative to the limit and therefore shall be used for final testing.

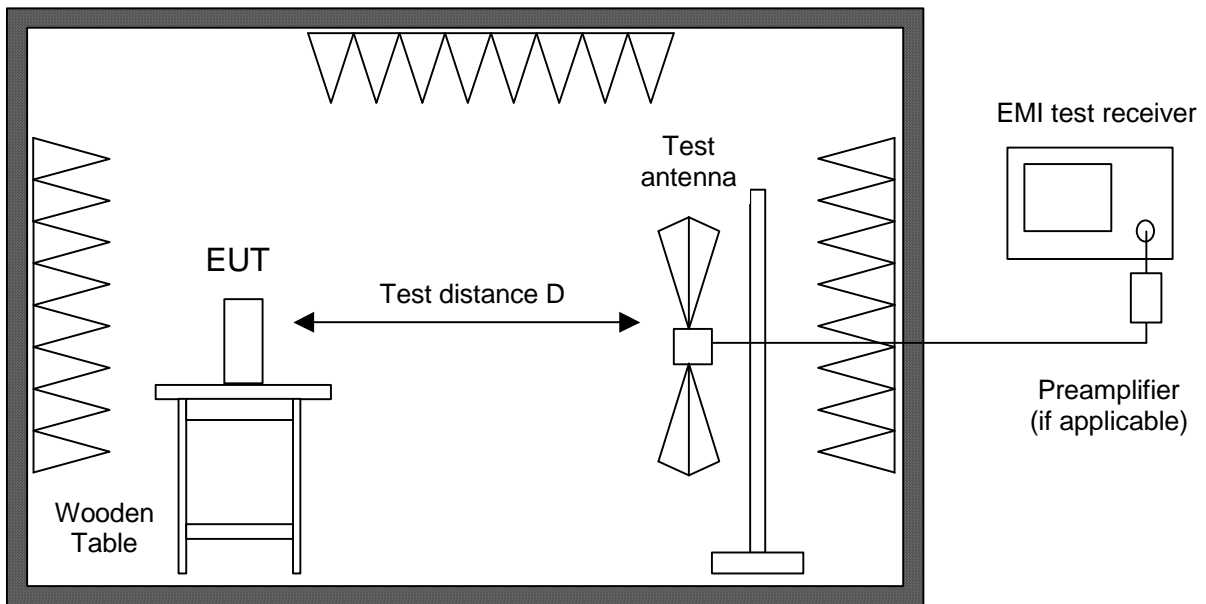
EUT is rotated all around to find the maximum levels of emissions. Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.

If worst case emission of the EUT cannot be recorded with EUT in standard position and loop antenna in vertical polarization the EUT (or the radiating part of the EUT) is rotated by 90 degrees instead of changing the loop antenna to horizontal polarization. This procedure is selected to minimize the influence of the environment (e.g. effects caused by the floor especially with longer distances).

Final measurement is performed at a test distance D of 30 meters using an open field test site. In case the regulation requires testing at other distances, the result is extrapolated by either making measurements at an additional distance D of 10 meters to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). In cases of very low emissions measurements are performed at shorter distances and results are extrapolated to the required distance. The provisions of CFR 47 Part 15 sections 15.31(d) and (f)(2) apply. According to CFR 47 Part 15 section 15.209(d) final measurement is performed with detector function set to quasi-peak except for the frequency bands 9 to 90 kHz and 110 to 490 kHz where, for non-pulsed operation, average detector is employed.

If the radiated emission limits are expressed in terms of the average value of the emission there also is a peak limit corresponding to 20 dB above the maximum permitted average limit. Additionally, if pulsed operation is employed, the average field strength is determined by averaging over one complete pulse train, including blanking intervals, as specified in CFR 47 Part 15 section 15.35(c). If the pulse train exceeds 0.1 second that 0.1 second interval during which the value of the emission is at its maximum is selected for calculation. The pulse train correction is added to the peak value of the emission to get the average value.

### 2.1.1.2 Radiated Emission at Alternative Test Site



Alternate test site (semi anechoic room)

Radiated emission in the frequency range 30 MHz to 1 GHz is measured within a semi-anechoic room with groundplane complying with the NSA requirements of ANSI C63.4 for alternative test sites. A linear polarized logarithmic periodic antenna combined with a 4:1 broadband dipole ("Trilog broadband antenna") is used. The measurement bandwidth of the test receiver is set to 120 kHz with quasi-peak detector selected.

If the radiated emission limits are expressed in terms of the average value of the emission there also is a peak limit corresponding to 20 dB above the maximum permitted average limit. Additionally, if pulsed operation is employed, the average field strength is determined by averaging over one complete pulse train, including blanking intervals, as specified in CFR 47 Part 15 section 15.35(c). If the pulse train exceeds 0.1 second that 0.1 second interval during which the value of the emission is at its maximum is selected for calculation. The pulse train correction is added to the peak value of the emission to get the average value.

Hand-held or body-worn devices are tested in the position producing the highest emission relative to the limit as verified by prescans in fully anechoic room.

If no prescan in a fully anechoic room is used first a peak scan is performed in four positions to get the whole spectrum of emission caused by EUT with the measuring antenna raised and lowered from 1 to 4 m to find table position, antenna height and antenna polarization for the maximum emission levels. Data reduction is applied to these results to select those levels having less margin than 10 dB to or exceeding the limit using subranges and limited number of maximums. Further maximization is following.

With detector of the test receiver set to quasi-peak final measurements are performed immediately after frequency zoom (for drifting disturbances) and maximum adjustment.

Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.

In cases where prescans in a fully anechoic room are taken (e. g. if EUT is operating for a short time only or battery is discharged quickly) final measurements with quasi-peak detector are performed manually at frequencies indicated by prescan with EUT rotating all around and receiving antenna raising and lowering within 1 meter to 4 meters to find the maximum levels of emission.

Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.



Product Service

For measuring emissions of intentional radiators and receivers a test distance D of 3 meters is selected. Testing of unintentional radiators is performed at a distance of 10 meters. If limits specified for 3 meters shall be used for measurements performed at 10 meters distance the limits are calculated according to CFR 47 Part 15 section 15.31(d) and (f)(1) using an inverse linear-distance extrapolation factor of 20 dB/decade.



## 3 Test Details

### 3.1 AC Power Line Conducted Emissions

#### 3.1.1 Specification Reference

FCC 47 CFR Part 15C Clause 15.207, Canada RSS-211

#### 3.1.2 Equipment Under Test and Modification State

P3, S/N: N/A - Modification State 0

Radar Mounted to the tank.

AC Power Line Conducted Emissions was performed only on one EUT because all EUTs an EUT configurations contain the same electronic and transceiver hardware.

#### 3.1.3 Date of Test

2018-09-30

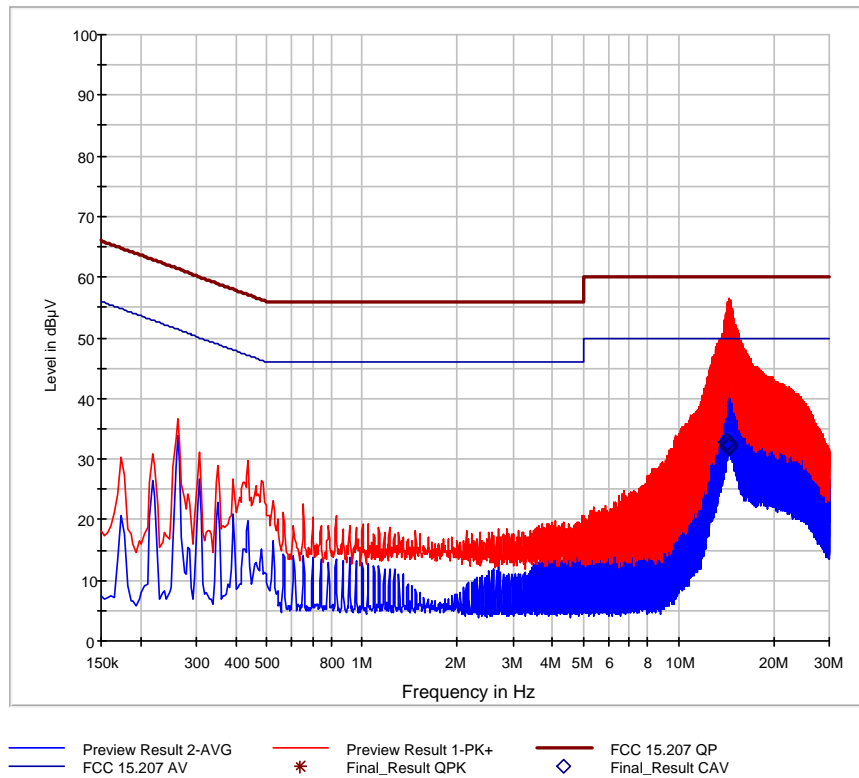
#### 3.1.4 Environmental Conditions

Ambient Temperature	22,0 °C
Relative Humidity	48,0 %



### 3.1.5 Test Results

Normal operation mode: Measurement with pulsed signal, Radar mounted to the tank



#### Final Results:

Frequency MHz	QuasiPeak dBµV	CAverage dBµV	Limit dBµV	Margin dB	Meas. Time ms	Bandwidth kHz	Line	Filter	Corr. dB
14.338000	---	32.76	50.00	17.24	1000.0	9.000	L1	ON	10.3
14.382000	---	32.68	50.00	17.32	1000.0	9.000	L1	ON	10.3
14.426000	---	32.31	50.00	17.69	1000.0	9.000	L1	ON	10.3
14.470000	---	32.13	50.00	17.87	1000.0	9.000	L1	ON	10.3
14.514000	---	32.04	50.00	17.96	1000.0	9.000	L1	ON	10.3

#### Plus and Minus Line Emissions Results





FCC 47 CFR Part 15. Limit Clause 15.207 and Industry Canada RSS-211

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	Quasi-Peak	Average
0.15 to 0.5	66 to 56*	56 to 46*
0.5 to 5	56	46
5 to 30	60	50

**Table 5**

\*Decreases with the logarithm of the frequency.

**3.1.6 Test Location and Test Equipment Used**

This test was carried out in Shielded room - cabin no. 9.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
EMI test receiver	Rohde & Schwarz	ESU8	19904	12	12.2019
V-network	Rohde & Schwarz	ESH 3 Z5	18919	36	10.2019
Shielded room	Albatross	No. 09	---	---	---
EMC Measurement Software	Rohde&Schwarz	EMC32 V10.20.01	19719	N/A	N/A

**Table 6**

TU - Traceability Unscheduled  
 O/P Mon – Output Monitored using calibrated equipment  
 N/A - Not Applicable



**3.2 Fundamental Emission 99% Bandwidth**

**3.2.1 Specification Reference**

Industry Canada RSS-GEN

**3.2.2 Equipment Under Test and Modification State**

P3, S/N: N/A - Modification State 0

Radar Mounted to the tank.

99 % Emission Bandwidth was performed only on one EUT because all EUTs an EUT configurations contain the same electronic and transceiver hardware.

**3.2.3 Date of Test**

2019-12-04

**3.2.4 Test Method**

The test was performed in accordance with  
ANSI C63.10  
RSS-211

**3.2.5 Environmental Conditions**

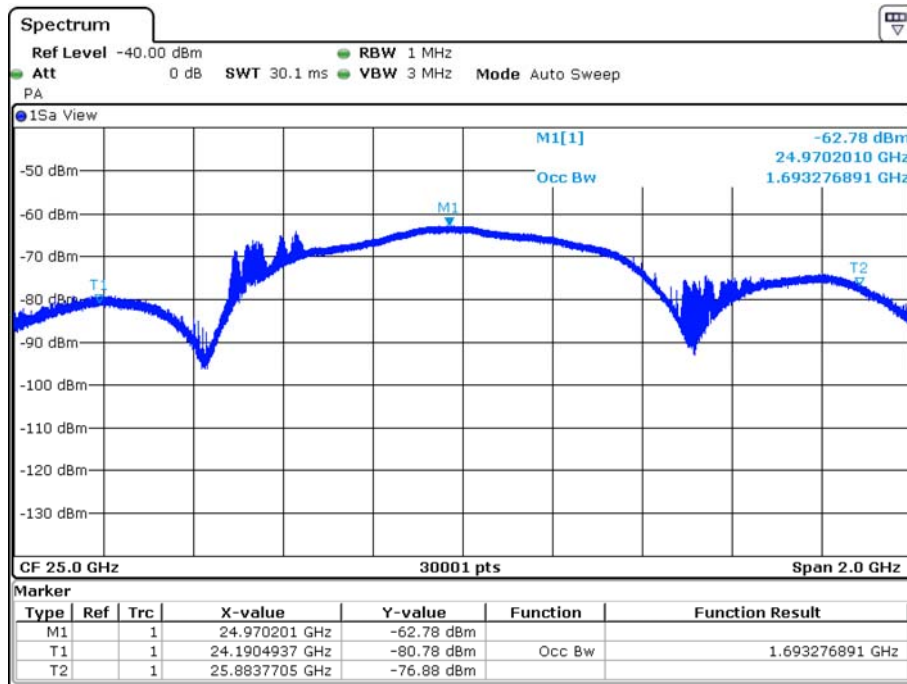
Ambient Temperature 20.0 °C  
Relative Humidity 36.0 %

**3.2.6 Test Results**

Normal operation mode: Measurement with pulsed signal, Radar mounted to the tank

<i>Equipment Under Test</i>	<i>99% Bandwidth (MHz)</i>	<i>f 99% lower (GHz)</i>	<i>f 99% upper (GHz)</i>
P3	1693	24.190	25.884

**Table 7**



Date: 4.DEC.2019 08:25:28

**Fundamental Emission – 99% Bandwidth – P3**

**3.2.7 Test Location and Test Equipment Used**

Radiated test was carried out in Non-shielded room with Test system TS8997.

T-ID	Designation	Type	Last Cal.	Next Cal.
20219	Signal and Spectrum Analysatorr	FSV40	2019-01-24	2020-01-31
20238	Vector Signal Generator	SMBV100A	2019-11-14	2022-11-30
20215	Signal Generator	SMB100A	2018-03-13	2021-03-31
20248	Switching Device	OSP120	2018-01-10	2020-01-31
38807	Switching Device	OSP120	2018-09-26	2020-09-30
19125	Horn Antenna	3160-09	---	---
19719	EMC Measurement Software	EMC32-ME+	---	---

**Table 8**



**3.3 Frequency stability**

**3.3.1 Specification Reference**

FCC 47 CFR Part 15C. Clause 15.215(c)  
 Industry Canada RSS-211

**3.3.2 Equipment Under Test and Modification State**

P1. S/N: N/A - Modification State 0  
 P3. S/N: N/A - Modification State 0

Radar Mounted to the tank.

Frequency stability was performed only once because all EUTs an EUT configurations contain the same electronic and transceiver hardware.

**3.3.3 Date of Test**

2019-08-07

**3.3.4 Test Method**

The test was performed in accordance with  
 ANSI C63.10  
 KDB 890966 D01  
 RSS-211

**3.3.5 Environmental Conditions**

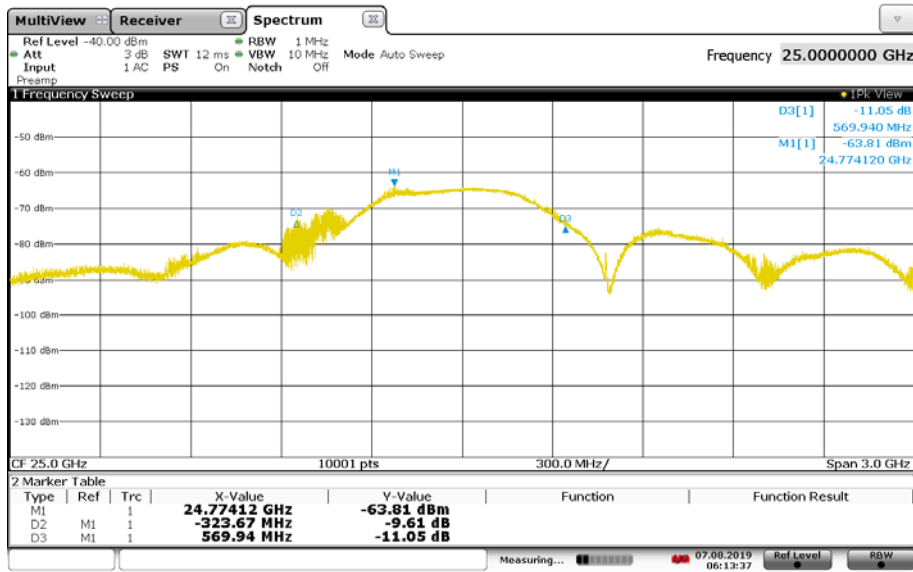
Ambient Temperature 25.0 °C  
 Relative Humidity 56.0 %

**3.3.6 Test Results**

Normal operation mode: Measurement with pulsed signa, Radar mounted to the tank

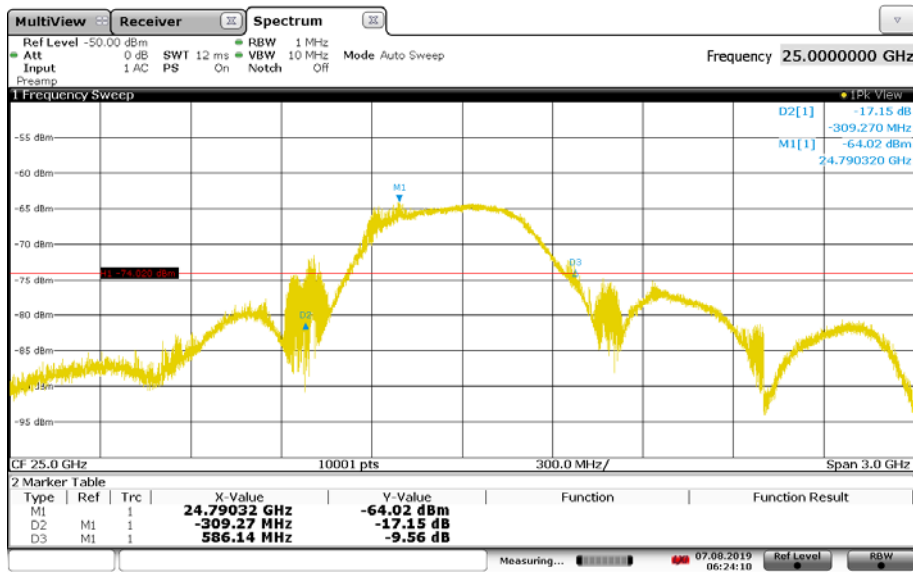
<i>Operating Conditions</i>	<i>10 dB Bandwidth (MHz)</i>	<i>f-10dB lower (GHz)</i>	<i>f-10 upper (GHz)</i>
10.2V DC / +20°C	893.61	24.45045	25.34406
34.5V DC / +20°C	895.41	24.48105	25.37646
24V DC / -20°C	1029.8	24.65823	25.68803
24V DC / -10°C	1011.2	24.47116	25.48236
24V DC / 0°C	1046.9	24.43605	25.48295
24V DC / +10°C	1001.9	24.45255	25.45445
24V DC / +20°C	878.61	24.45735	25.33596
24V DC / +30°C	980.3	24.43156	25.41186
24V DC / +40°C	907.11	24.45405	25.36116
24V DC / +50°C	915.21	24.44265	25.35786

**Table 9**



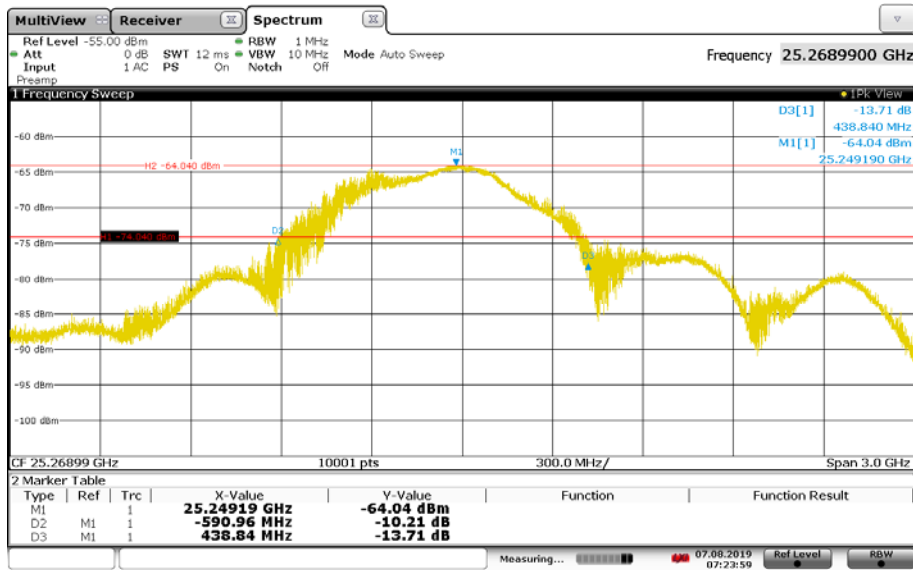
06:13:38 07.08.2019

**Fundamental Emission -10 dB Bandwidth – 10.2V DC / +20°C**



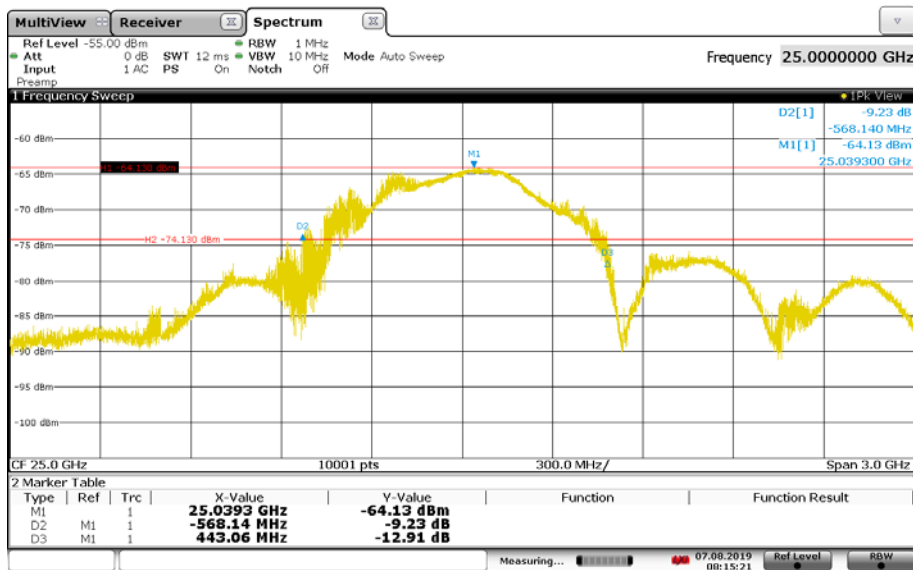
06:24:11 07.08.2019

**Fundamental Emission -10 dB Bandwidth – 34.5V DC / +20°C**



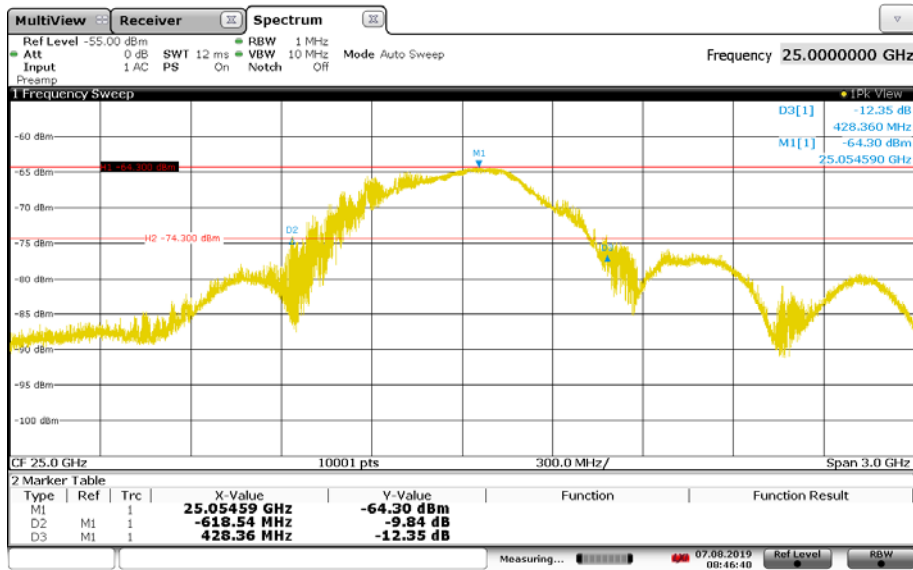
07:24:00 07.08.2019

**Fundamental Emission -10 dB Bandwidth – 24.0V DC / -20°C**



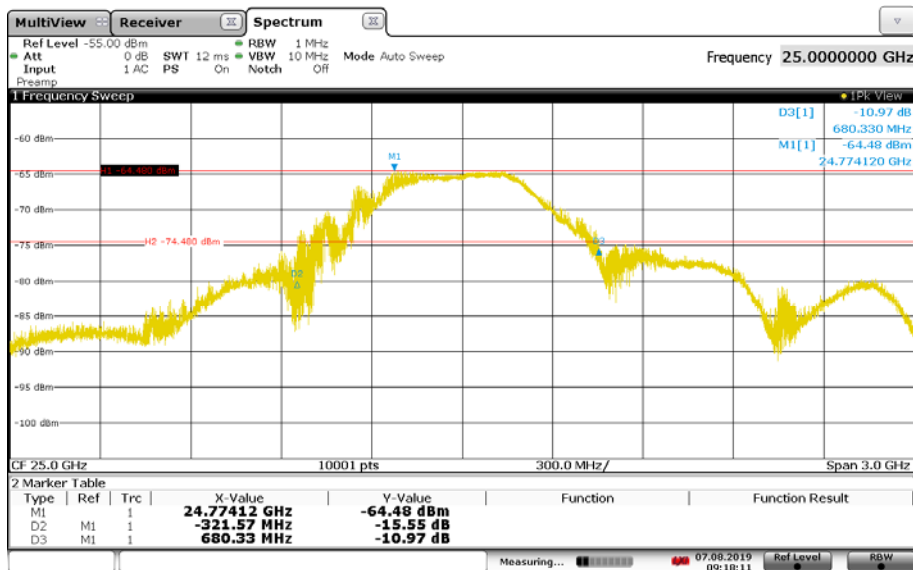
08:15:22 07.08.2019

**Fundamental Emission -10 dB Bandwidth – 24.0V DC / -10°C**



08:46:40 07.08.2019

**Fundamental Emission -10 dB Bandwidth – 24.0V DC / 0°C**



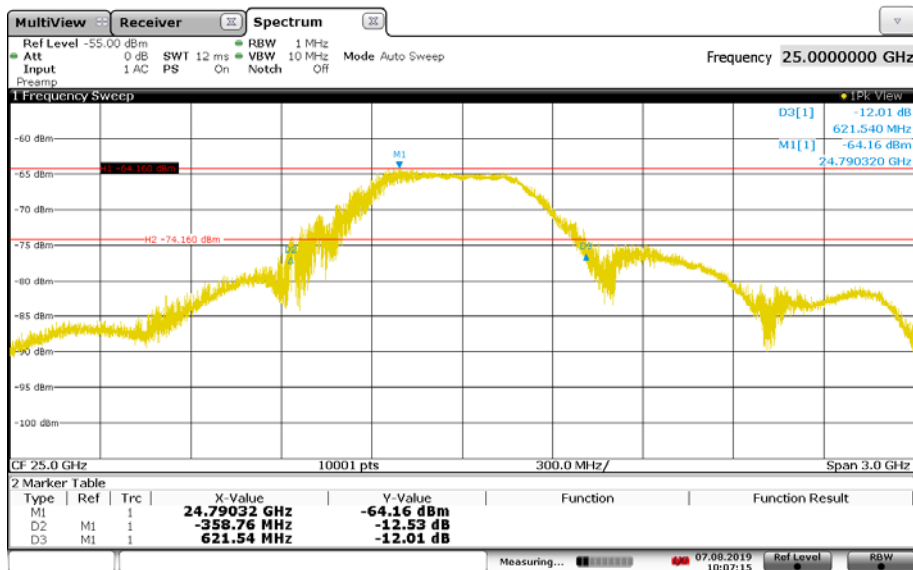
09:18:11 07.08.2019

**Fundamental Emission -10 dB Bandwidth – 24.0V DC / +10°C**



06:08:42 07.08.2019

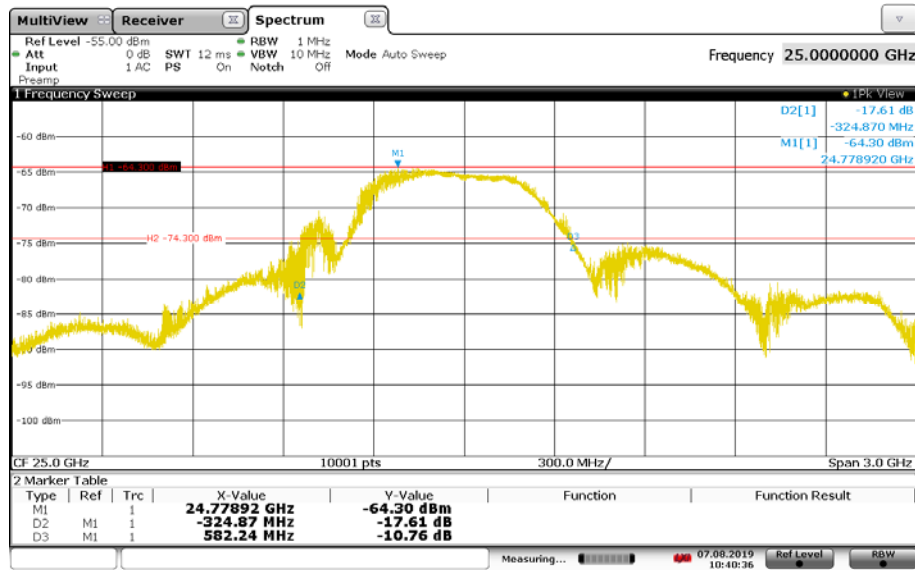
**Fundamental Emission -10 dB Bandwidth – 24.0V DC / +20°C**



10:07:16 07.08.2019

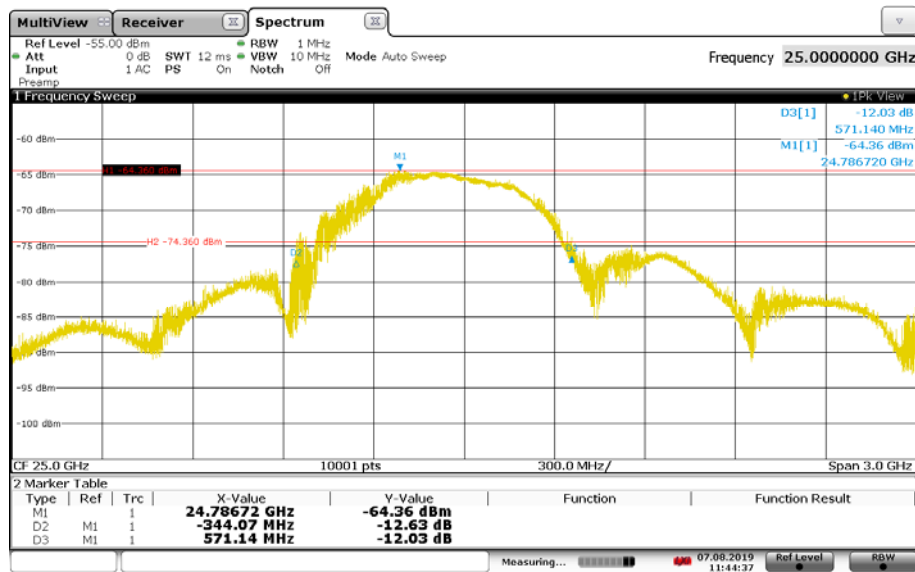
**Fundamental Emission -10 dB Bandwidth – 24.0V DC / +30°C**





10:40:36 07.08.2019

**Fundamental Emission -10 dB Bandwidth – 24.0V DC / +40°C**



11:44:38 07.08.2019

**Fundamental Emission -10 dB Bandwidth – 24.0V DC / +50°C**

FCC 47 CFR Part 15. Limit Clause 15.215 and Industry Canada RSS-211  
 Emission shall fall fully into designated frequency band 24.05 to 29.00 GHz.



**3.3.7 Test Location and Test Equipment Used**

This test was carried out in Fully Anechoic Room no. 2.

<i>T-ID</i>	<i>Designation</i>	<i>Type</i>	<i>Last Cal.</i>	<i>Next Cal.</i>
19125	Horn antenna	3160-09	Verified	
19383	Double ridged waveguide horn antenna	3115	2017-02	2020-02
19442	Horn antenna	3160-10	Verified	
19946	Horn antenna	24240-20	Verified	
22553	Waveguide mixer	FS-Z170	2016-08	2019-08
25849	Waveguide mixer	FS-Z60	2017-04	2020-04
25850	Waveguide mixer	FS-Z90	2016-12	2019-12
25851	Waveguide mixer	FS-Z110	2016-11	2019-11
27898	Horn antenna	26240-20	Verified	
27899	Horn antenna	27240-20	Verified	
39897	EMI test receiver	ESW44	2019-02	2020-02
36954	Harmonic Mixer	FS-Z220	2018-03	2021-03
36955	Harmonic Mixer	FS-Z325	2018-02	2021-02
37863	Horn antenna	30240-20 WG30	Verified	
37864	Horn antenna	32240-20 WG32	Verified	
38401	ULTRALOG Antenna	HL562E	2018-05	2021-05

**Table 10**



Product Service

### **3.4 Unwanted emissions**

#### **3.4.1 Specification Reference**

FCC 47 CFR Part 15C. Clause 15.209  
Industry Canada RSS-211

#### **3.4.2 Equipment Under Test and Modification State**

P1. S/N: N/A - Modification State 0  
P3. S/N: N/A - Modification State 0

Radar Mounted to the tank.

#### **3.4.3 Date of Test**

2018-07-30 to 2019-08-06

#### **3.4.4 Test Method**

The test was performed in accordance with  
ANSI C63.10  
RSS-211

#### **3.4.5 Environmental Conditions**

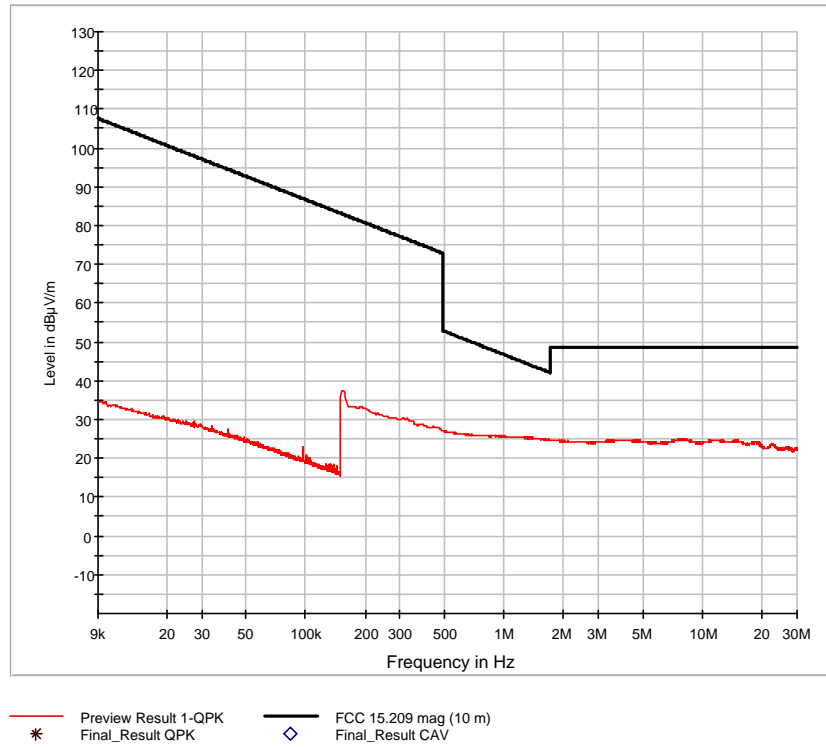
Ambient Temperature	22.0 °C
Relative Humidity	31.0 %

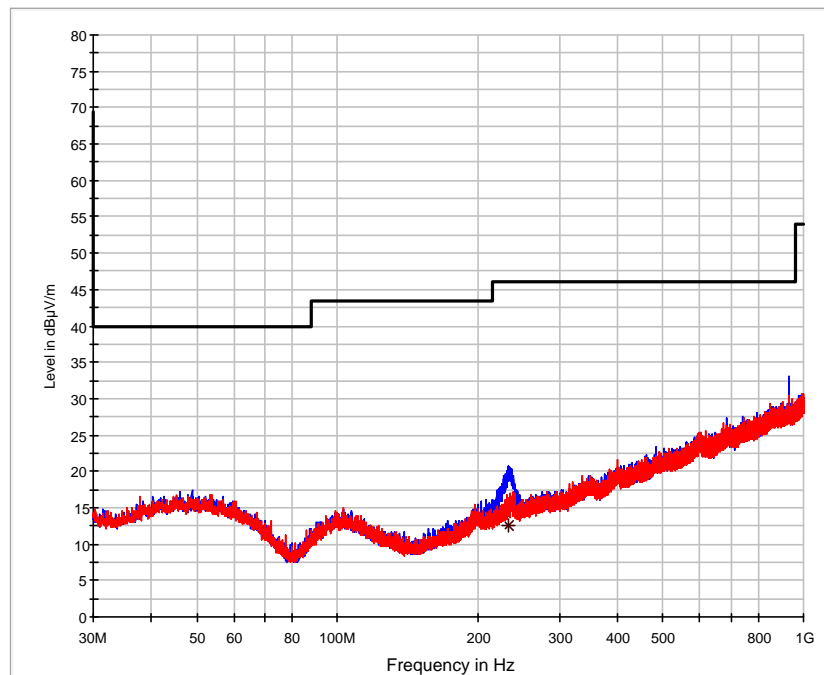


### 3.4.6 Test Results

EUT: P1 in TLPR operation (radar mounted to tank)

Normal operation mode: Measurement with pulsed signal, Radar mounted to the tank

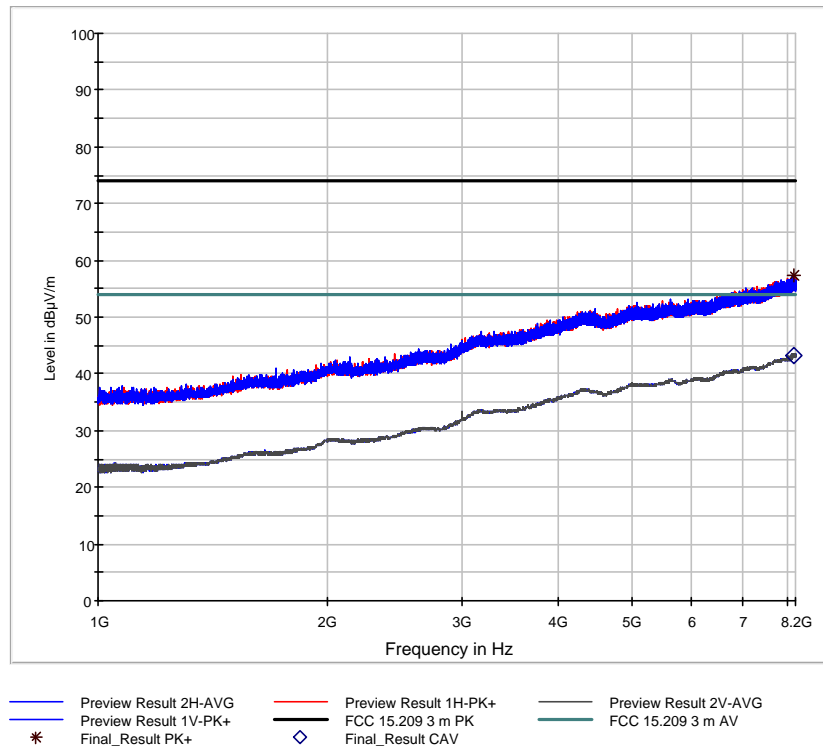




— Preview Result 1V-PK+     — Preview Result 1H-PK+  
— FCC 15.209\_3m     \* Final\_Result QPK

**Final Results:**

Frequency MHz	QuasiPeak dBµV/m	Limit dBµV/m	Margin dB	Meas. Time ms	Bandwidth kHz	Height cm	Pol	Azimuth deg	Corr. dB
232.275000	12.67	46.00	33.33	1000.0	120.000	103.0	V	144.0	13.7



**Final Results:**

Frequency MHz	MaxPeak dBµV/m	CAverage dBµV/m	Limit dBµV/m	Margin dB	Meas. Time ms	Bandwidth kHz	Height cm	Pol	Azimuth deg	Corr. dB
8150.750000	---	43.08	53.98	10.90	1000.0	1000.000	117.0	H	58.0	46.7
8150.750000	57.46	---	73.97	16.51	1000.0	1000.000	117.0	H	58.0	46.7