



Test report No:
NIE: 63330RRF.004

Partial Test Report

USA FCC Part 15.247, 15.209

CANADA RSS-247, RSS-Gen

Radio Frequency Devices. Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz.

Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices.

General Requirements and Information for the Certification of Radio Apparatus.

(*) Identification of item tested	Wireless Charger Primary Side
(*) Trademark	DELTA
(*) Model and /or type reference	WPU 1000W 1AC US
Other identification of the product	HW version: P2.5 SW version: 4.0 FCC ID: Not provided IC: Not provided
(*) Features	Supports 802.15.4 @ 2.4GHz RF transceiver
Applicant	DELTA ENERGY SYSTEMS (GERMANY) GMBH Tscheulinstrasse 21 79331 TENINGEN GERMANY
Test method requested, standard	USA FCC Part 15.247 (10-1-18) Edition: Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz. USA FCC Part 15.209 (10-1-18) Edition: Radiated emission limits; general requirements. CANADA RSS-247 Issue 2 (February 2017). CANADA RSS-Gen Issue 5 (April 2018). Guidance for Performing Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid Systems Devices Operating Under Section 15.247 of the FCC Rules. 558074 D01 Meas Guidance v05r02 dated April 2, 2019. ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices. FCC 15.247 (d) / RSS-247 5.5. Emission limitations radiated (Transmitter)
Approved by (name / position & signature)	Rafael López Martín EMC Consumer & RF Lab. Manager
Date of issue	2020-05-22
Report template No	FDT08_22 (*) "Data provided by the client"

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Competences and guarantees

DEKRA Testing and Certification S.A.U. is a testing laboratory accredited by the National Accreditation Body (ENAC -Entidad Nacional de Acreditación), to perform the tests indicated in the Certificate No. 51/LE 147.

DEKRA Testing and Certification is a FCC-recognized accredited testing laboratory with appropriate scope of accreditation that include testing performed in this test report.

DEKRA Testing and Certification is an ISED-recognized accredited testing laboratory with appropriate scope of accreditation that include testing performed in this test report.

In order to assure the traceability to other national and international laboratories, DEKRA Testing and Certification S.A.U. has a calibration and maintenance program for its measurement equipment.

DEKRA Testing and Certification S.A.U. guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at DEKRA Testing and Certification S.A.U. at the time of performance of the test.

DEKRA Testing and Certification S.A.U. is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

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General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA Testing and Certification S.A.U.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Testing and Certification S.A.U. and the Accreditation Bodies.

Uncertainty

Uncertainty (factor $k=2$) was calculated according to the DEKRA Testing and Certification S.A.U. internal document PODT000.

Data provided by the client

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item tested", "Trademark", "Model and/or type reference tested").
2. The sample of the model DELTA WPU 1000W 1AC US is the Primary side of an Automotive Wireless Charger (load transmitter) feeded by Mains Supply. Primary side includes Wall-Box and Base-Pad, and a cable between them. Normally primary side is installed on the infrastructure, such as wall or ground.

DEKRA Testing and Certification S.A.U. declines any responsibility with respect to the information provided by the client and that may affect the validity of result.

Usage of samples

Samples undergoing test have been selected by: The client.

- Sample S/01 is composed of the following elements:

Control N°	Description	Model	Serial N°	Reception
63330/019	Wireless Charger	WPU 1000W 1AC US	--	2020/01/20
63330/018	Power Supply	EOE14010738	E140107381943000405P2.5	2020/01/20

Auxiliary elements used with the Sample S/01:

Control N°	Description	Model	Serial N°	Reception
63330/001	Wooden test rack	--	--	2020/01/20

Sample S/01 has undergone the test(s): All the 24 Vdc Radiated tests indicated in Appendix A.

- Sample S/02 is composed of the following elements:

Control N°	Description	Model	Serial N°	Reception
63330/005	Wireless Charger	WPU 1000W 1AC US	--	2020/01/20
63330/003	Power Supply	EOE14010738	E140107381943000379P2.5	2020/01/20

Auxiliary elements used with the Sample S/02:

Control N°	Description	Model	Serial N°	Reception
63330/001	Wooden test rack	--	--	2020/01/20

Sample S/02 has undergone the test(s): All the 48 Vdc Radiated tests indicated in Appendix A.

Test sample description

Ports..... :	Port name and description	Cable					
		Specified max length [m]	Attached during test	Shielded	Coupled to patient ⁽³⁾		
	AC input.	1m	☒	☐	☐		
	Power output.	0.5m	☒	☐	☐		
	Signal interface for CAN-Bus.	0.5m	☒	☐	☐		
	Signal inputs for Ext_Enable function and Sleep mode function.	0.5m	☒	☐	☐		
Temperature sensor	0.5m	☒	☐	☐			
Supplementary information to the ports..... :	Not provided.						
Rated power supply	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	☒	AC: 100...240V	☒	☐	☐	☒	☒
Rated Power	1000W						
Clock frequencies.....	160...300kHz, 2.4GHz bands.						
Other parameters	Not provided.						
Software version	4.0						
Hardware version	P2.5						
Dimensions in cm (W x H x D)	Primary side: 28 * 19.2 * 6 + 16 (diameter) * 1.9						
Mounting position	☒	Wall/Ceiling mounted equipment					
	☒	Other: Primary side can be mounted vertically on the wall, or horizontally on the ground/ceiling, correspondingly, the secondary side can be mounted vertically on the side of a vehicle, or horizontally on the bottom/top of a vehicle.					
Modules/parts..... :	Module/parts of test item	Type		Manufacturer			
	Primary side.	WPU 1000W 1AC US		DELTA ENERGY SYSTEMS (GERMANY) GMBH			
Accessories (not part of the test item)	Description	Type		Manufacturer			
	Not provided.						
Documents as provided by the applicant..... :	Description	File name		Issue date			
	User manual.	1kW Wireless Charger User Manual P2.3 RevD.2 22_Jan_2020		Jan 22 nd , 2020			

⁽³⁾ Only applicable to medical equipments.

Identification of the client

DELTA ENERGY SYSTEMS (GERMANY) GMBH
Tscheulinstrasse 21, 79331 TENINGEN, GERMANY

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2020-02-25
Date (finish)	2020-03-09

Document history

Report number	Date	Description
63330RRF.004	2020-05-22	First release

Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

In the semianechoic chamber, the following limits were not exceeded during the test.

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

Remarks and comments

The tests have been performed by the technical personnel: José Manuel Jiménez, Nicolás Salguero, Cristina Calle, Alfonso Gutiérrez.

Used instrumentation:

Radiated Measurements:

		Last Calibration	Due Calibration
1.	Semianechoic Absorber Lined Chamber ETS LINDGREN FACT 3 200 STP	N.A.	N.A.
2.	Biconical/Log Antenna 30 MHz - 6 GHz ETS LINDGREN 3142E	2017/04	2020/04
3.	Pre-Amplifier G>40dB 10MHz-6GHz, BONN ELEKTRONIK, BLNA 0160-01N	2020/02	2021/02
4.	EMI Test Receiver 7 GHz ROHDE AND SCHWARZ ESR7	2019/10	2021/10
5.	Low Pass Filter DC - 1 GHz WAINWRIGHT INSTRUMENTS WLK1000-6SS	2018/06	2020/06
6.	Horn antenna 1-18 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9120 D	2019/11	2022/11
7.	Broadband Horn antenna 18 - 40 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9170	2018/07	2021/07
8.	RF Pre-amplifier, 40 dB ,1-18 GHz BONN ELEKTRONIK BLMA 0118-1M	2019/04	2020/04
9.	Low Noise Amplifier G>30dB, 18 - 40 GHz BONN ELEKTRONIK BLMA 1840-1M	2019/02	2021/02
10.	Signal and Spectrum Analyzer ROHDE AND SCHWARZ FSV40	2019/09	2021/09
11.	Multi-device Controller EMCO 2090	N.A.	N.A.
12.	Field Probe Positioner MATURO FPP 2.3-M	N.A.	N.A.
13.	Shielded Room ETS LINDGREN S101	N.A.	N.A.
14.	High Pass Filter 3 - 18 GHz TEMSTRON /TEMWELL ST-3GA2833-HS	2019/10	2020/10
15.	High Pass Filter 18-40 GHz TEMSTRON /TEMWELL ST-18G-40G-798S	N.A.	N.A.

Testing verdicts

Not applicable:	N/A
Pass:	P
Fail:	F
Not measured:	N/M

Summary

1. 802.15.4 - 2.4 GHz.

FCC PART 15 PARAGRAPH / RSS-247			
Requirement – Test case		Verdict	Remark
FCC 15.247 (a)(1) / RSS-247 5.1. (b)	20 dB Bandwidth and Carrier frequency separation	N/M	
FCC 15.247 (a)(1)(iii) / RSS-247 5.1. (d)	Number of hopping channels	N/M	
FCC 15.247 (a)(1)(iii) / RSS-247 5.1. (d)	Time of occupancy (Dwell Time)	N/M	
FCC 15.247 (b) / RSS-247 5.4. (b)	Maximum peak output power and antenna gain	N/M	
FCC 15.247 (d) / RSS-247 5.5.	Band-edge emissions compliance (Transmitter)	N/M	
FCC 15.247 (d) / RSS-247 5.5.	Emission limitations radiated (Transmitter)	P	(1)
Supplementary information and remarks:			
(1) Only test requested.			

Appendix A: Test results. 802.15.4 - 2.4 GHz

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TEST CONDITIONS

POWER SUPPLY (V):

Vn:	100~240 V
Type of Power Supply:	Mains Supply.

ANTENNA:

Maximum Declared Antenna Gain:	+2.09 dBi
Type of Antenna:	Integral.

TEST FREQUENCIES:

Low Channel:	2405 MHz
Middle Channel:	2445 MHz
High Channel:	2480 MHz

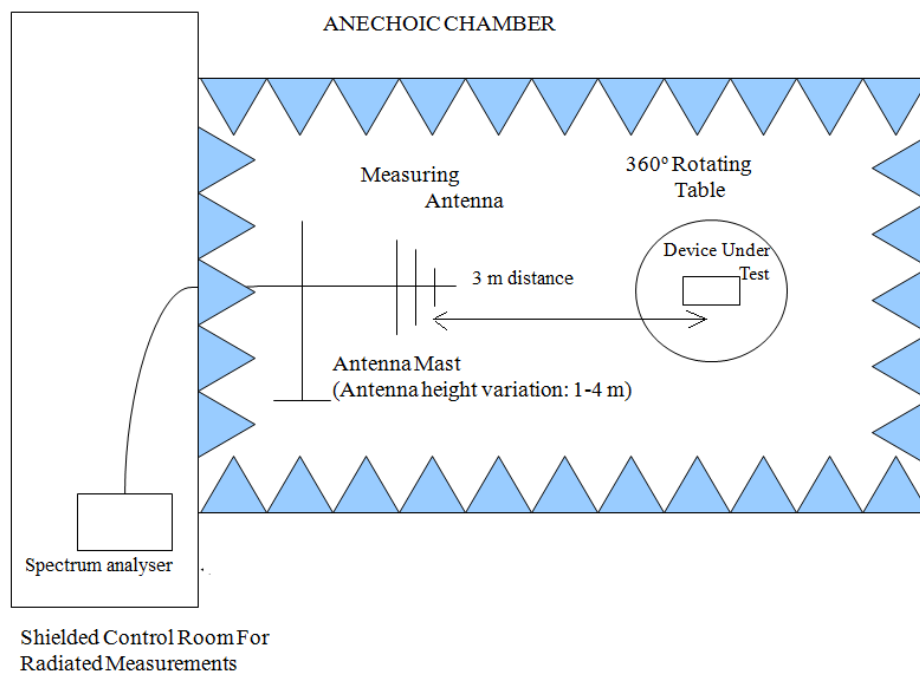
RADIATED MEASUREMENTS:

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m for the frequency range 30 MHz-1000 MHz (30 MHz-1000 MHz Bilog antenna) and at a distance of 3 m for the frequency range 1 GHz-18 GHz (1 GHz-18 GHz Double ridge horn antenna) and at a distance of 1 m for the frequency range 18 GHz-40 GHz horn antenna).

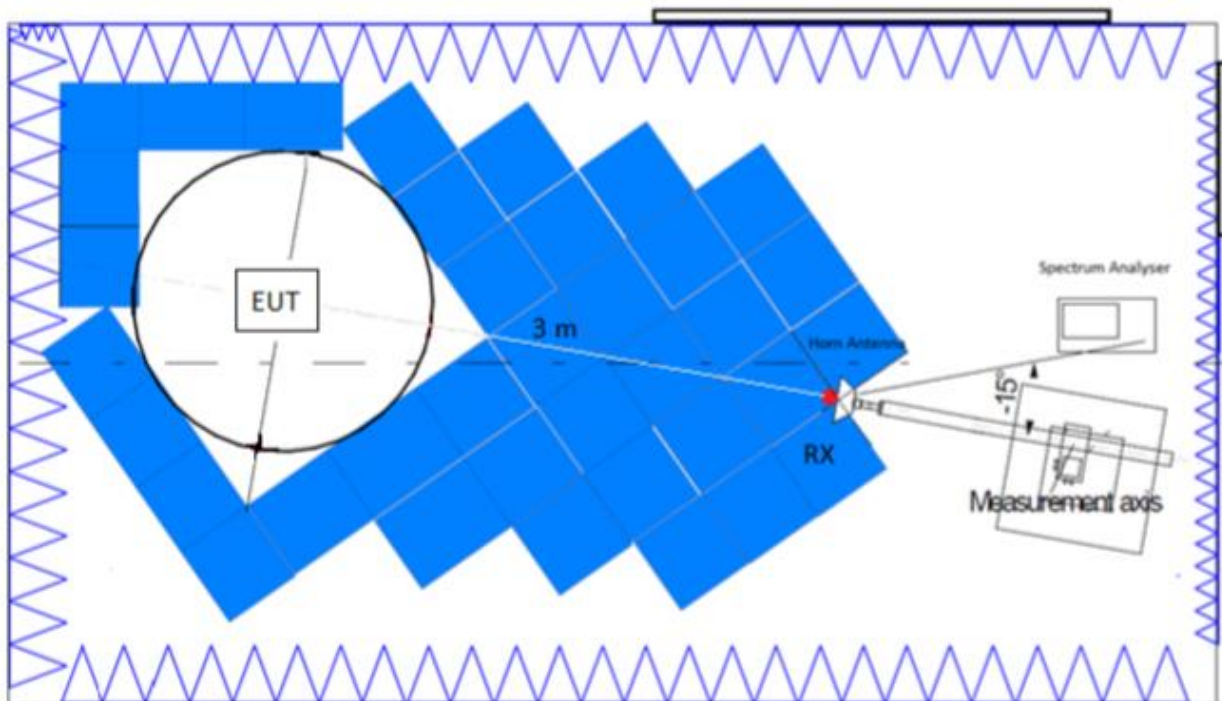
The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

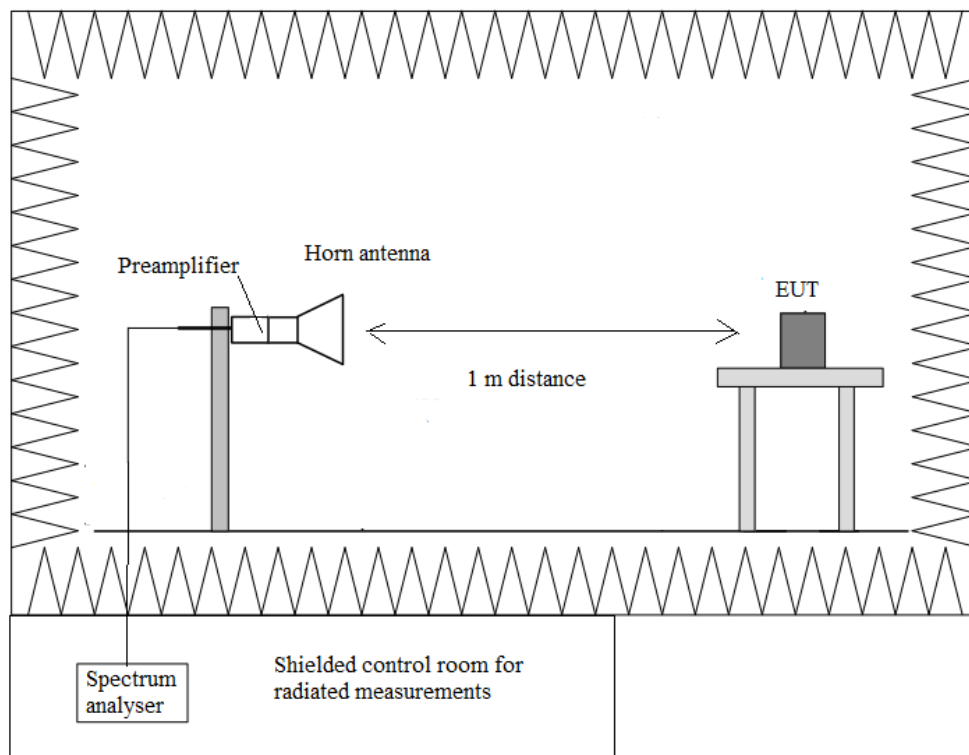
Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup from 1 GHz to 18 GHz:



Radiated measurements setup from 18 GHz to 40 GHz:



FCC 15.247 (d) / RSS-247 5.5. Emission limitations radiated. (Transmitter)

SPECIFICATION:

Radiated emissions which fall in the restricted bands. as defined in §15.205(a). must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)/RSS-Gen):

Frequency Range (MHz)	Field strength ($\mu\text{V/m}$)	Field strength ($\text{dB}\mu\text{V/m}$)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	30
1.705 - 30.0	30	-	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
960 - 25000	500	54	3

The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz. 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

For average radiated emission measurements above 1000 MHz. there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

RSS-247. Attenuation below the general field strength limits specified in RSS-Gen is not required.

RESULTS:

The situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

All tests were performed in a semi-anechoic chamber at a distance of 3 m for the frequency range 30 MHz-18GHz and at distance of 1m for the frequency range 18 GHz-26 GHz.

The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor. cable loss and pre-amplifiers gain.

• **24 Vdc:**

Frequency range 30 MHz - 1 GHz:

The spurious frequencies detected do not depend neither on the operating channel.

Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (MHz)	Emission Level (dBμV/m)	Polarization	Detector	Measurement Uncertainty (dB)
288.036	28.9	H	Quasi peak	<± 3.81

Verdict: PASS

Frequency range 1 - 26 GHz:

The results in the next tables show the maximum measured levels in the 1-26 GHz range including the restricted bands 2.31-2.39 GHz and 2.4835-2.5 GHz.

Spurious frequencies with peak levels above the average limit (54 dBμV/m at 3 m) are measured with average detector for checking compliance with the average limit.

- LOW CHANNEL. Spurious frequencies detected below the limit:

Spurious frequency (GHz)	Emission Level (dBμV/m)	Polarization	Detector	Measurement Uncertainty (dB)
1.06250	37.08	V	Peak	<± 4.70
2.34580	41.84	H	Peak	<± 4.70
2.36431	41.46	H	Peak	<± 4.70
2.38353	46.04	H	Peak	<± 4.70
2.38606	47.15	H	Peak	<± 4.70
4.80997	42.86	H	Peak	<± 4.70
7.21890	43.84	V	Peak	<± 4.70

- MIDDLE CHANNEL. Spurious frequencies detected below the limit:

Spurious frequency (GHz)	Emission Level (dBμV/m)	Polarization	Detector	Measurement Uncertainty (dB)
2.37624	43.23	V	Peak	<± 4.70
2.48569	45.63	H	Peak	<± 4.70
4.88977	40.77	H	Peak	<± 4.70
5.00970	34.49	H	Peak	<± 4.70
7.33790	42.06	V	Peak	<± 4.70

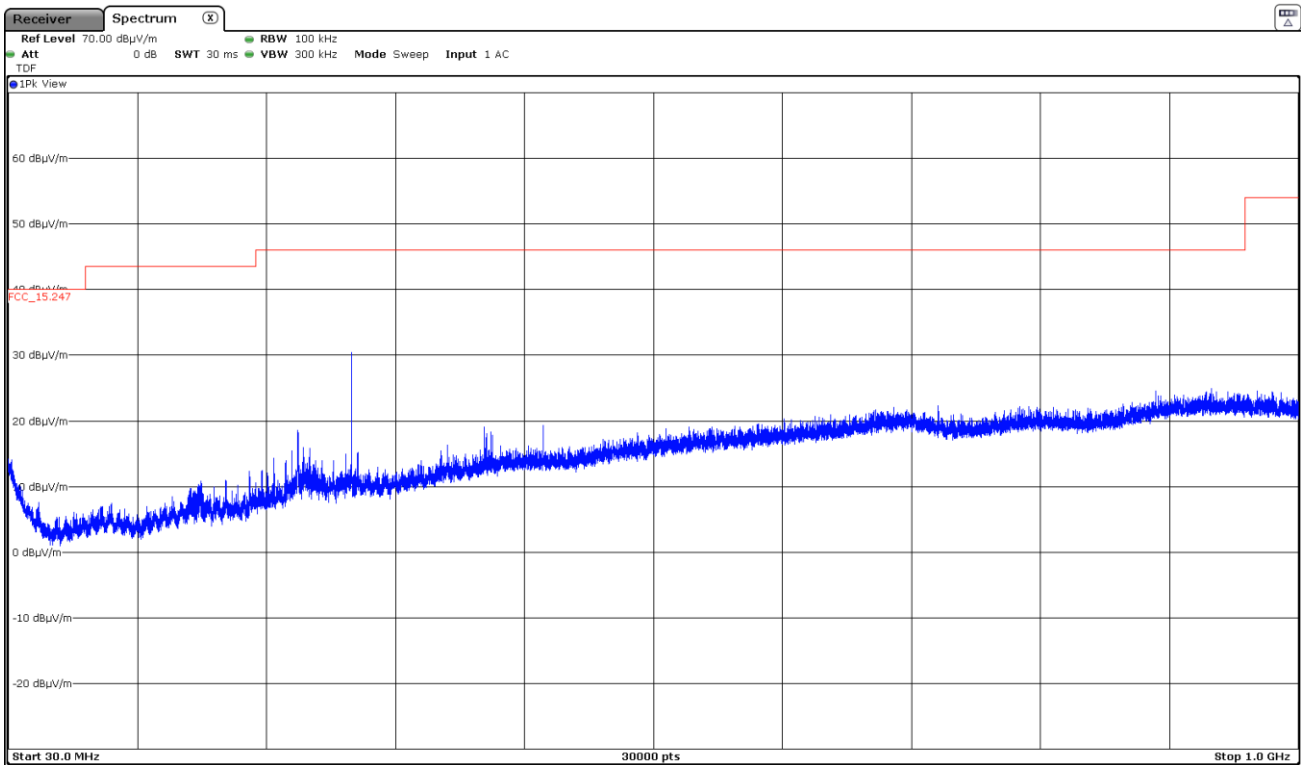
- HIGH CHANNEL. Spurious frequencies detected below the limit:

Spurious frequency (GHz)	Emission Level (dBµV/m)	Polarization	Detector	Measurement Uncertainty (dB)
1.06217	37.11	V	Peak	<± 4.70
1.27993	36.44	V	Peak	<± 4.70
2.32625	41.74	H	Peak	<± 4.70
2.32498	43.08	H	Peak	<± 4.70
2.48568	59.12	H	Peak	<± 4.70
	53.81		Average	<± 4.70
4.96023	38.08	H	Peak	<± 4.70
5.10023	34.77	V	Peak	<± 4.70
7.43963	40.62	V	Peak	<± 4.70

Verdict: PASS

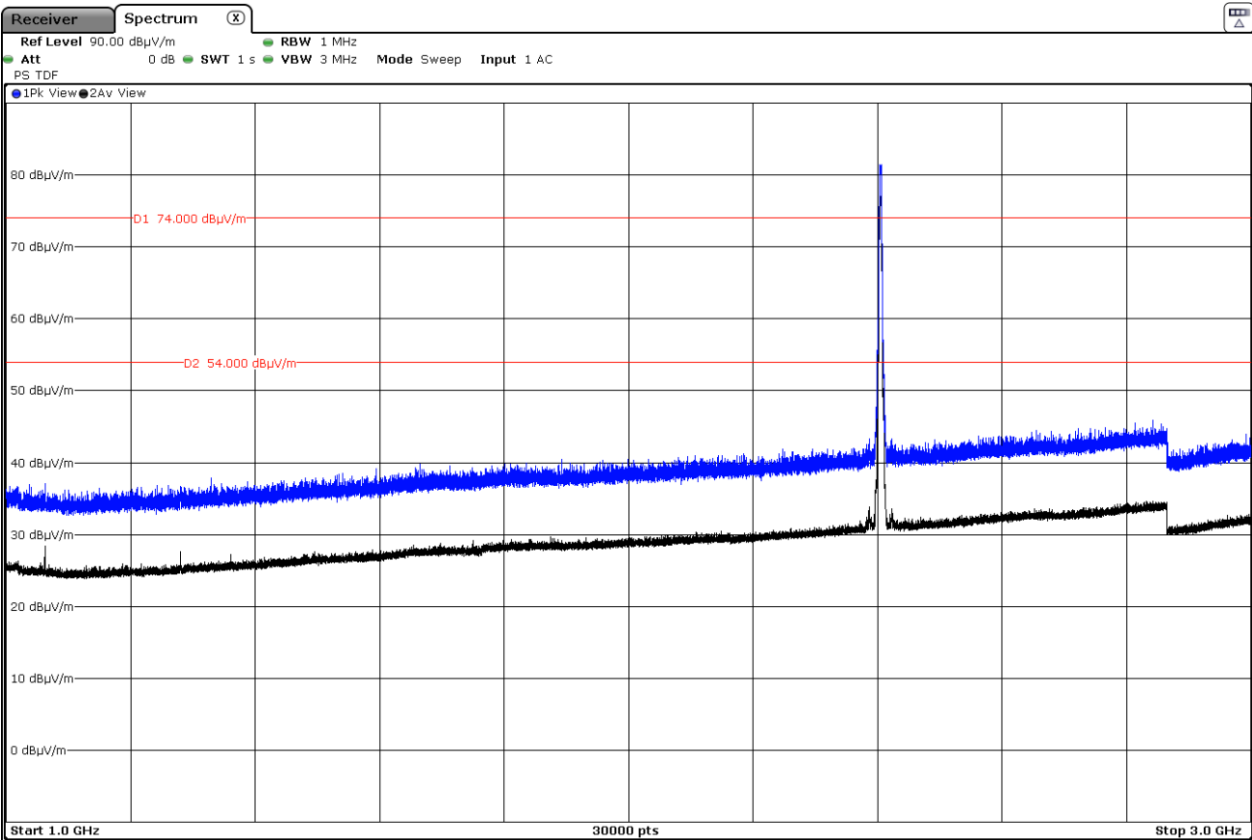
FREQUENCY RANGE 30 MHz - 1 GHz

The spurious frequencies do not depend on the operating channel.



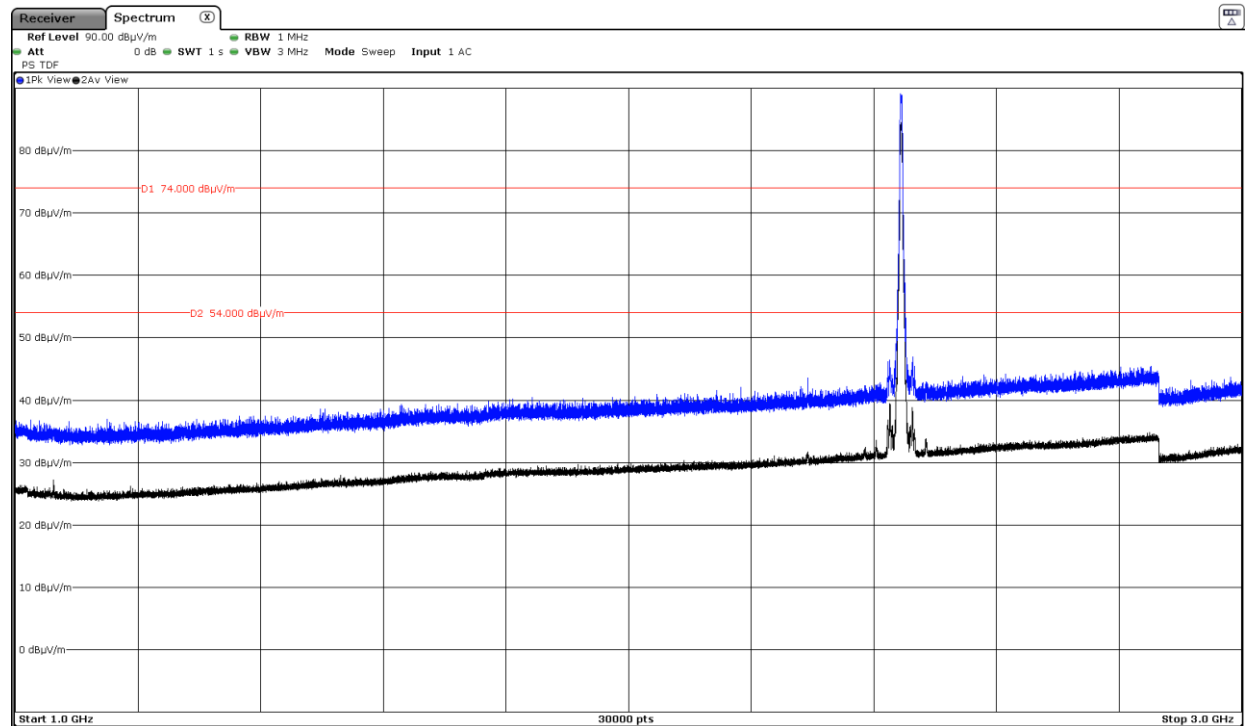
FREQUENCY RANGE 1 - 3 GHz

- Low Channel:



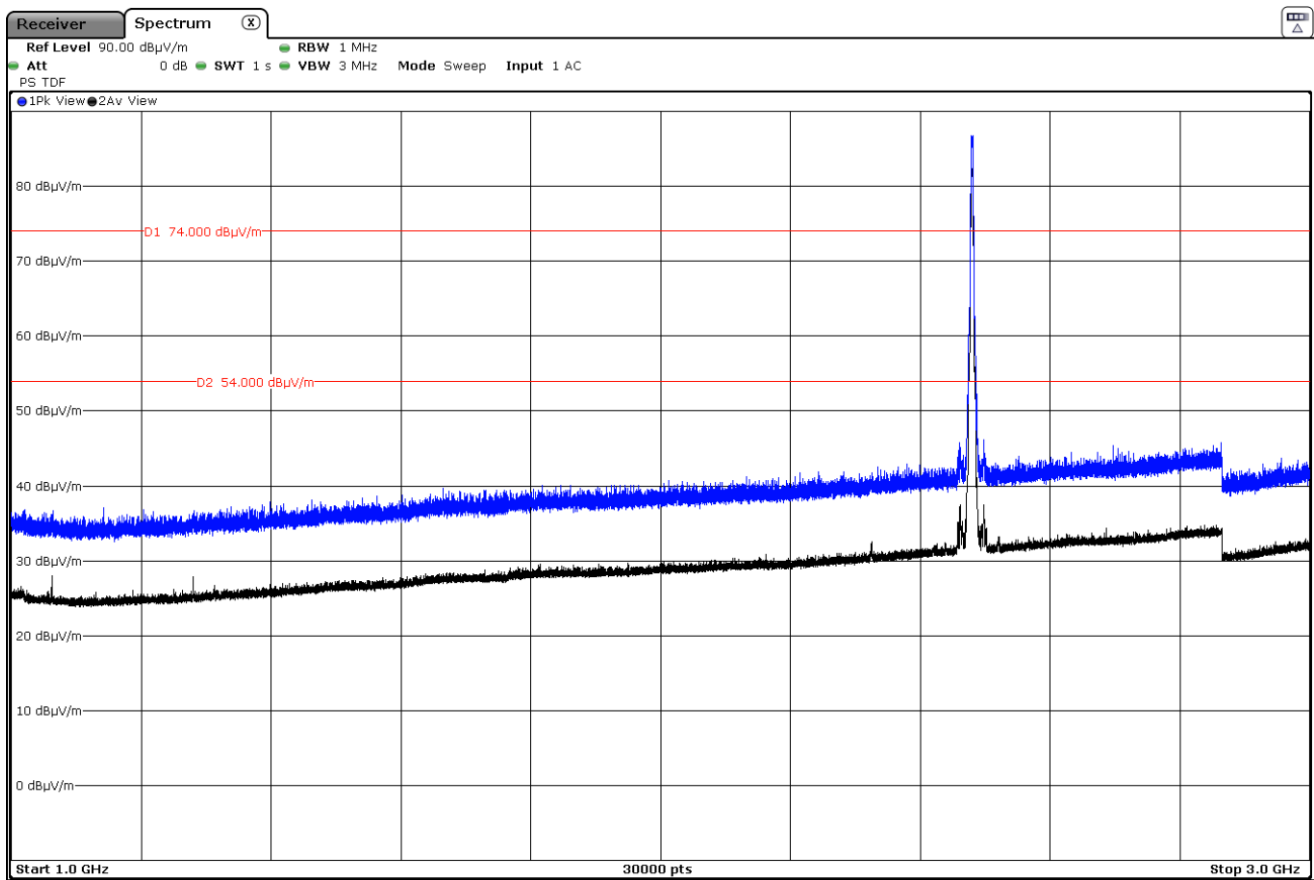
The peak above the limit is the carrier frequency.

- Middle Channel:



The peak above the limit is the carrier frequency.

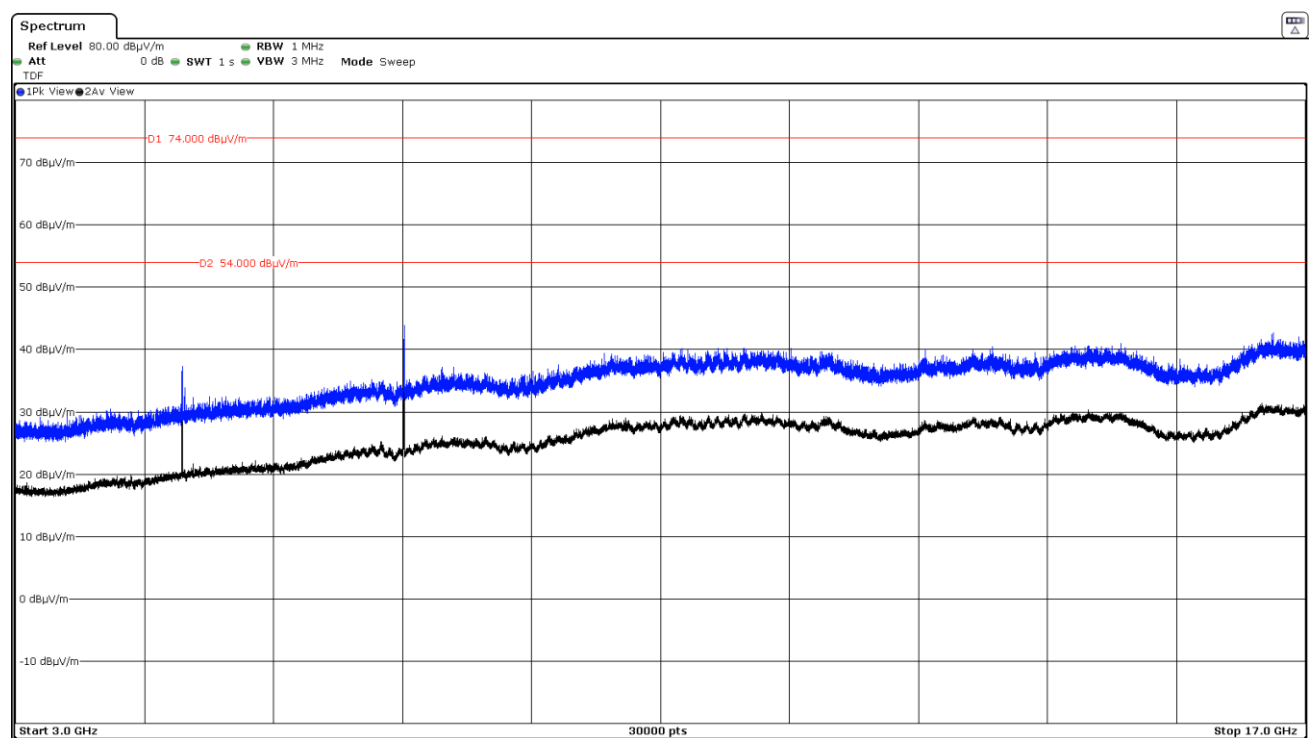
- High Channel:



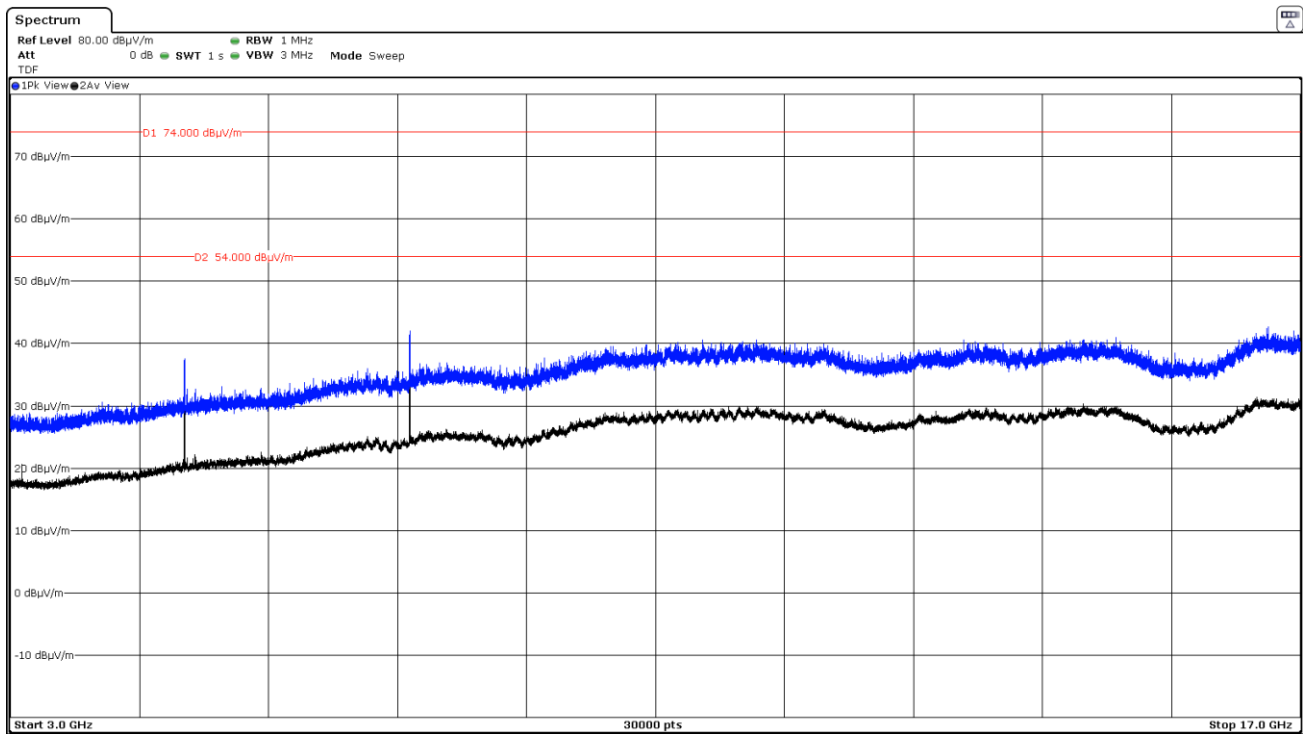
The peak above the limit is the carrier frequency.

FREQUENCY RANGE 3 - 17 GHz

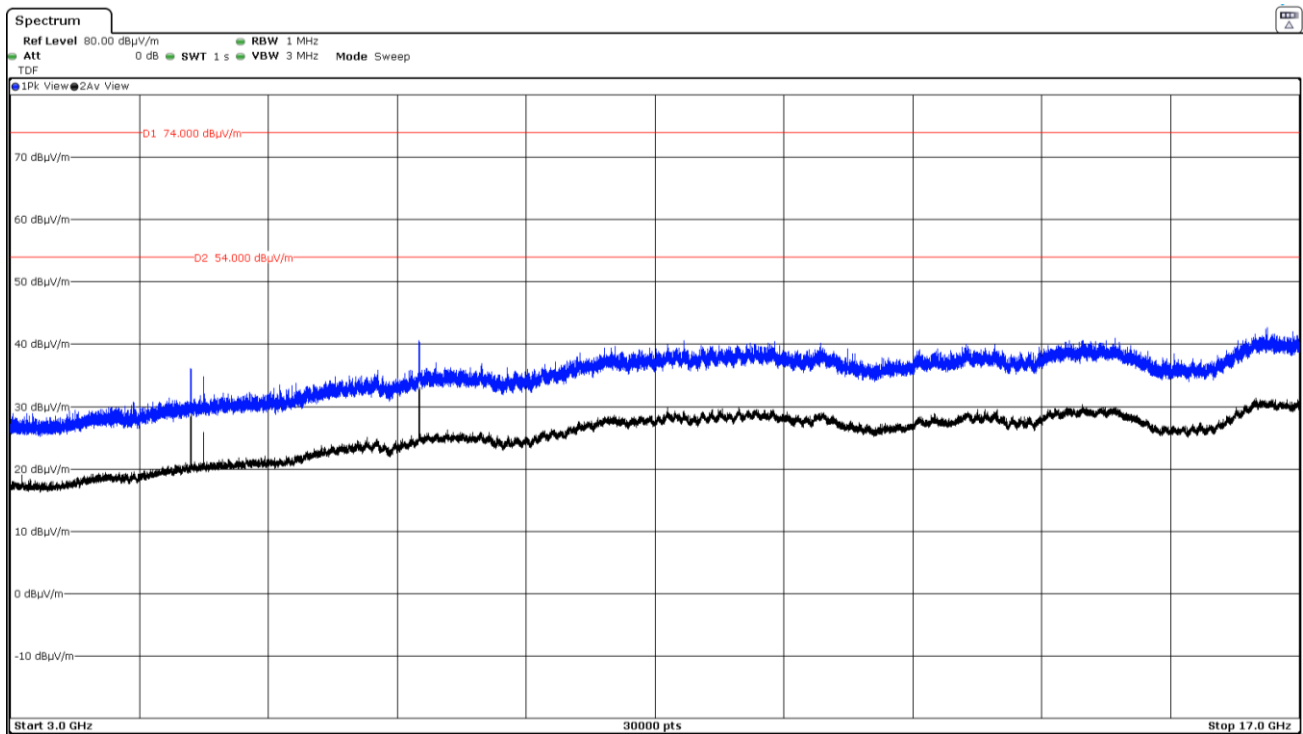
- Low Channel:



- Middle Channel:

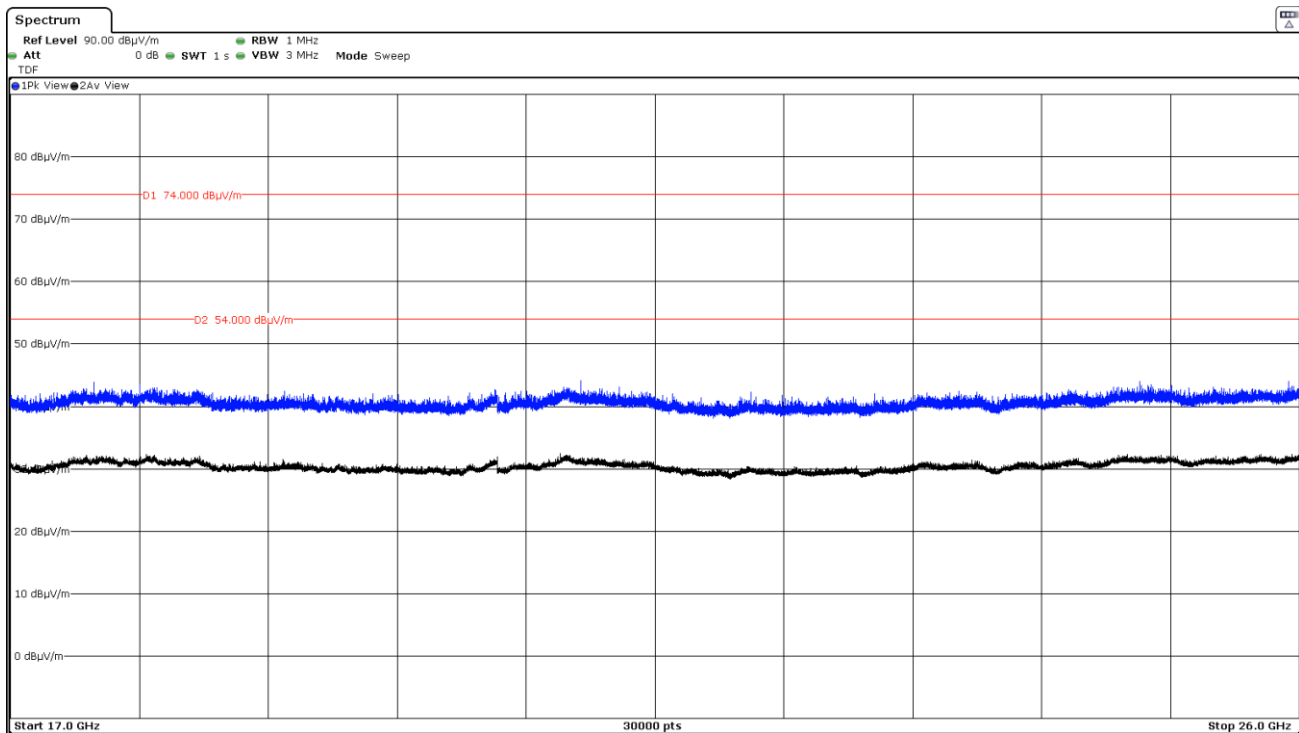


- High Channel:



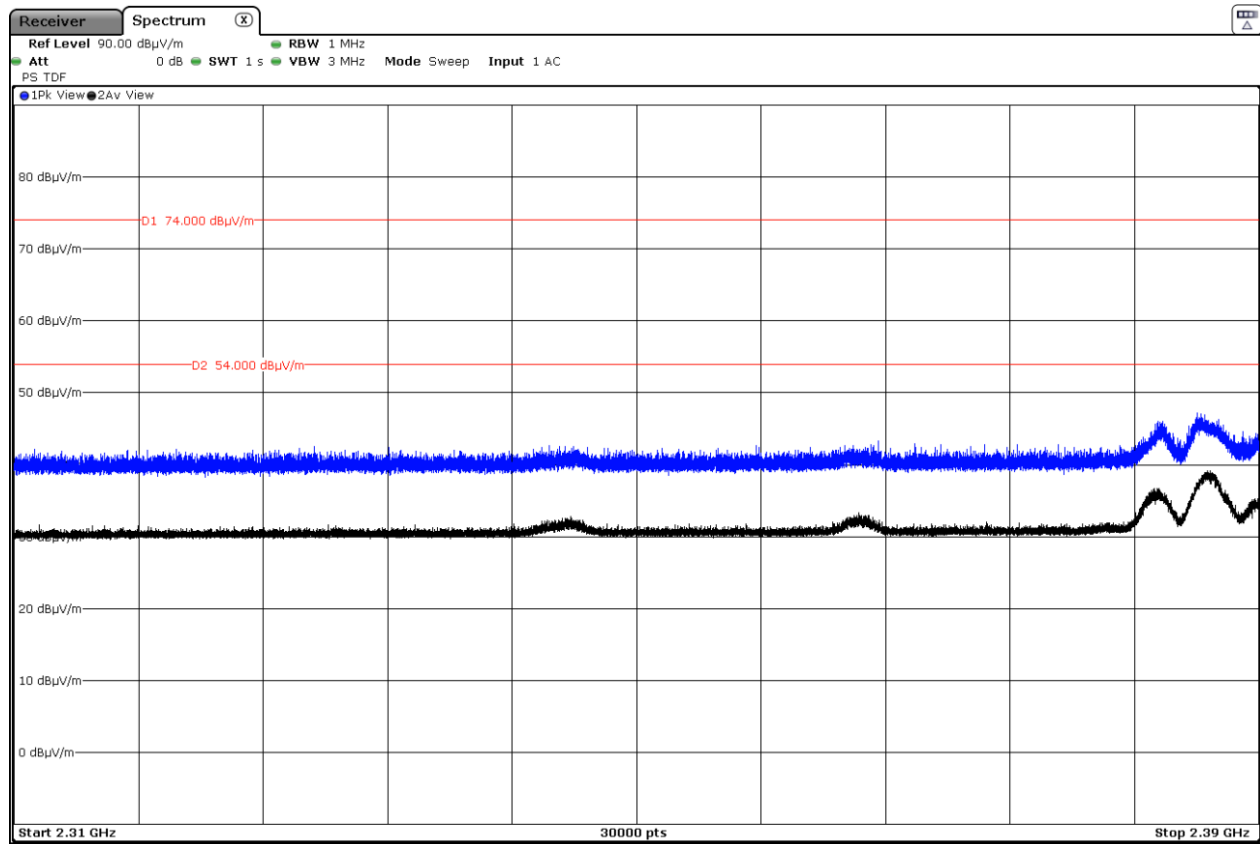
FREQUENCY RANGE 17 - 26 GHz

The spurious frequencies do not depend on the operating channel.

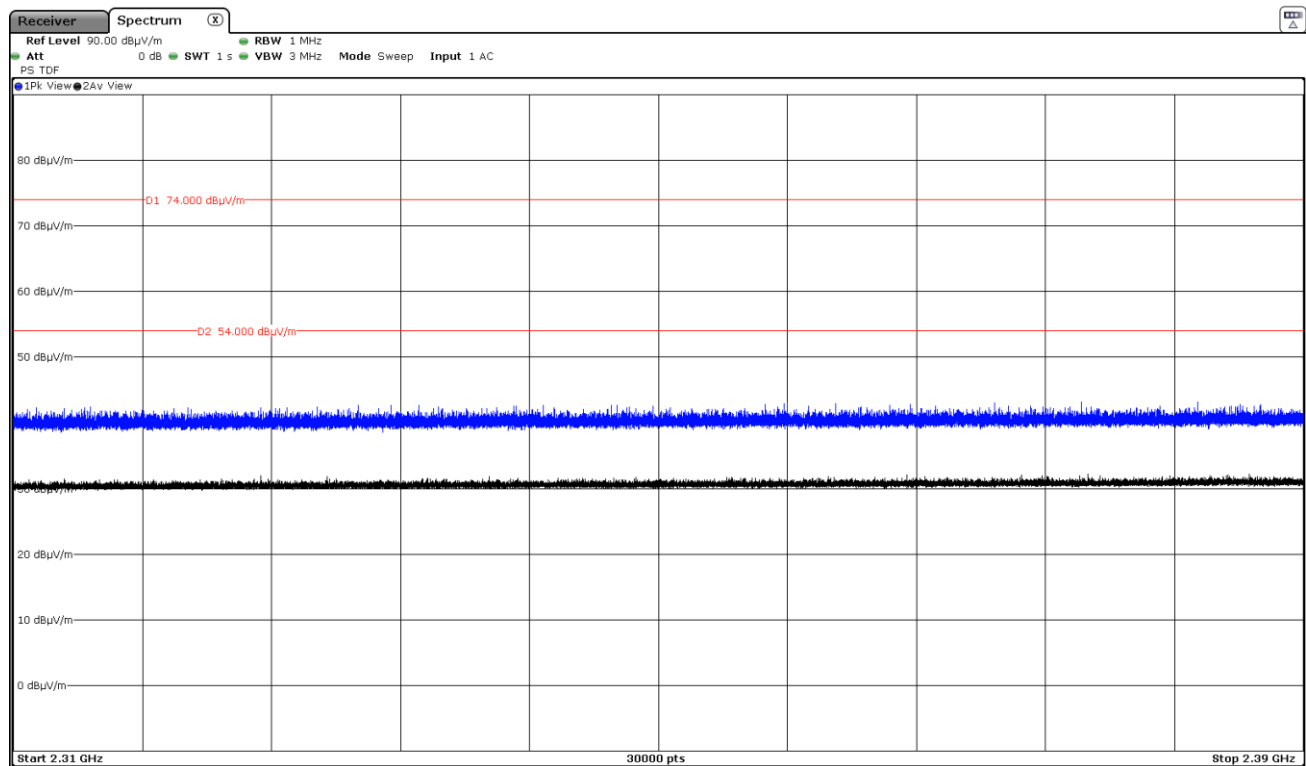


FREQUENCY RANGE 2.31 - 2.39 GHz

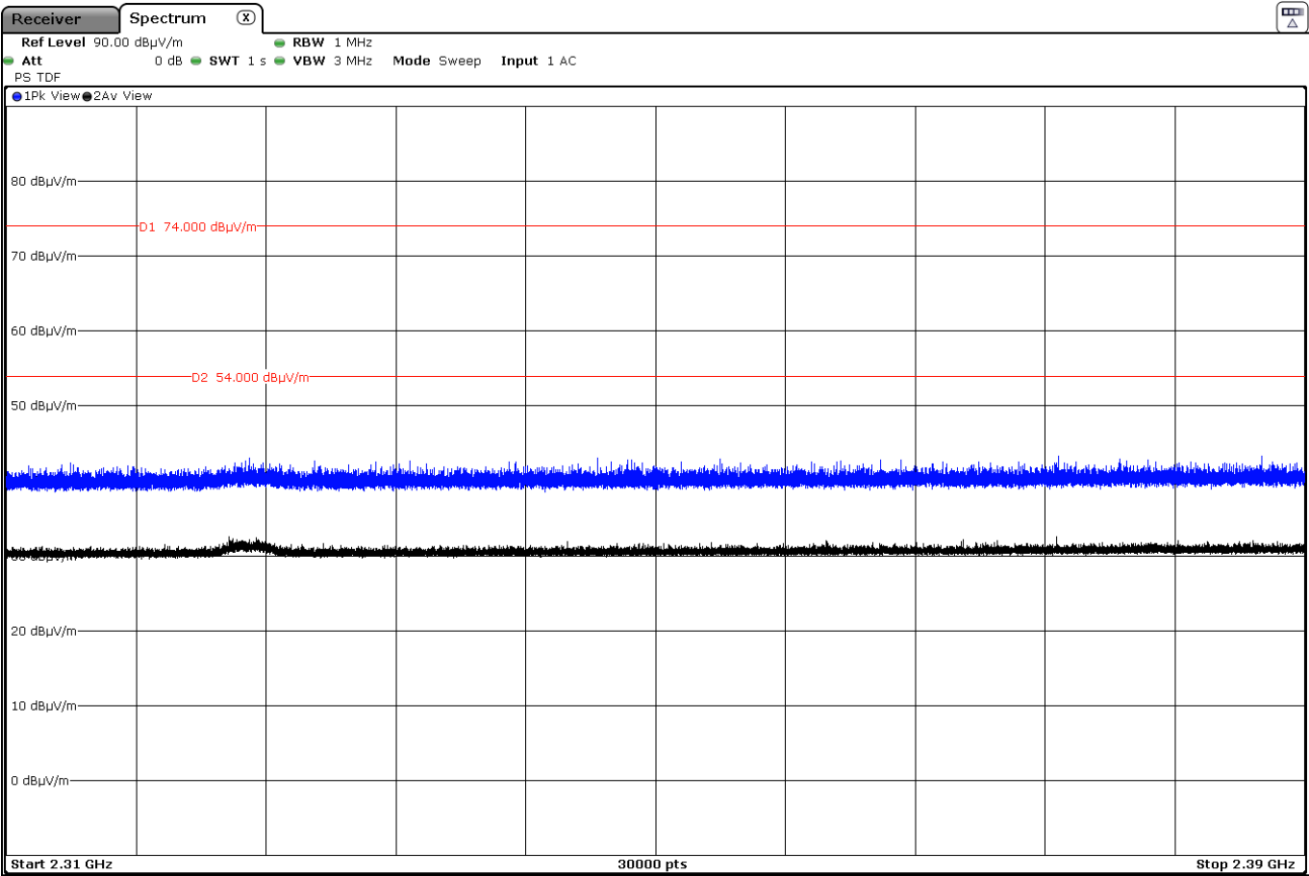
- Low Channel:



- Middle Channel:

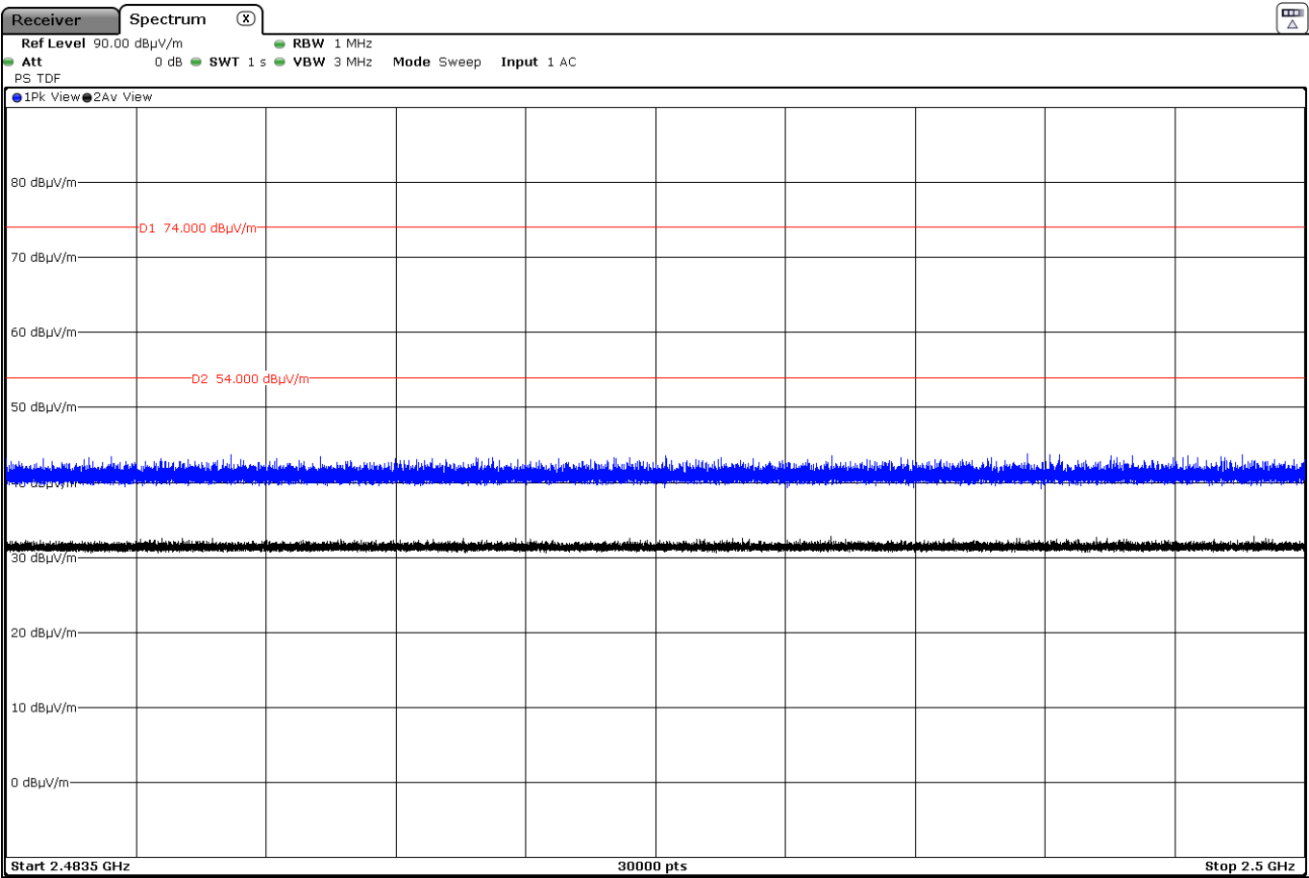


- High Channel:

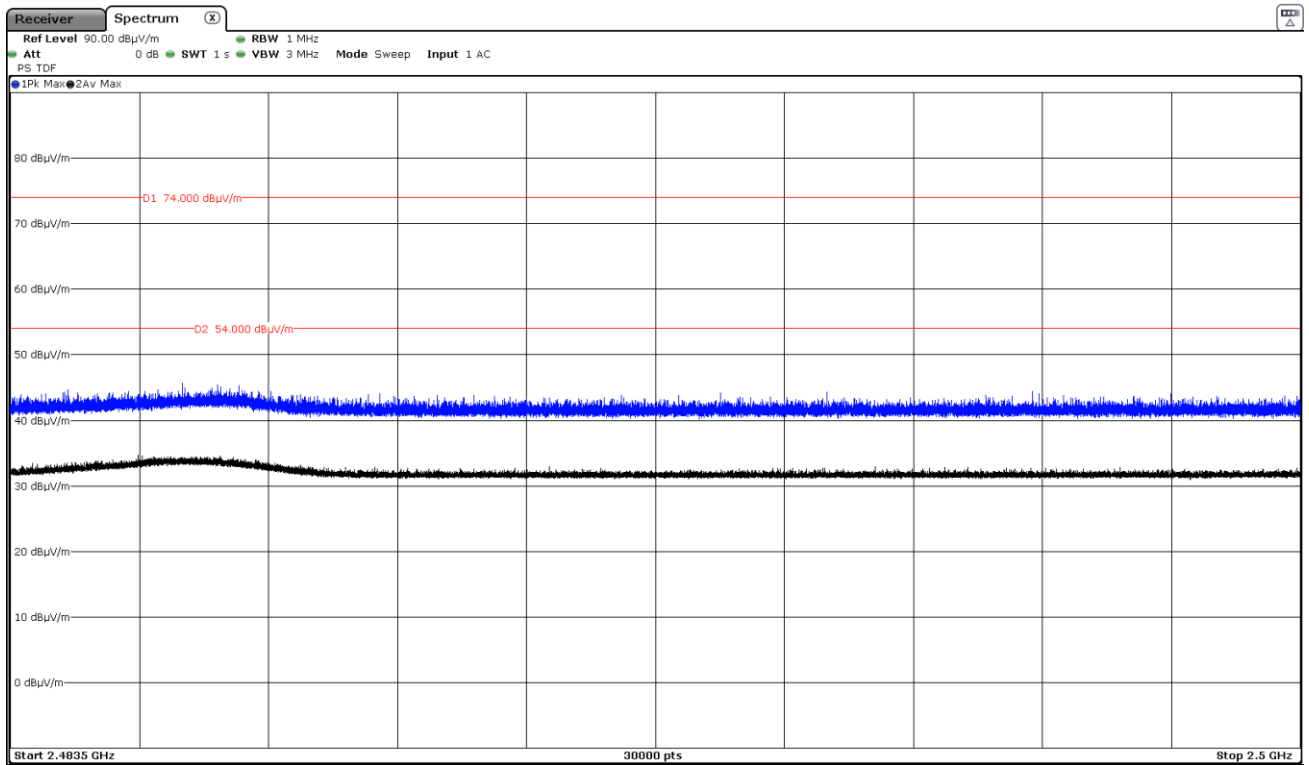


FREQUENCY RANGE 2.4835 - 2.5 GHz

- Low Channel:



- Middle Channel:

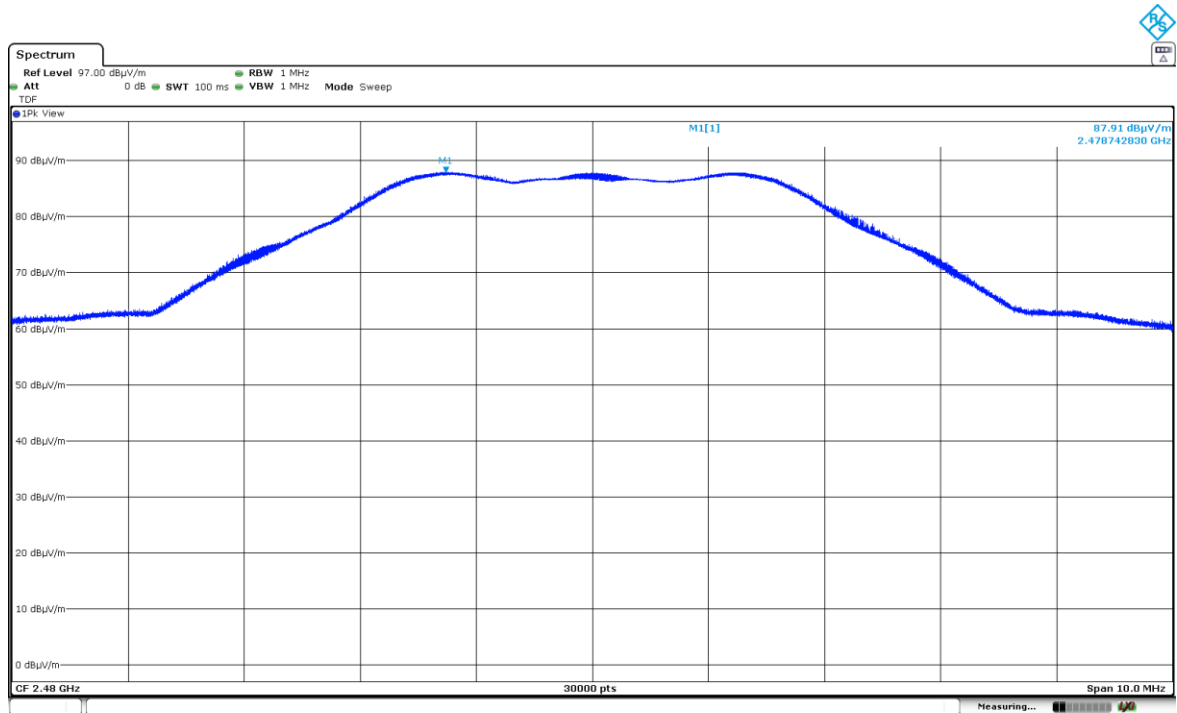


- High Channel:

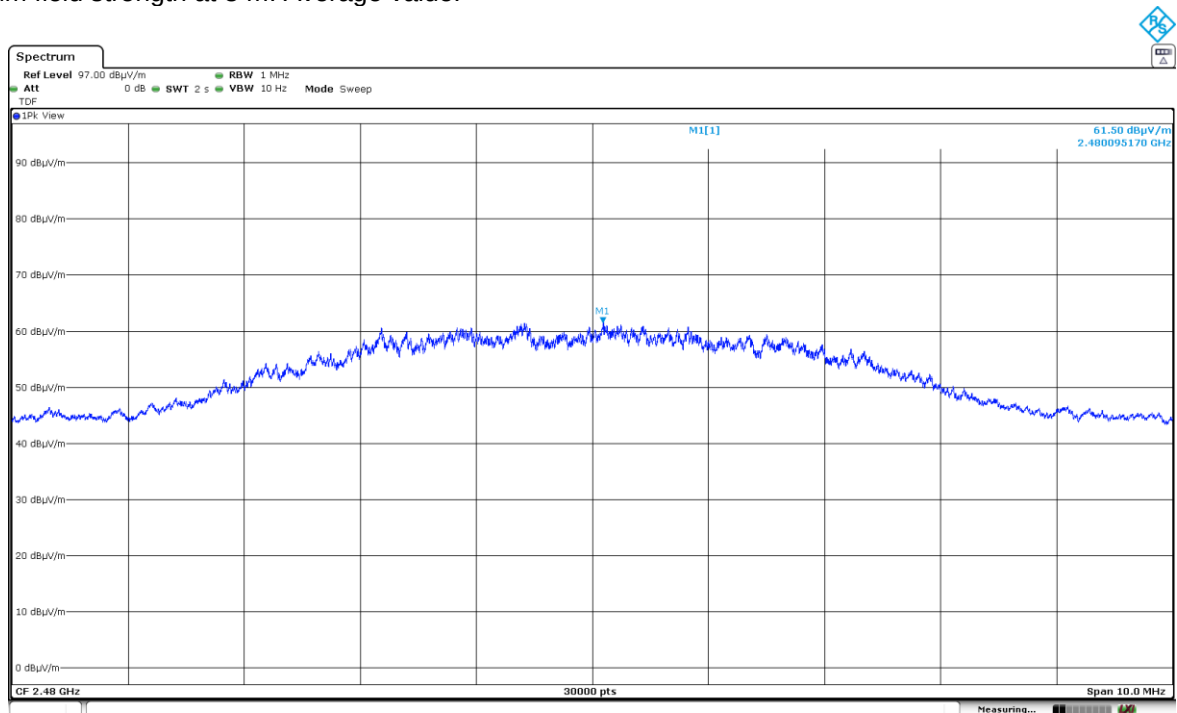
Delta Marker Method

- Maximum peak and average field strength of fundamental emission at 3 m distance

Maximum field strength at 3 m. Peak value:



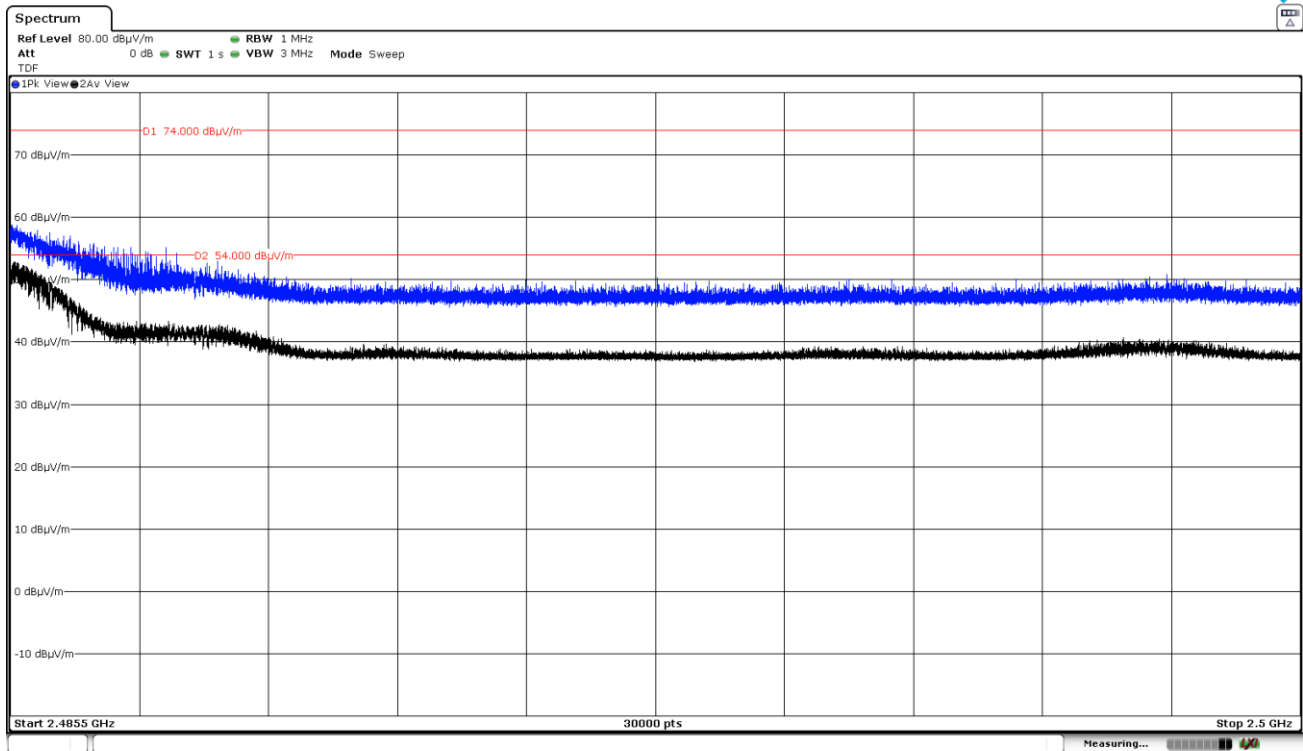
Maximum field strength at 3 m. Average value:





Fundamental max. Peak value 3 m	Delta value	Calculated value 3 m	Limit
87.91 dBμV/m	26.40 dB	61.51 dBμV/m	74 dBμV/m

- Restricted band



• **48 Vdc:**

Frequency range 30 MHz - 1 GHz:

The spurious frequencies detected do not depend neither on the operating channel or the modulation mode.

No spurious frequencies detected at less than 20 dB below the limit.

Measurement Uncertainty (dB): $<\pm 3.81$

Verdict: PASS

Frequency range 1 - 26 GHz:

The results in the next tables show the maximum measured levels in the 1-26 GHz range including the restricted bands 2.31-2.39 GHz and 2.4835-2.5 GHz.

Spurious frequencies with peak levels above the average limit (54 dB μ V/m at 3 m) are measured with average detector for checking compliance with the average limit.

- LOW CHANNEL. Spurious frequencies detected below the limit:

Spurious frequency (GHz)	Emission Level (dB μ V/m)	Polarization	Detector	Measurement Uncertainty (dB)
2.38618	49.8	H	Peak	$<\pm 4.70$
4.80997	46.97	H	Peak	$<\pm 4.70$
4.89863	36.5	H	Peak	$<\pm 4.70$
7.21890	42.83	V	Peak	$<\pm 4.70$

- MIDDLE CHANNEL. Spurious frequencies detected below the limit:

Spurious frequency (GHz)	Emission Level (dB μ V/m)	Polarization	Detector	Measurement Uncertainty (dB)
4.88977	44.47	H	Peak	$<\pm 4.70$
7.33883	40.85	V	Peak	$<\pm 4.70$

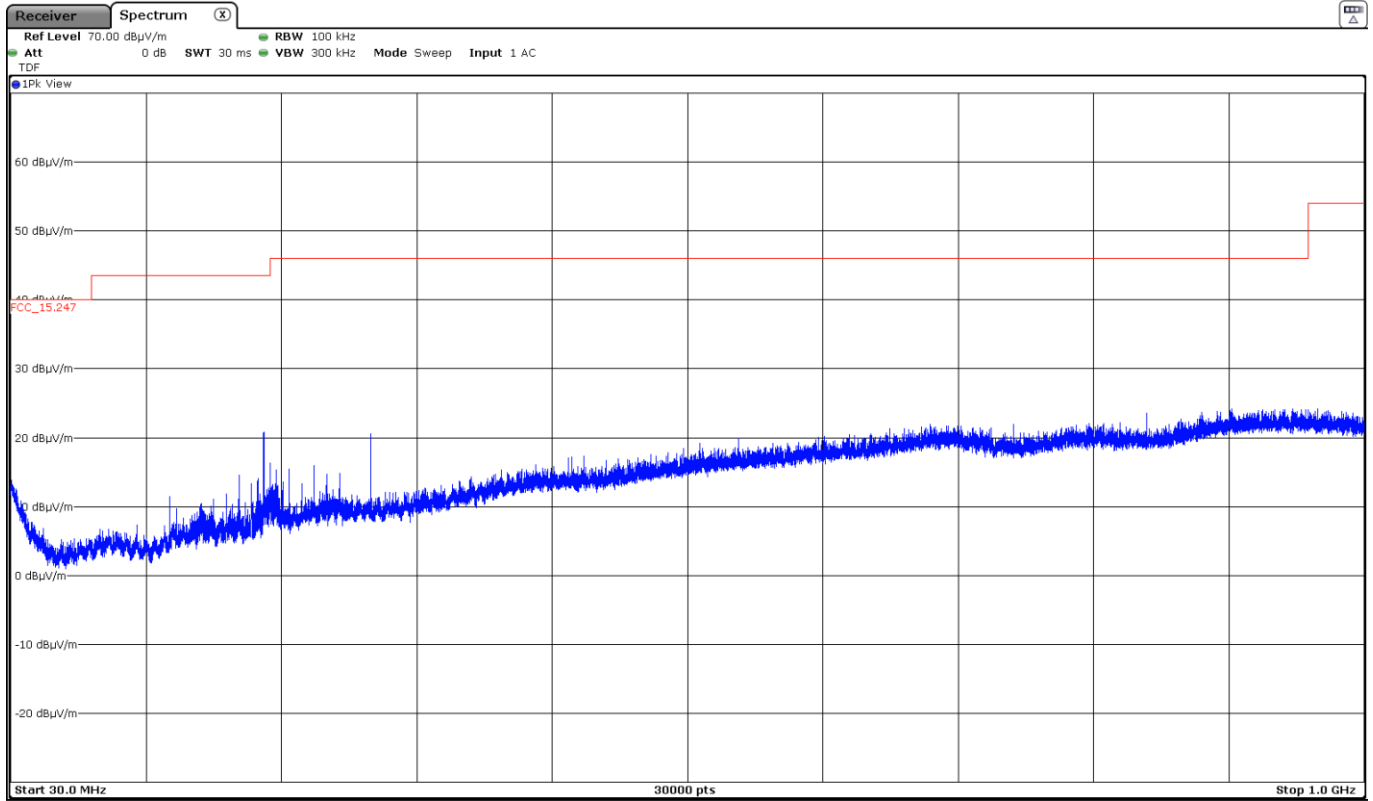
- HIGH CHANNEL. Spurious frequencies detected below the limit:

Spurious frequency (GHz)	Emission Level (dB μ V/m)	Polarization	Detector	Measurement Uncertainty (dB)
2.48553	59.62	H	Peak	$<\pm 4.70$
	53.81		Average	$<\pm 4.70$
4.96023	38.98	H	Peak	$<\pm 4.70$
7.43590	42.96	V	Peak	$<\pm 4.70$

Verdict: PASS

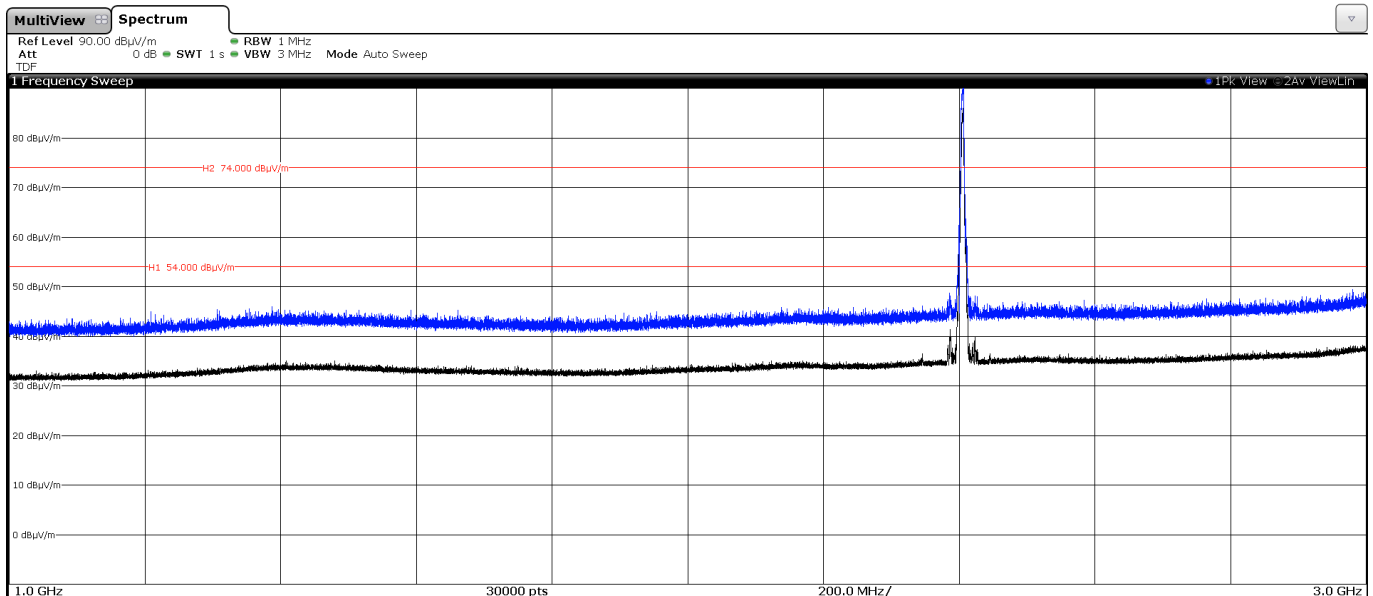
FREQUENCY RANGE 30 MHz - 1 GHz

The spurious frequencies do not depend on the operating channel.



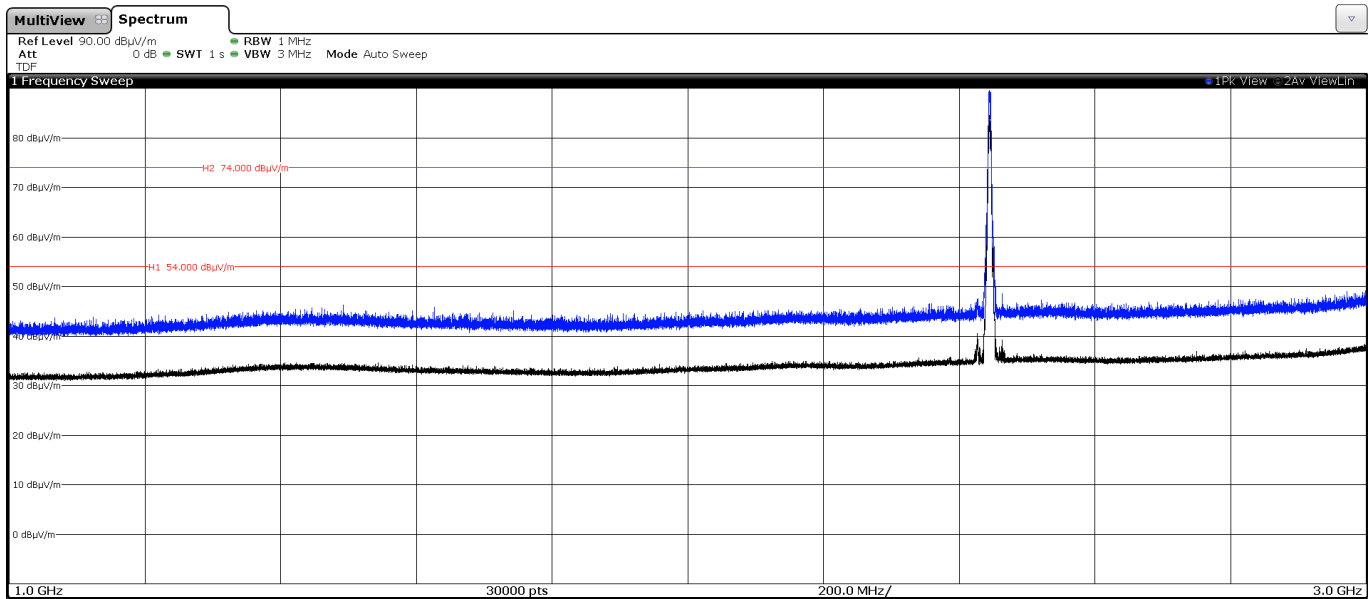
FREQUENCY RANGE 1 - 3 GHz

- Low Channel:



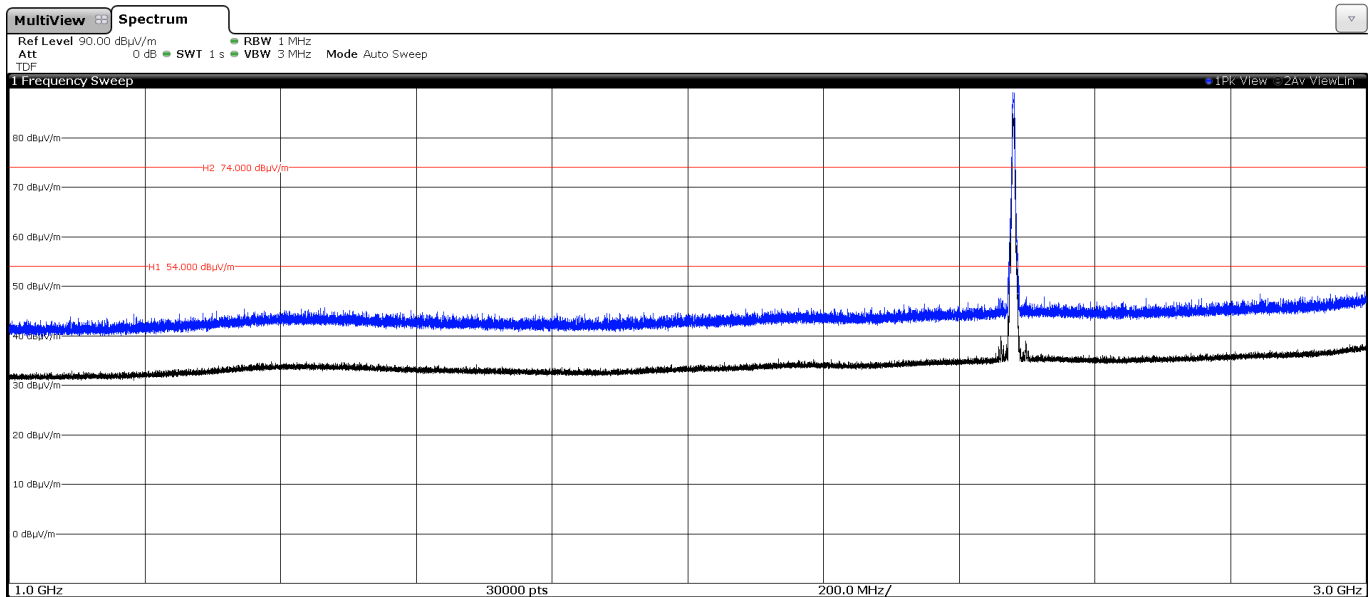
The peak above the limit is the carrier frequency.

- Middle Channel:



The peak above the limit is the carrier frequency.

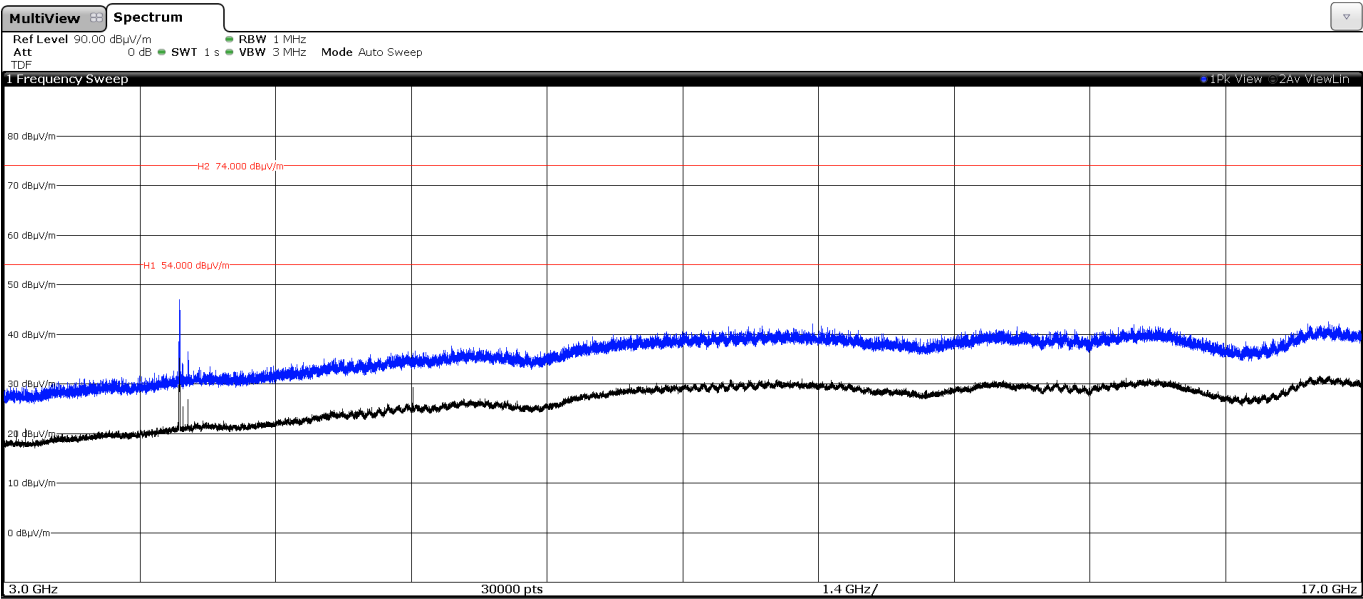
- High Channel:



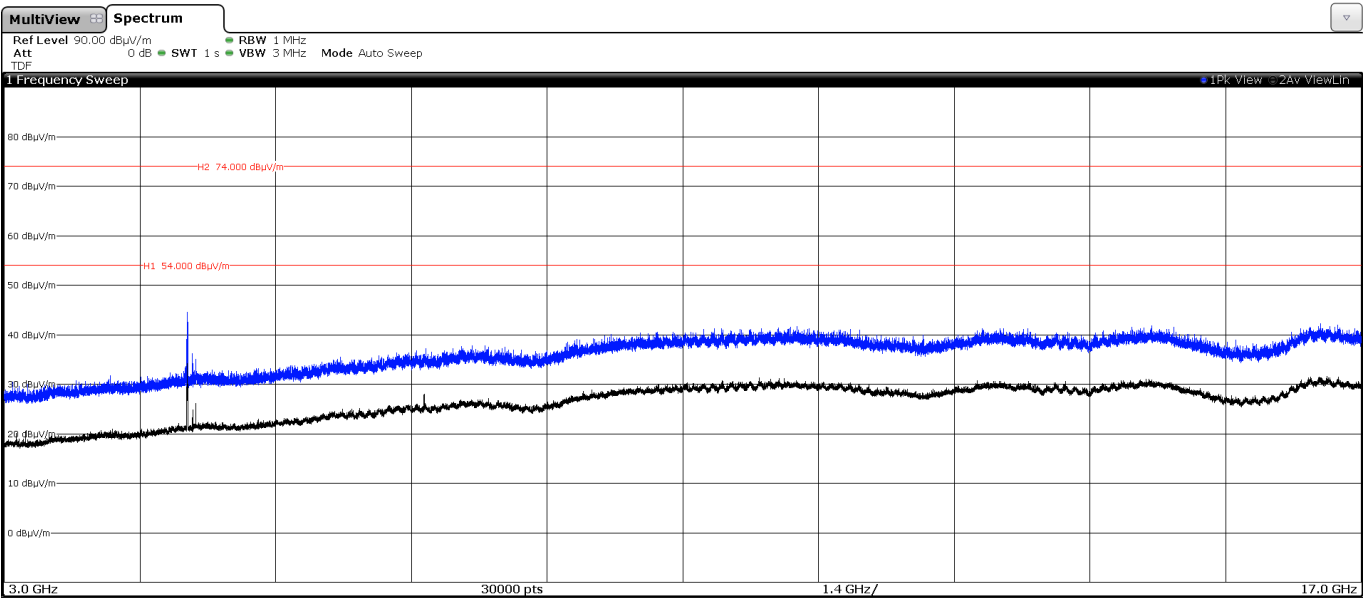
The peak above the limit is the carrier frequency.

FREQUENCY RANGE 3 - 17 GHz

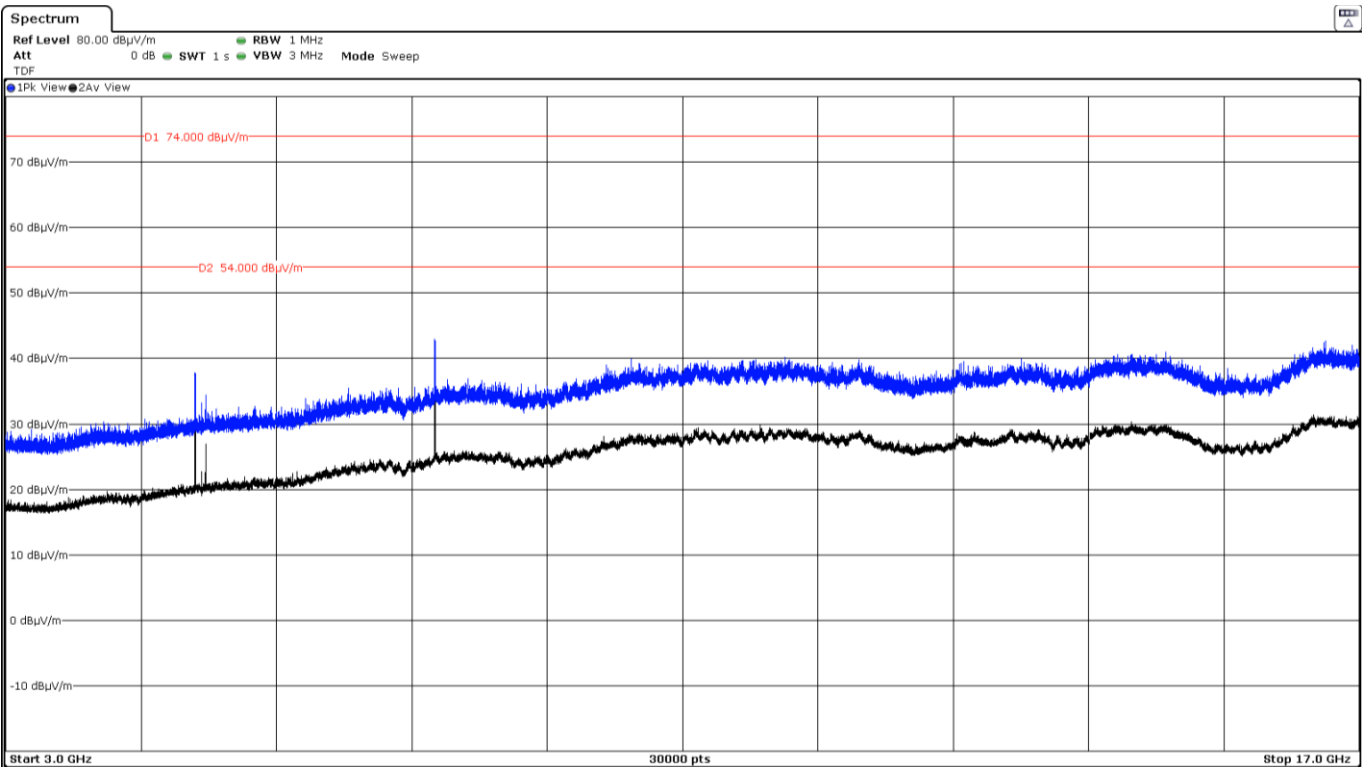
- Low Channel:



- Middle Channel:

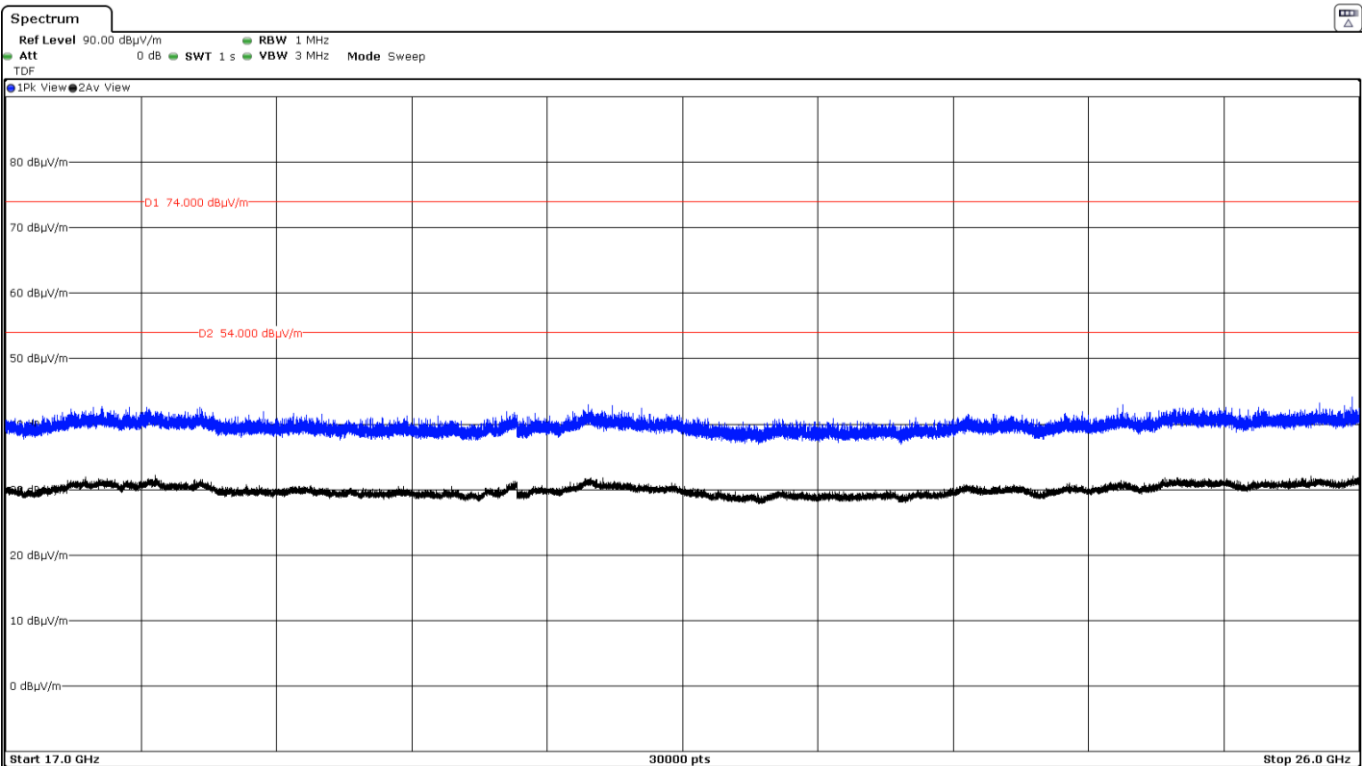


- High Channel:



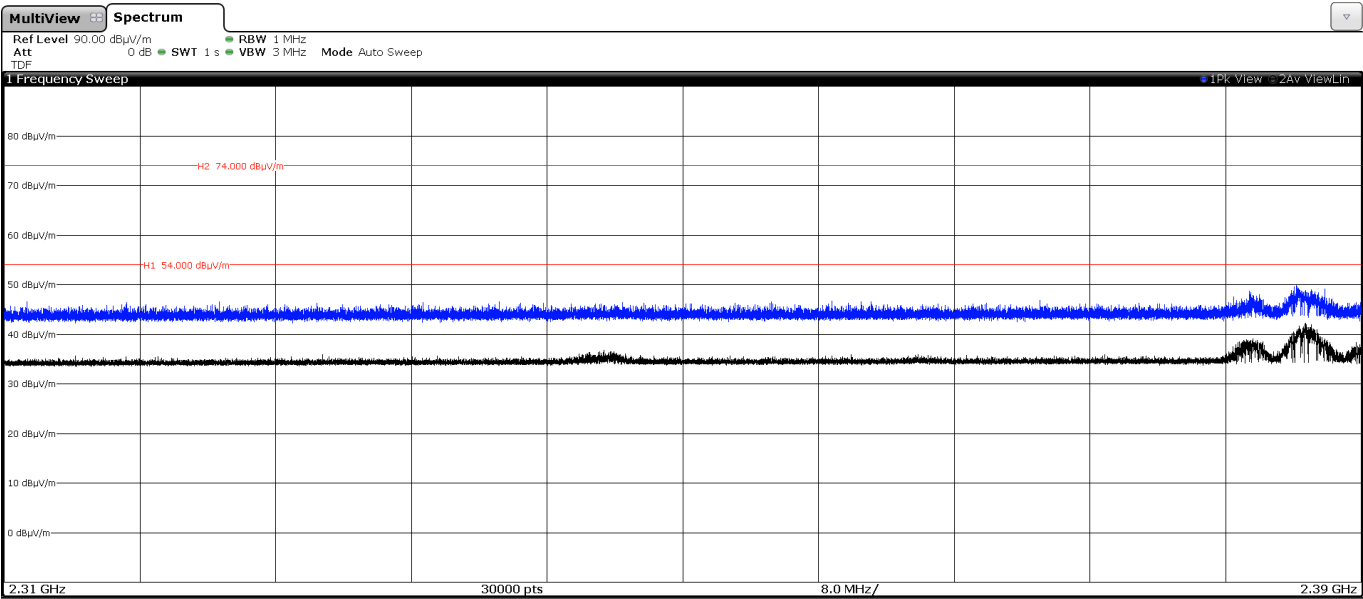
FREQUENCY RANGE 17 - 26 GHz

The spurious frequencies do not depend on the operating channel.

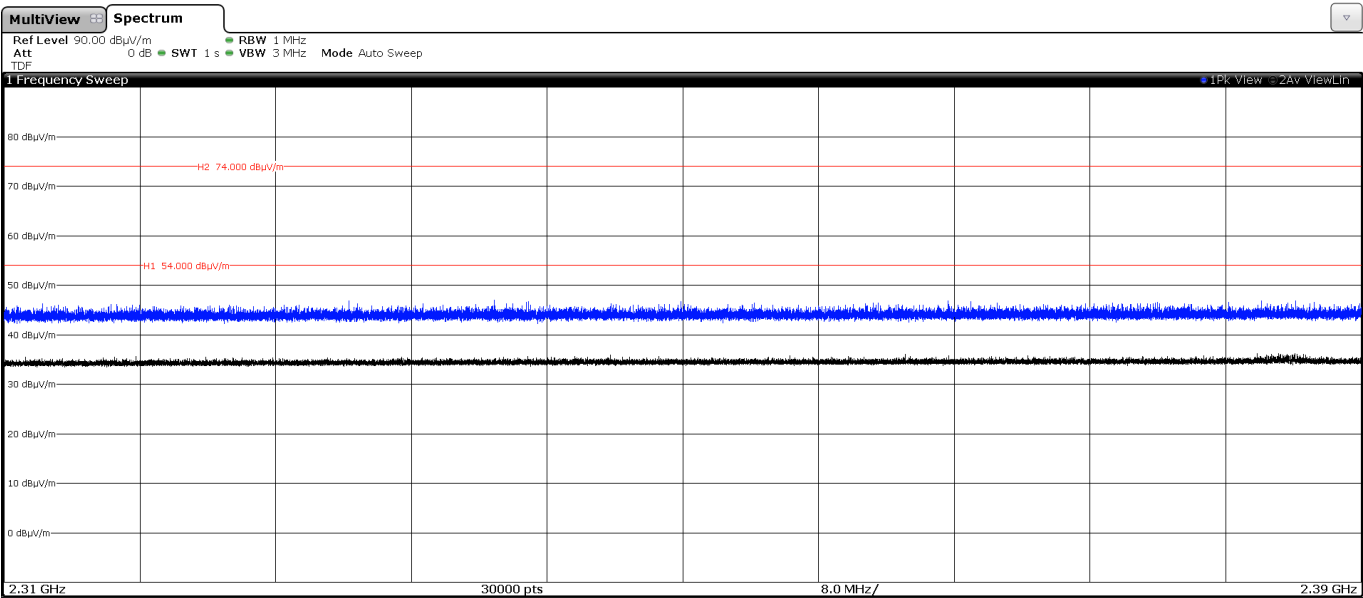


FREQUENCY RANGE 2.31 - 2.39 GHz

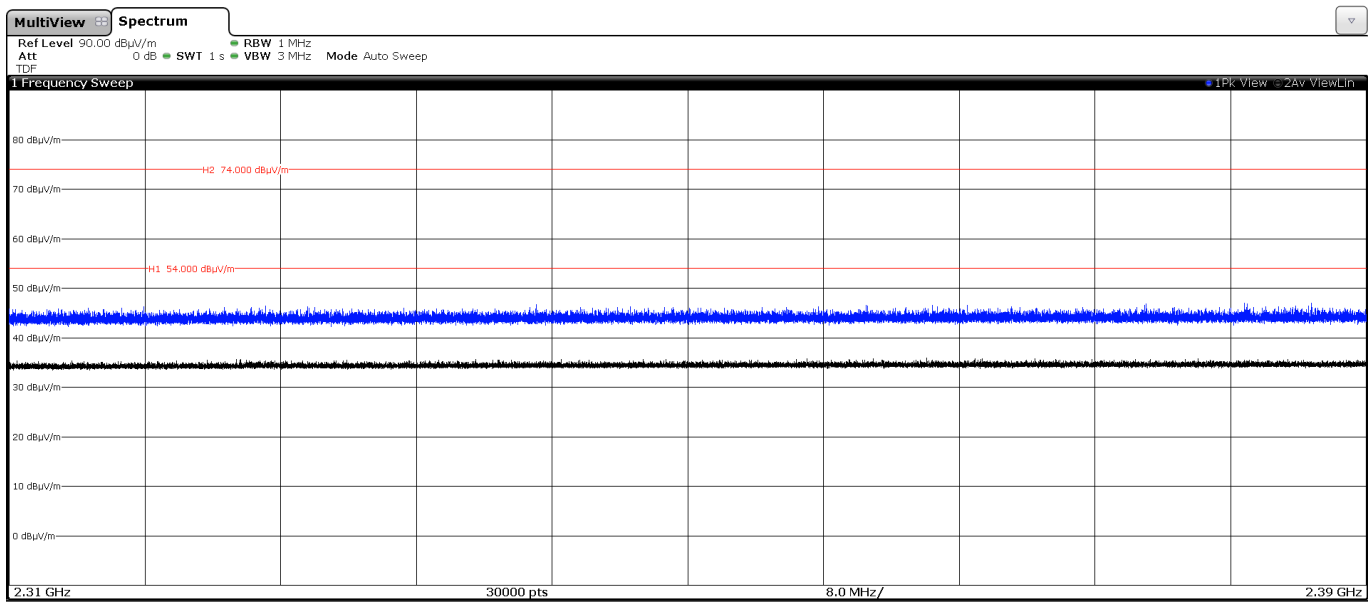
- Low Channel:



- Middle Channel:

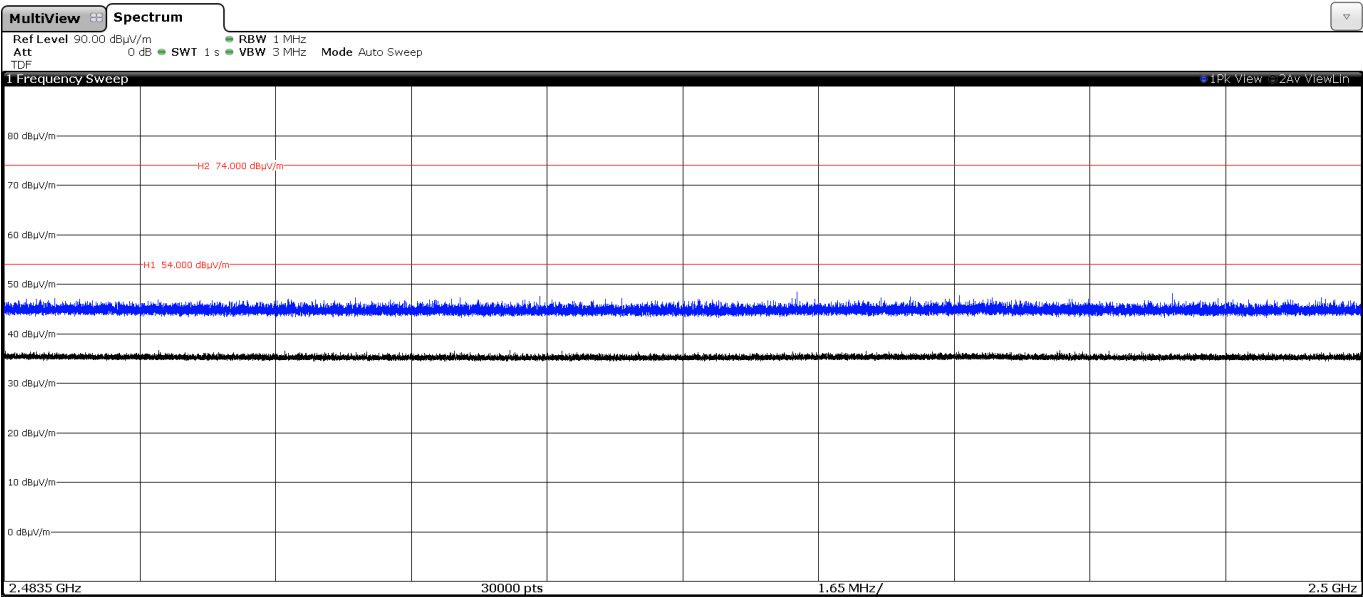


- High Channel:

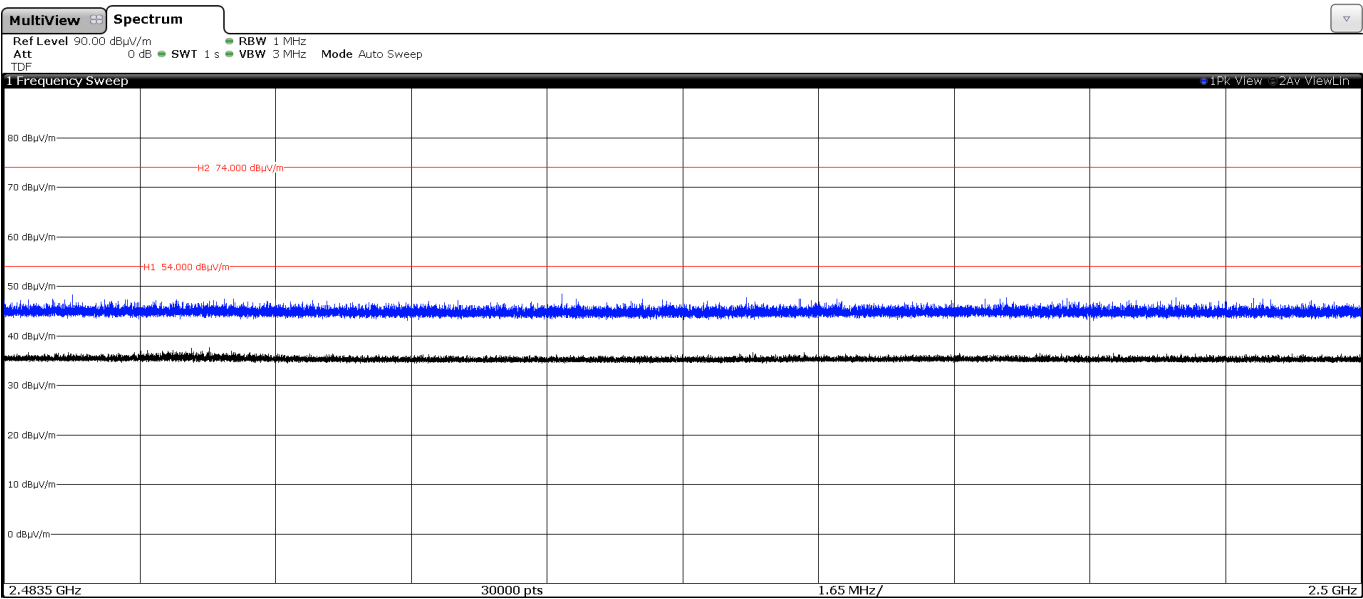


FREQUENCY RANGE 2.4835 - 2.5 GHz

- Low Channel:



- Middle Channel:

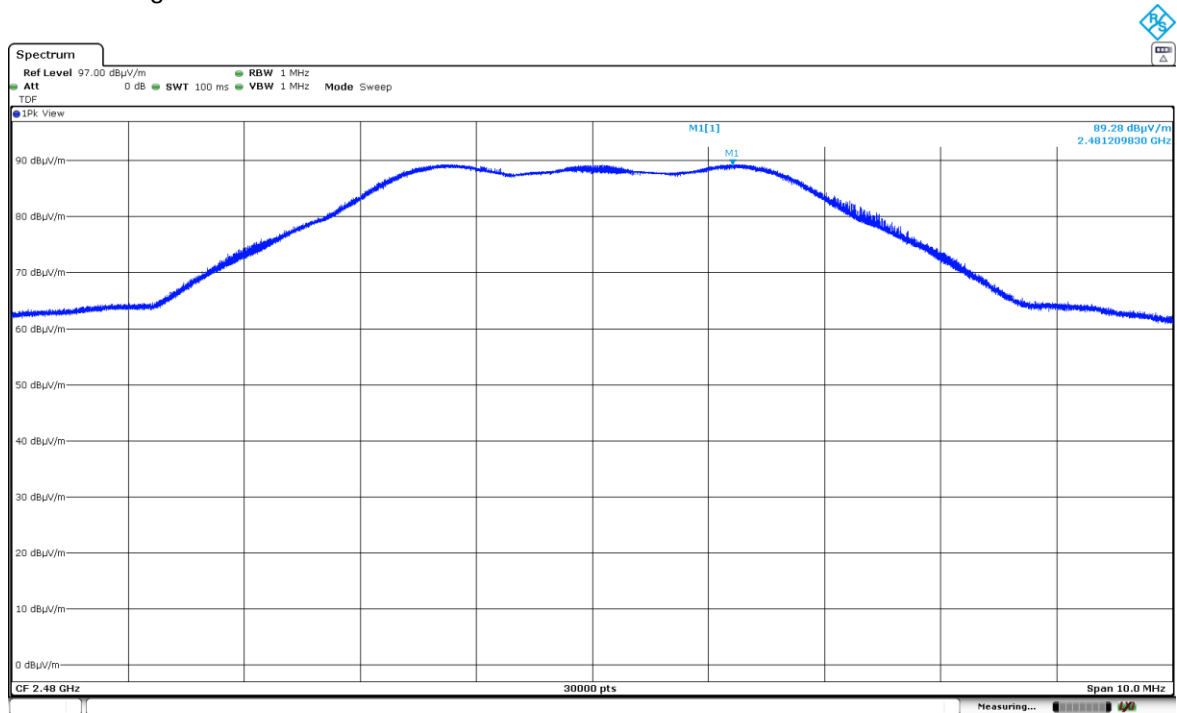


- High Channel:

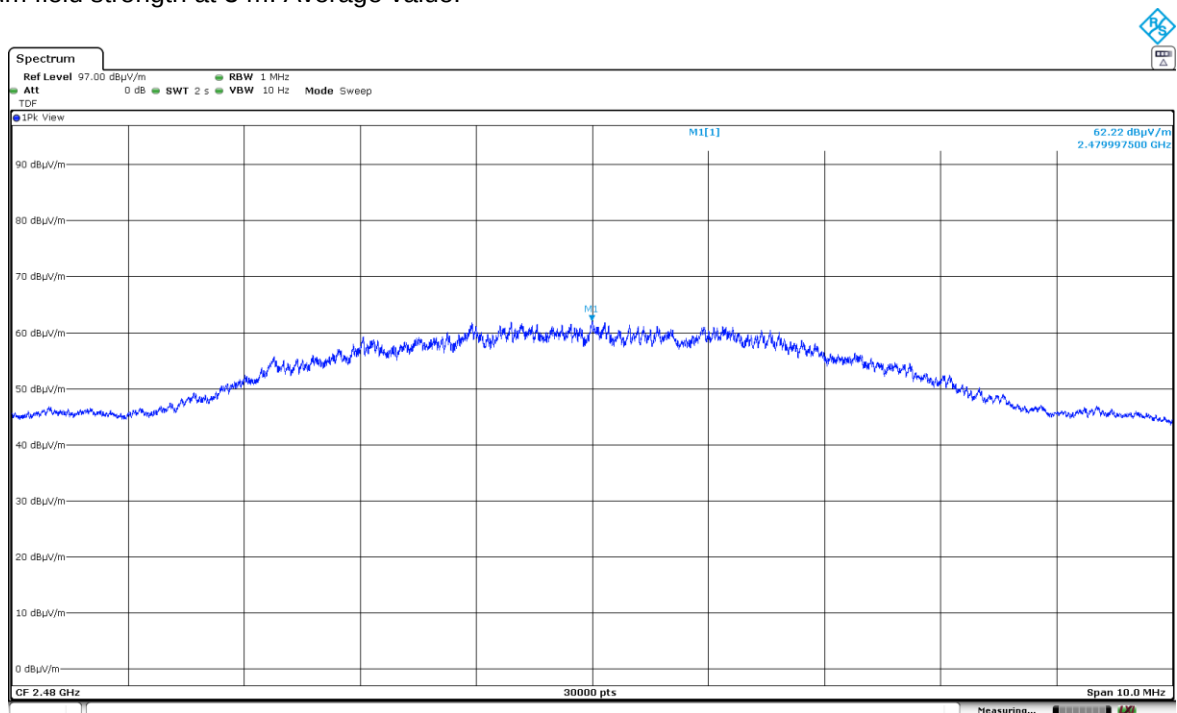
Delta Marker Method

- Maximum peak and average field strength of fundamental emission at 3 m distance

Maximum field strength at 3 m. Peak value:



Maximum field strength at 3 m. Average value:



- Band-edge compliance radiated



- Band edge compliance of radiated emissions

Fundamental max. average value 3 m	Delta value	Calculated value 3 m	Limit
62.22 dBμV/m	26.03	36.19 dBμV/m	54 dBμV/m

Fundamental max. Peak value 3 m	Delta value	Calculated value 3 m	Limit
89.28 dBμV/m	26.03	63.25 dBμV/m	74 dBμV/m

- Restricted band

