DEKRA Testing and Certification, S.A.U.
Parque Tecnológico de Andalucía,
c/ Severo Ochoa nº 2 · 29590 Campanillas · Málaga · España
C.I.F. A29 507 456

Test report No:

NIE: 56382RRF.001A2

Test report

USA FCC Part 15.249, 15.209
CANADA RSS-210, RSS-Gen

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

Identification of item tested	Wearable electronic device
Trademark	WIMU
Model and /or type reference	WIMU PRO
Other identification of the product	FCC ID: 2AQOV-WIMUPRO IC: 24141-WIMUPRO HW version: 8.0 SW version: 8.5
Features	GNSS, ANT+, WiFi + Bluetooth and UWB (only reception)
Applicant	Realtrack Systems S.L. Calle Guinea, 2 Almería 04009 Spain
Test method requested, standard	USA FCC Part 15.249 (10-1-17) Edition: Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, 5725 - 5875 MHz, and 24.0 – 24.25 GHz. USA FCC Part 15.209 (10-1-17) Edition: Radiated emission limits; general requirements. CANADA RSS-210 Issue 9 (August 2016). CANADA RSS-Gen Issue 5 (April 2018). ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Rafael López Martín EMC Consumer & RF Lab. Manager RAFAEL LÓPEZ MARTÍN 2020.12.04 13:55:33 +01'00'
Date of issue	2020-12-04
Report template No	FDT08_23

Index

Competences and guarantees 3
General Conditions 3
Uncertainty 3
Data provided by the client 3
Usage of samples 4
Test sample description 5
Identification of the client 6
Testing period and place 6
Document history 6
Environmental conditions 6
Remarks and comments 7
Testing verdicts 8
Summary 8
Appendix A: Test results. ANT+ 9

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.

IMPORTANT: No parts of this report may be reproduced or quoted out of context, in any form or by any means, except in full, without the previous written permission of DEKRA Testing and Certification S.A.U.

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 WIMU Pro is a small wearable, wireless multi-sensor device with the next features:

   • 1 GHz processing capability.
   • LINUX Operating System, INTEL Core Processor inside each wearable unit.
   • 10 Hz GPS to accurately measure position, speed, distance, precise time, etc.
   • 3D accelerometer 2G recording at 1000 Hz to track inclination , free fall, flight time, etc.

- 3D accelerometer 16G recording at 1000 Hz.
- 3D accelerometer 100G recording at 1000 Hz to track acceleration, impact, reaction time, jump, hits, etc.
- 3D gyroscope recording at 1000 Hz with 2000 degrees per second to measure angular speed, roll, pitch, yaw, etc.
- 3D magnetometer recording at 100 Hz to act as a compass and to assess the movement direction (forwards, backwards, sideways...).
- Barometer at 120 kPa to ascertain atmospheric pressure, barometric height, etc.
- WIFI 802.11 b/g/n to broadcast data wirelessly and efficiently up to Bluetooth 2.1. Wireless protocol for exchanging data over a ANT+ wireless short range technology interoperable with sensors such as hr, podometer, cadence, weight, ECG, blood pressure, etc.
- High Speed 2.0 USB.
- UltraWideBand 10cm precision in location indoor/outdoor.
- MicroUSB standard charging system.

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 results.

Usage of samples

Samples undergoing test have been selected by: The client.

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

Control Nº	Description	Model	Serial Nº	Date of reception
56382/001	Wearable electronic device with integral antenna	WIMU PRO	--	2018-05-28

Sample M/01 has undergone the following test(s): All radiated tests indicated in Appendix A.

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

Control Nº	Description	Model	Serial Nº	Date of reception
52412B/021	Wearable electronic device with antenna connector	WIMU PRO	--	2018-02-13

Sample M/02 has undergone the following test(s): All conducted 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)
	-		☐	☐	☐
Supplementary information to the ports…… :	-				
Rated power supply .....:	Voltage and Frequency				
	☒	DC:			
Rated Power .....:	1,2 W				
Clock frequencies .....:	-				
Other parameters.....:	-				
Software version .....:	8.5				
Hardware version.....:	9.0				
Dimensions in cm (W x H x D)....:	8,0 x 4,5 x 1,7				
Mounting position.....:	☐	Table top equipment			
	☐	Wall/Ceiling mounted equipment			
	☐	Floor standing equipment			
	☐	Hand-held equipment			
	☐	Other:			
Modules/parts .....:	Module/parts of test item		Type	Manufacturer	
	2 WIMU PRO conducted		SMA Connectors	RealTrack Systems	
	1 WIMU PRO radiated		Integrated Antennas	RealTrack Systems	
Accessories (not part of the test item) .....:	Description		Type	Manufacturer	
	3 Gable USB2.0 A to Micro B Male		0,6 m	LogiLink	
	1 Charger AC/DC 5V-1A		PSA05E-050Q		
Documents as provided by the applicant.....:	Description		File name	Issue date	
	-				

(3) Only for Medical Equipment.

Identification of the client

REALTRACK SYSTEMS, S.L.
Calle Guinea, 2, 01009 Almería, SPAIN

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2018-06-04
Date (finish)	2018-06-13

Document history

Report number	Date	Description
56382RRF.001	2018-11-26	First release
56382RRF.001A1	2020-03-18	First modification. By client's requirement the format of the test report has been updated to the current version. This modification test report cancels and replaces the test report 56382RRF.001.
56382RRF.001A2	2020-12-04	First modification. Typo corrections on device's data on front page. This modification test report cancels and replaces the test report 56382RRF.001A1.

Environmental conditions

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

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

In the chamber for conducted measurements, the following limits were not exceeded during the test:

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

Remarks and comments

The tests have been performed by the technical personnel: Jose Alberto Aranda, Miguel Angel Torres and Carlos Alberto Contreras.

Used instrumentation:

Conducted Measurements:

		Last Calibration	Due Calibration
1.	Spectrum Analyzer Agilent PSA E4440A	2017/10	2019/10

Radiated Measurements:

		Last Calibration	Due Calibration
1.	Semianechoic Absorber Lined Chamber Frankonia SAC-3	N.A.	N.A.
2.	Biconical/Log Antenna ETS LINDGREN 3142E	2017/09	2020/09
3.	Multi Device Controller EMCO 2090	N.A.	N.A.
4.	Double-ridge Guide Horn Antenna 1-18 GHz SCHWARZBECK BBHA 9120 D	2016/12	2019/12
5.	Broadband Horn Antenna 18-40 GHz SCHWARZBECK BBHA 9170	2017/03	2020/03
6.	EMI Test Receiver R&S ESR7	2016/07	2018/07
7.	Spectrum Analyzer Rohde & Schwarz FSV40	2017/07	2019/07
8.	RF Pre-Amplifier 30 MHz-6 GHz Bonn Elektronik BLNA 0360-01N	2017/07	2018/09
9.	RF Pre-Amplifier 1-18 GHz Bonn Elektronik BLMA 0118-1M	2018/03	2019/03
10.	RF Pre-Amplifier 18-40 GHz BONN ELEKTRONIK BLMA 1840-1M	2018/03	2020/03

Testing verdicts

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

Summary

1. ANT+

FCC PART 15 PARAGRAPH / RSS-210			
Requirement – Test case		**Verdict**	**Remark**
15.249 (a) / RSS-210 B.10 (a)	Field strength of fundamental and harmonic emissions	P	
15.249 (d) / RSS-210 B.10 (b)	Emissions radiated outside of the specific frequency bands	P	
Supplementary information and remarks: None.			

Appendix A: Test results. ANT+

Index

TEST CONDITIONS 11
Occupied Bandwidth 13
FCC15.249 (a) / RSS-210 B.10 (a) Field strength of fundamental and harmonics emissions 15
FCC 15.249 (d) / RSS-210 B.10 (b) Emissions radiated outside of the specific frequency bands 18

TEST CONDITIONS

POWER SUPPLY (V):

V nominal:	5.0 Vdc
Type of power supply:	DC voltage from internal battery.
Type of antenna:	Internal antenna.
Declared antenna gain:	+2 dBi

TEST FREQUENCIES:

Low Channel:	2402 MHz
Middle Channel:	2440 MHz
High Channel:	2480 MHz

The test set-up was made in accordance to the general provisions of FCC DTS Measurement 558074 D01 DTS Meas Guidance v04 dated 04/05/2017.

The sample was used to configure the EUT to continuously transmit at a specified output power in all channels.

CONDUCTED MEASUREMENTS

The equipment under test was set up in a shielded room and it is connected to the spectrum analyser using a low loss RF cable. The reading of the spectrum analyser is corrected taking into account the cable loss.

The DC supply voltage is applied using an internal battery fully charged.

RADIATED MEASUREMENTS

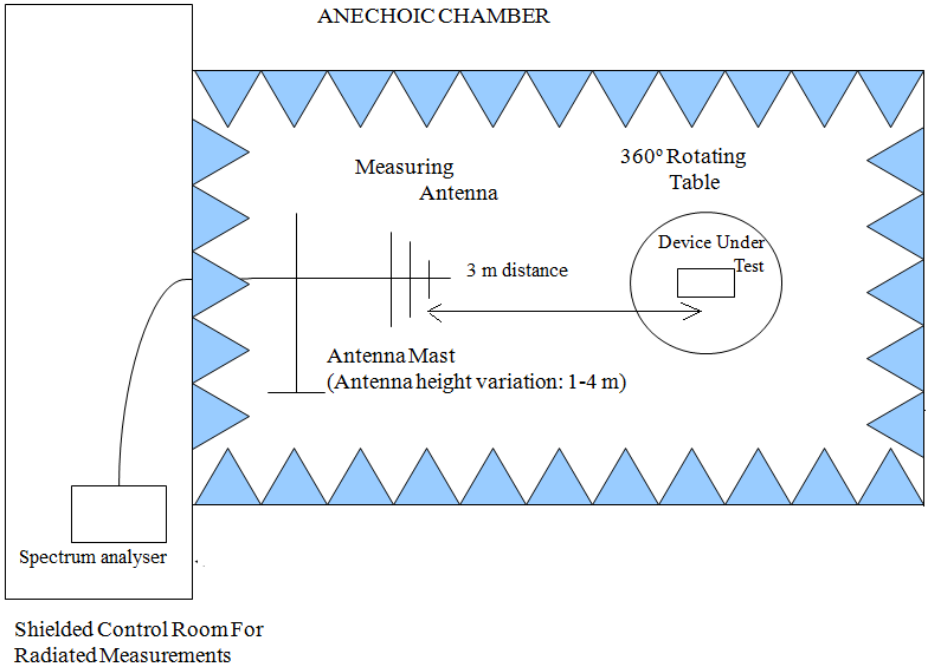
All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m for the frequency range 30 MHz-1000 MHz (30 MHz-1000 MHz Bilog antenna) and at a distance of 1m for the frequency range 1 GHz-25 GHz (1 GHz-18 GHz Double ridge horn antenna and 18 GHz-40 GHz horn antenna).

For radiated emissions in the range 1 GHz-25 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

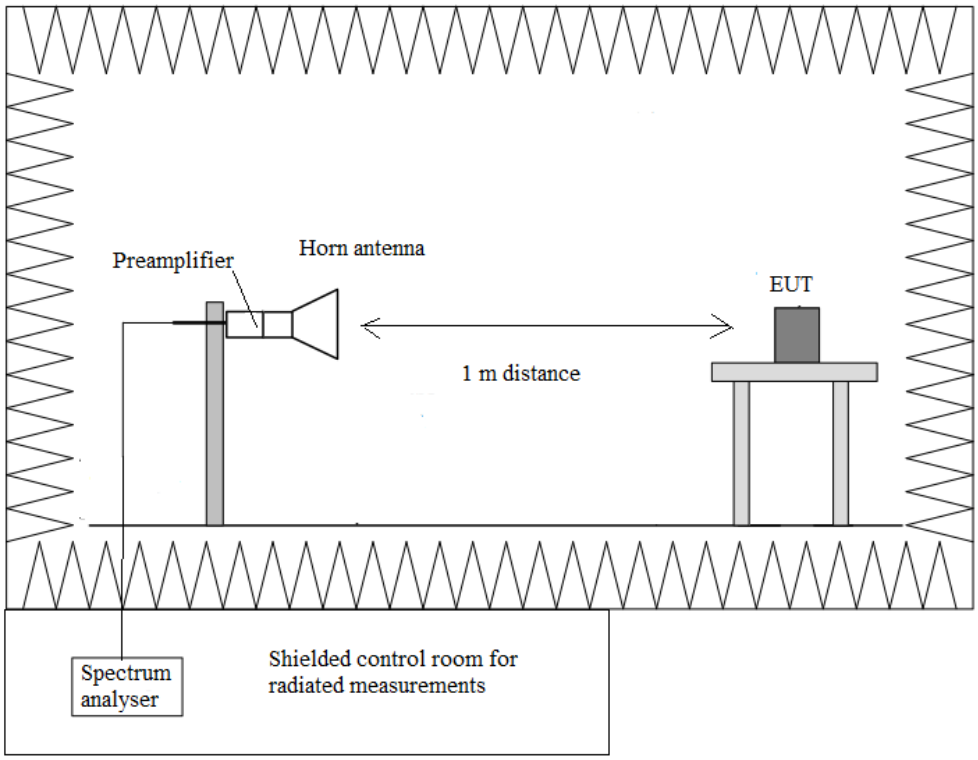
The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

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

Radiated measurements setup f < 1 GHz:



Radiated measurements setup f > 1 GHz:

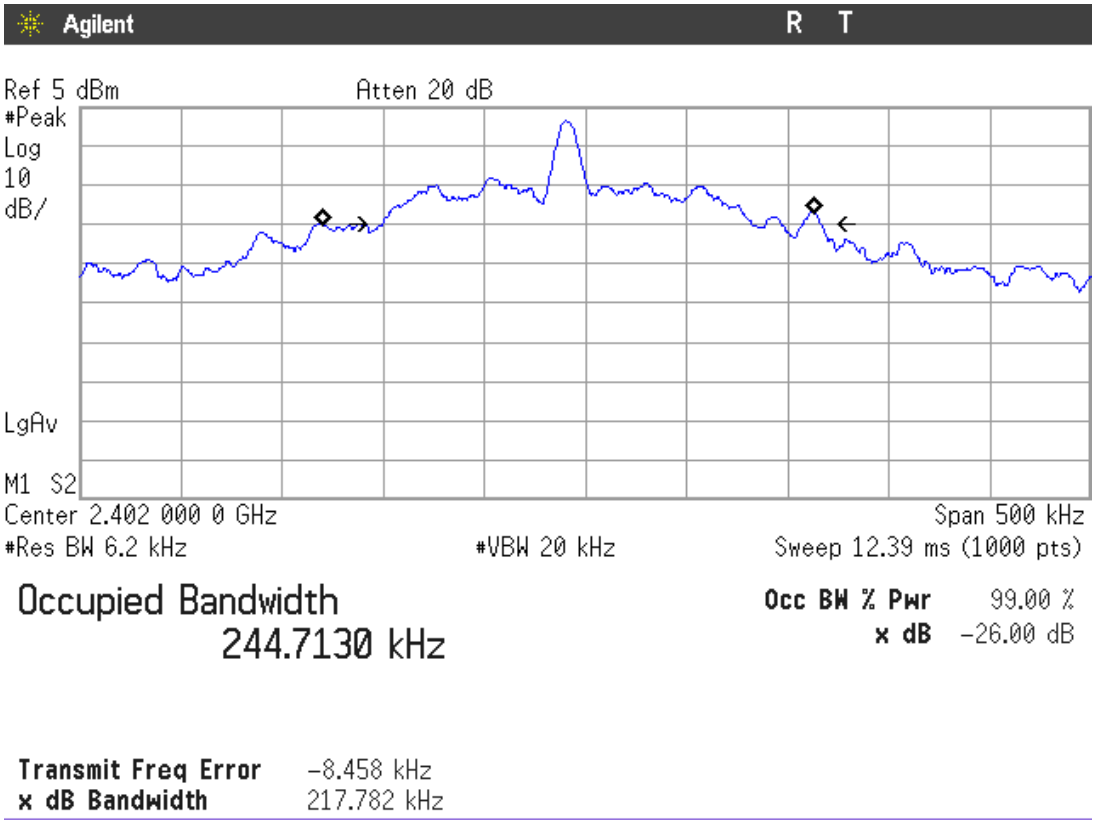


Occupied Bandwidth

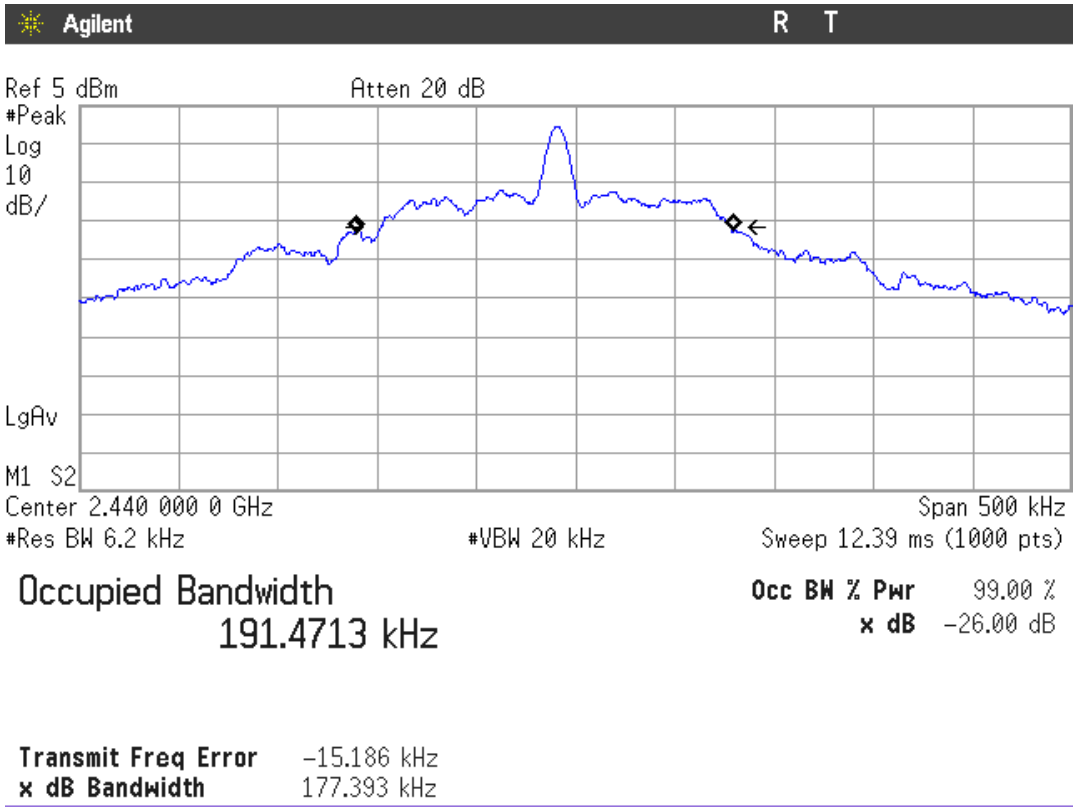
RESULTS:

	Low Channel 2402 MHz	Middle Channel 2440 MHz	High Channel 2480 MHz
99% Bandwidth (MHz)	0.2447	0.1915	0.2339
-26 dBc Bandwidth (MHz)	0.2178	0.1774	0.2139
Measurement Uncertainty (kHz)	<±5.00		

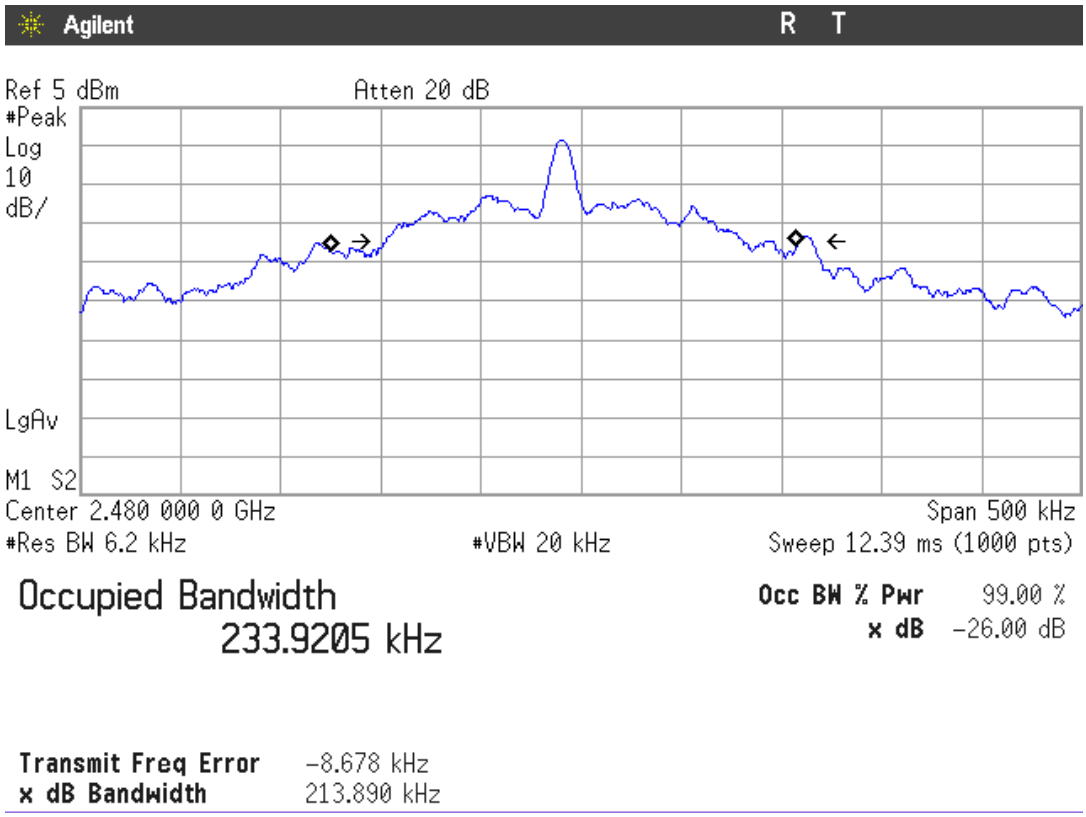
- Low Channel:



- Middle Channel:



- High Channel:



FCC15.249 (a) / RSS-210 B.10 (a) Field strength of fundamental and harmonics emissions

SPECIFICATION:

The field strength of emissions from intentional radiators shall comply with the following

Fundamental frequency (MHz)	Field strength of fundamental (mV/m)	Field strength (dBµV/m)	Measurement distance (m)
902 - 928	50	93.98	3
2400 – 2483.5	50	93.98	3
5725 - 5875	50	93.98	3
24000-24250	250	107.96	3

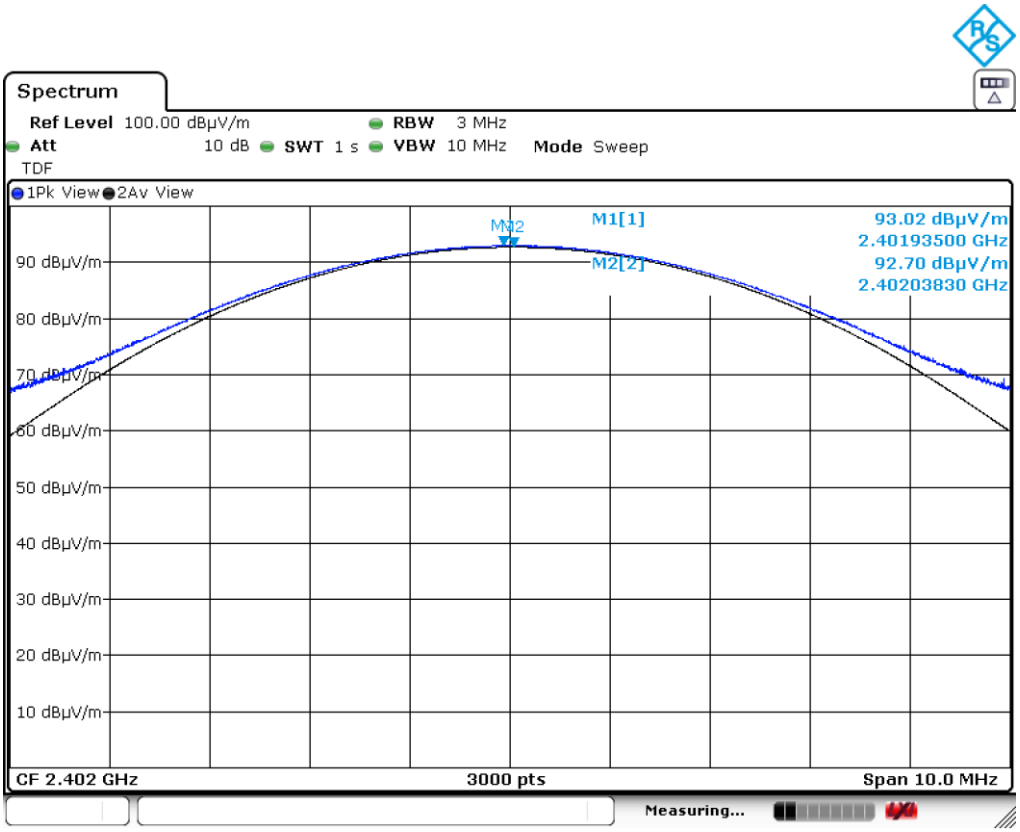
For frequencies above 1000 MHz, the above field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

RESULTS:

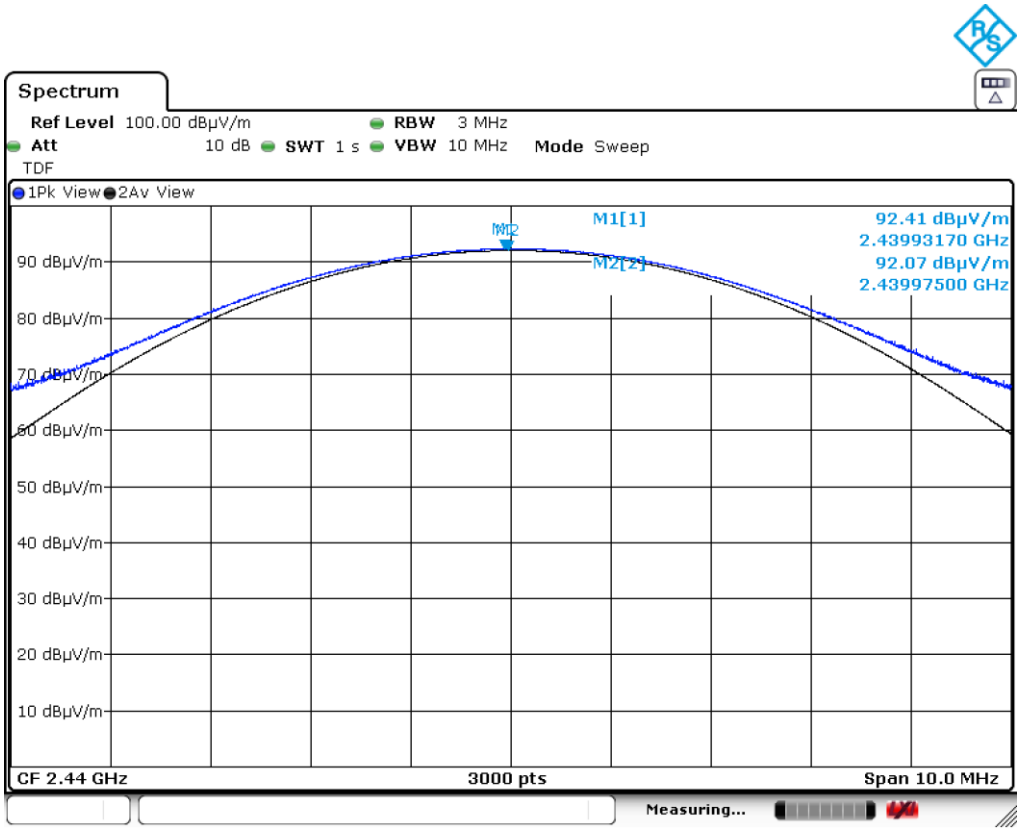
	Low Channel 2402 MHz	Middle Channel 2440 MHz	High Channel 2480 MHz
Peak Field Strength (dBµV/m)	93.02	92.41	90.90
Average Field Strength (dBµV/m)	92.70	92.07	90.51
Measurement Uncertainty (dB)	<±3.05		

Verdict: PASS

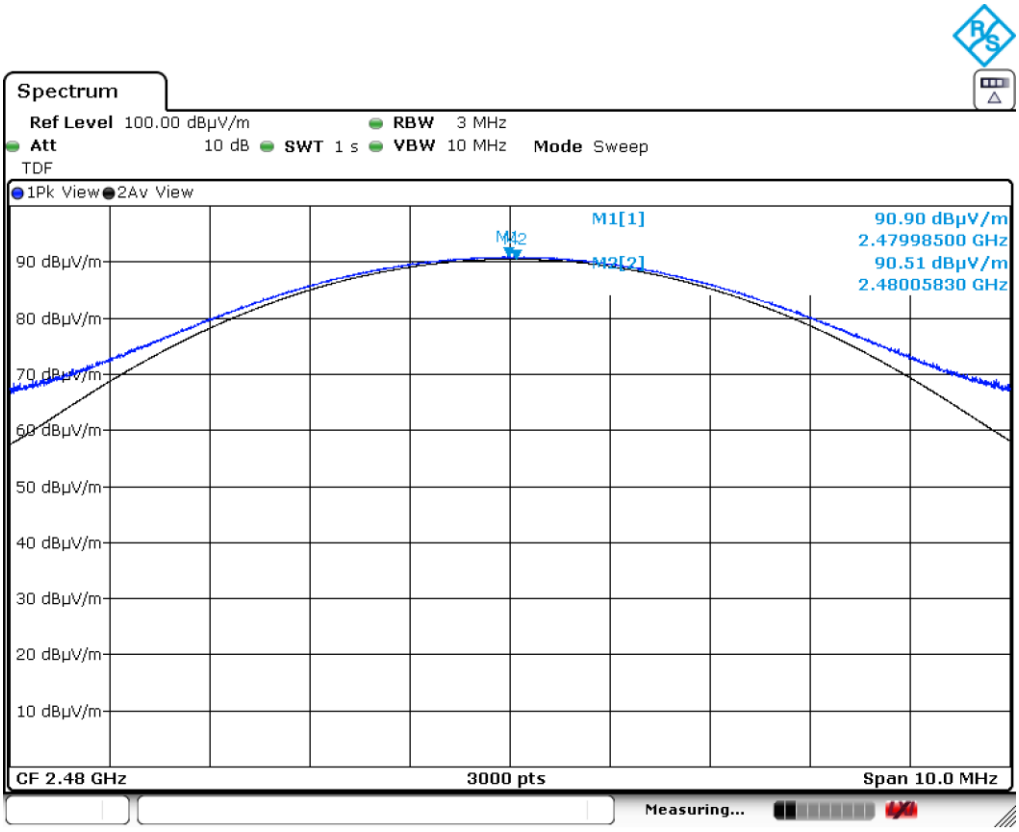
- Low Channel:



- Middle Channel:



- High Channel:



FCC 15.249 (d) / RSS-210 B.10 (b) Emissions radiated outside of the specific frequency bands

SPECIFICATION:

The field strength of harmonics from intentional radiators shall comply with the following

Fundamental frequency (MHz)	Field strength of harmonics (µV/m)	Field strength of harmonics (dBµV/m)	Measurement distance (m)
902 - 928	500	54	3
2400 – 2483.5	500	54	3
5725 - 5875	500	54	3
24000-24250	2500	67.96	3

Emissions radiated outside of the specific frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of fundamental or to the general radiated emission limits specified in section 15.209:

Frequency Range (MHz)	Field strength (µV/m)	Field strength (dBµV/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

Whichever is the lesser attenuation.

RESULTS:

The situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º 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-1000 MHz and at distance of 1m for the frequency range 1 GHz-25 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.

Frequency range 30 MHz - 1 GHz.

The spurious signals detected do not depend on the operating channel.

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
594.071	V	Quasi-peak	32.50	± 3.88
742.611	V	Quasi-peak	26.90	± 3.88
891.118	V	Quasi-peak	23.20	± 3.88

Frequency range 1 - 25 GHz.

The results in the next tables show the maximum measured levels in the 1-25 GHz range including the restricted bands 2.31-2.39 GHz and 2.4835-2.5 GHz (see next plots).

Spurious signals 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 (2402 MHz):

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
4.80390	H	Peak	43.35	± 3.70
7.20630	H	Peak	40.72	± 3.70
9.60823	V	Peak	44.26	± 3.70

- Middle Channel (2440 MHz):

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
4.87997	V	Peak	45.52	± 3.70
7.32017	V	Peak	40.58	± 3.70

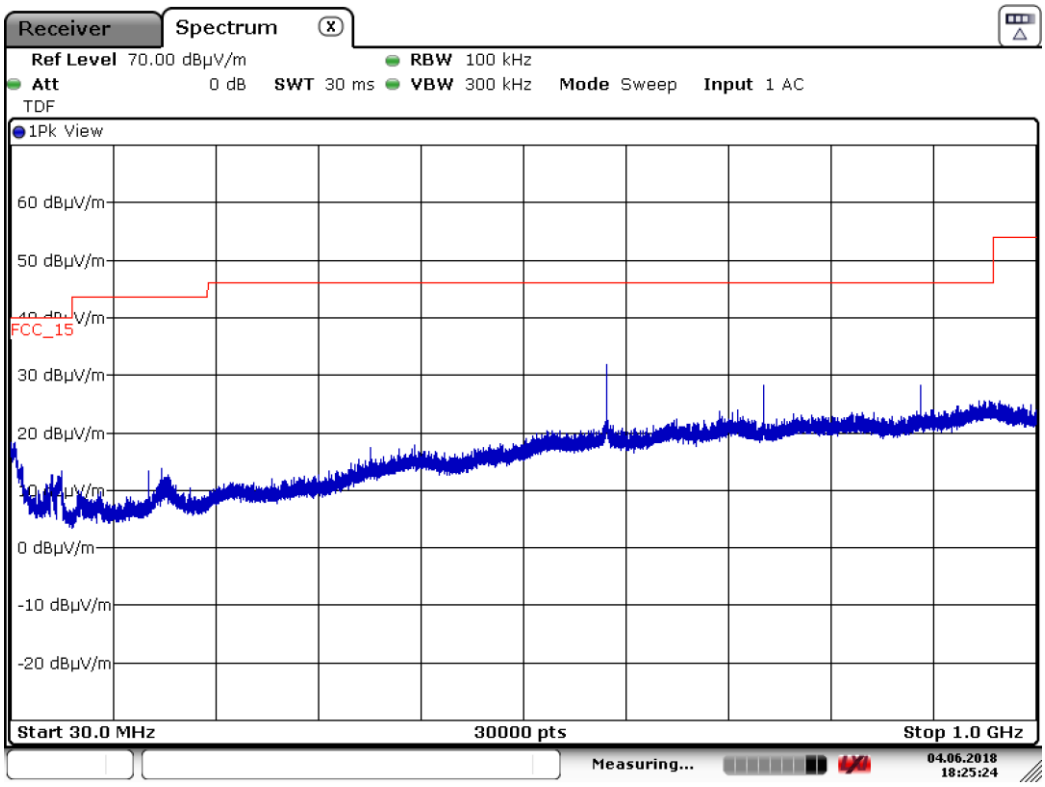
- High Channel (2480 MHz):

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
4.96023	V	Peak	44.53	± 3.70
7.44010	V	Peak	39.840	± 3.70

Verdict: PASS

FREQUENCY RANGE 30 MHz - 1 GHz

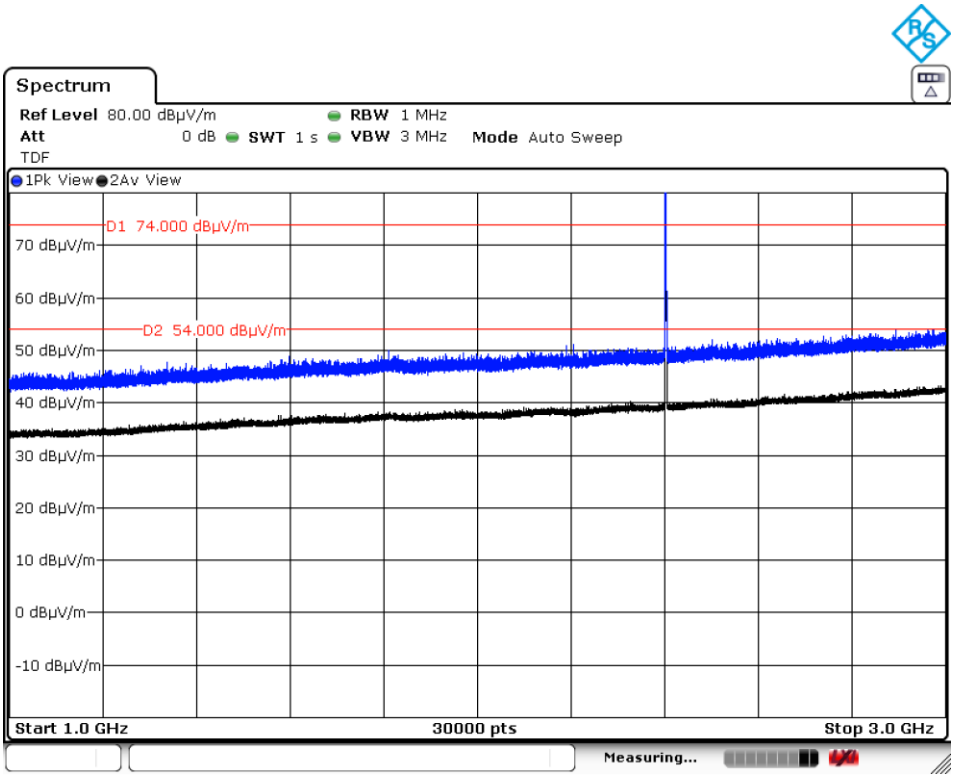
The spurious frequencies detected do not depend on the operating channel.



This plot is valid for the Low, Middle and High Channels.

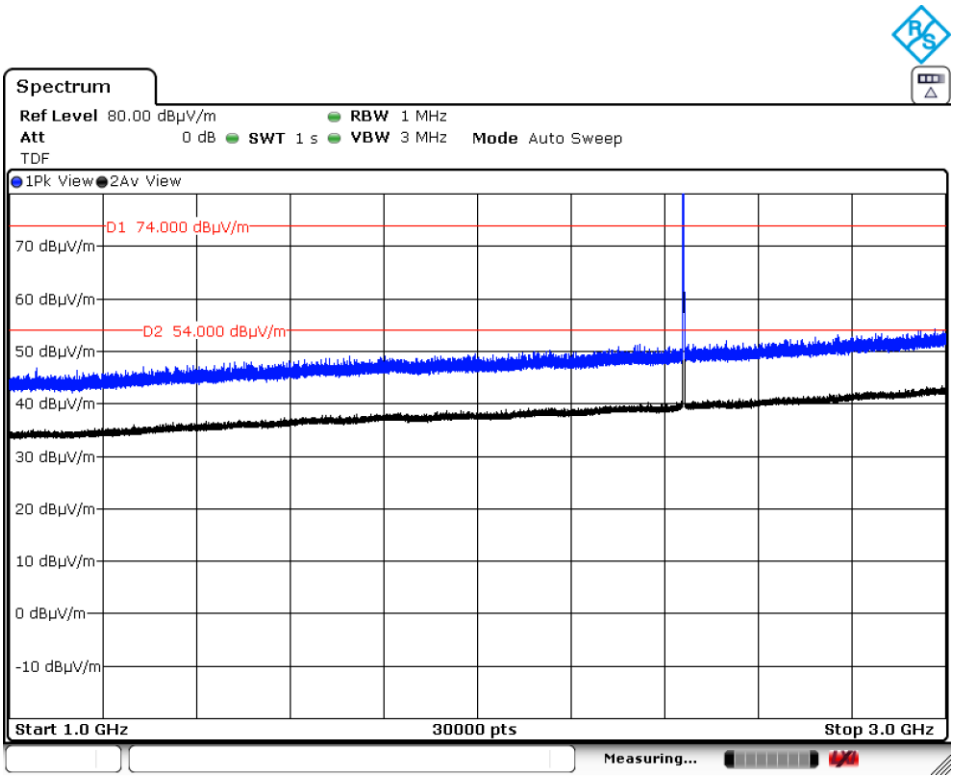
FREQUENCY RANGE 1 - 3 GHz

- Low Channel:



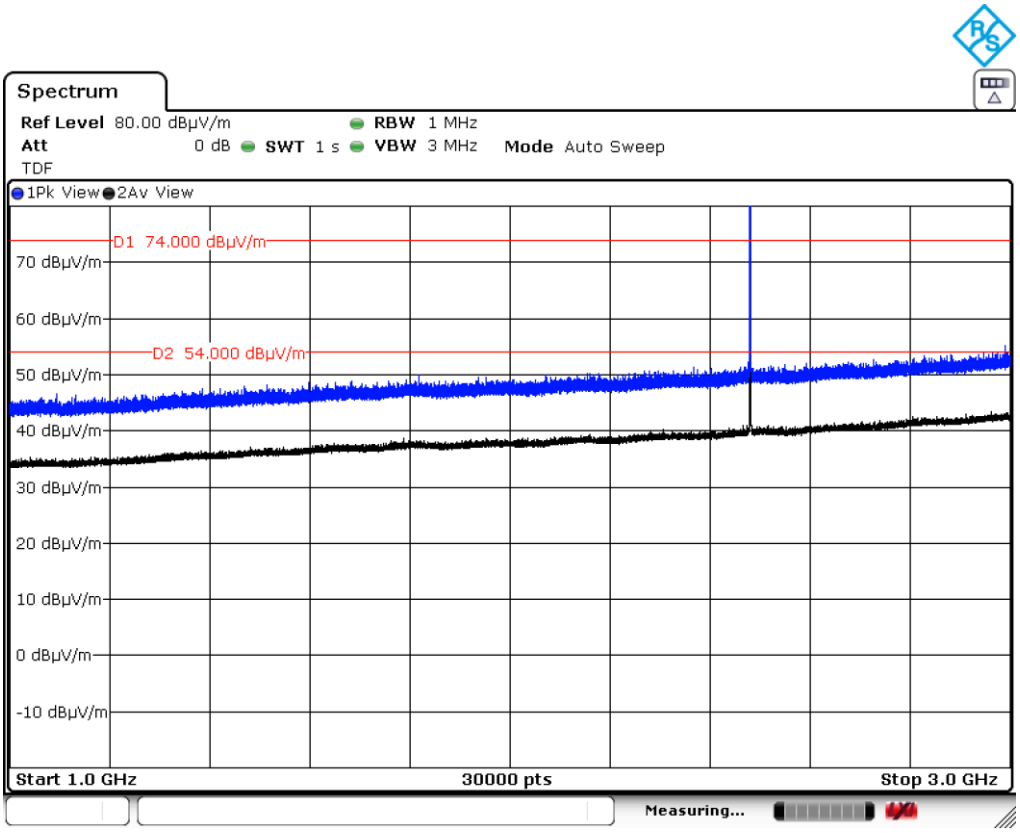
The peak above the limit is the carrier frequency.

- Middle Channel:



The peak above the limit is the carrier frequency.

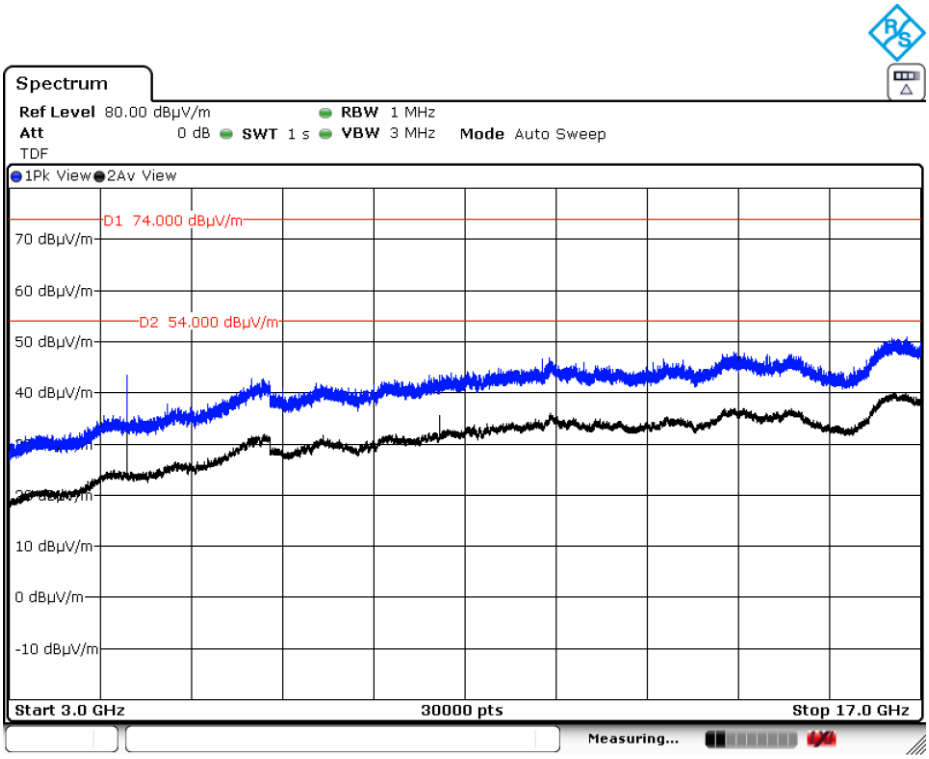
- High Channel:



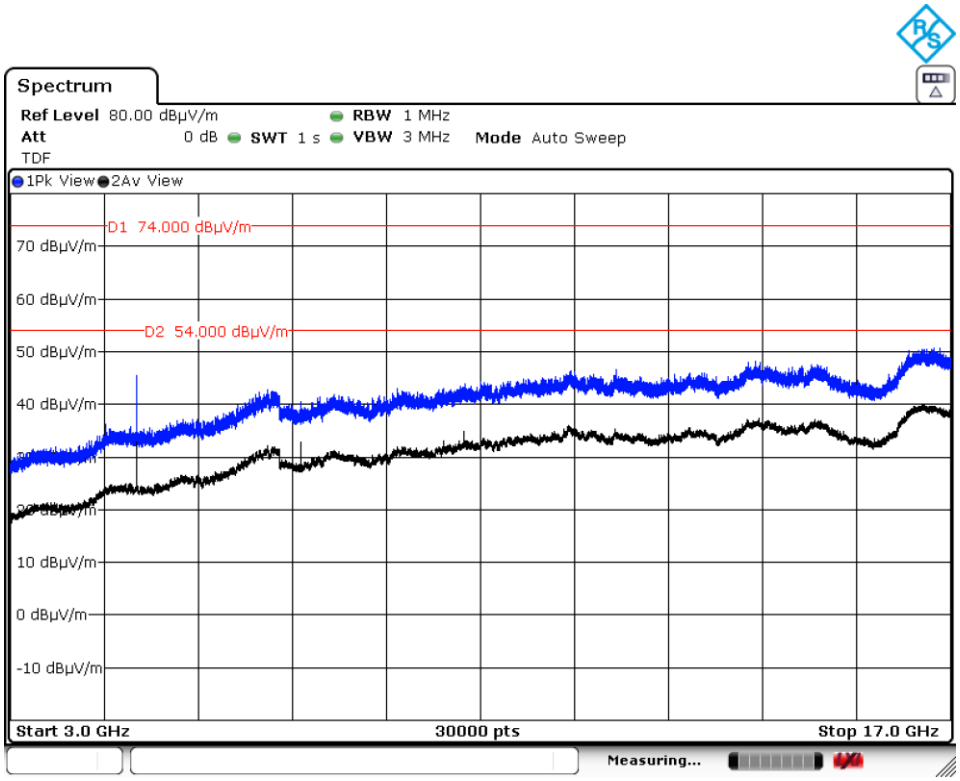
The peak above the limit is the carrier frequency.

FREQUENCY RANGE 3 - 17 GHz

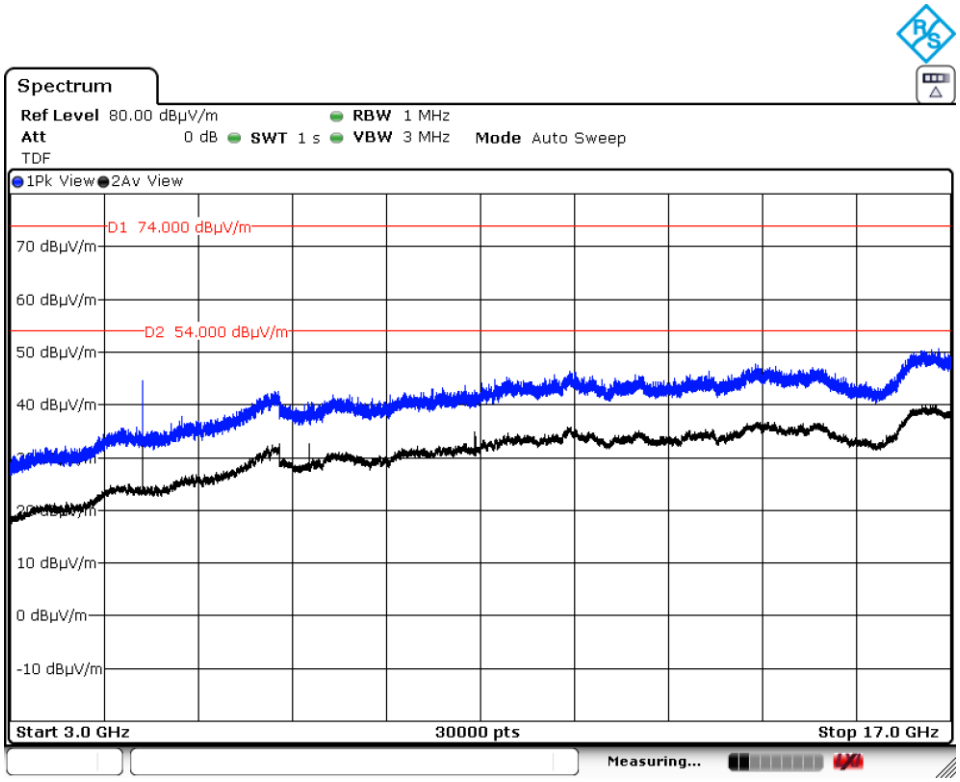
- Low Channel:



- Middle Channel:

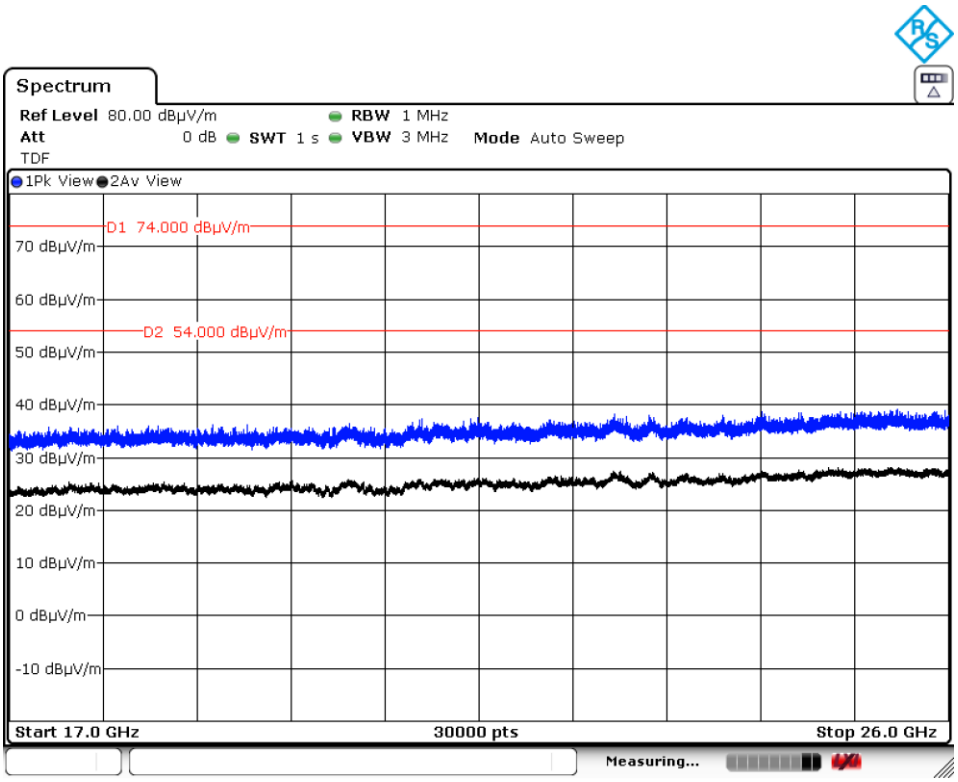


- High Channel:



FREQUENCY RANGE 17 - 26 GHz

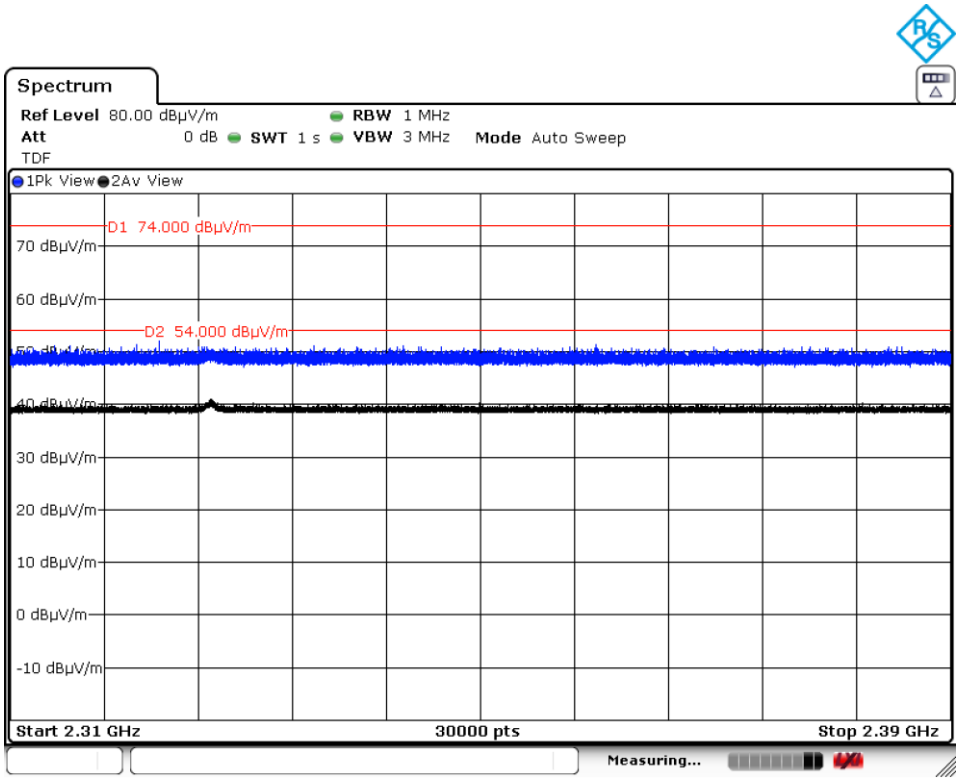
The spurious frequencies detected do not depend on the operating channel.



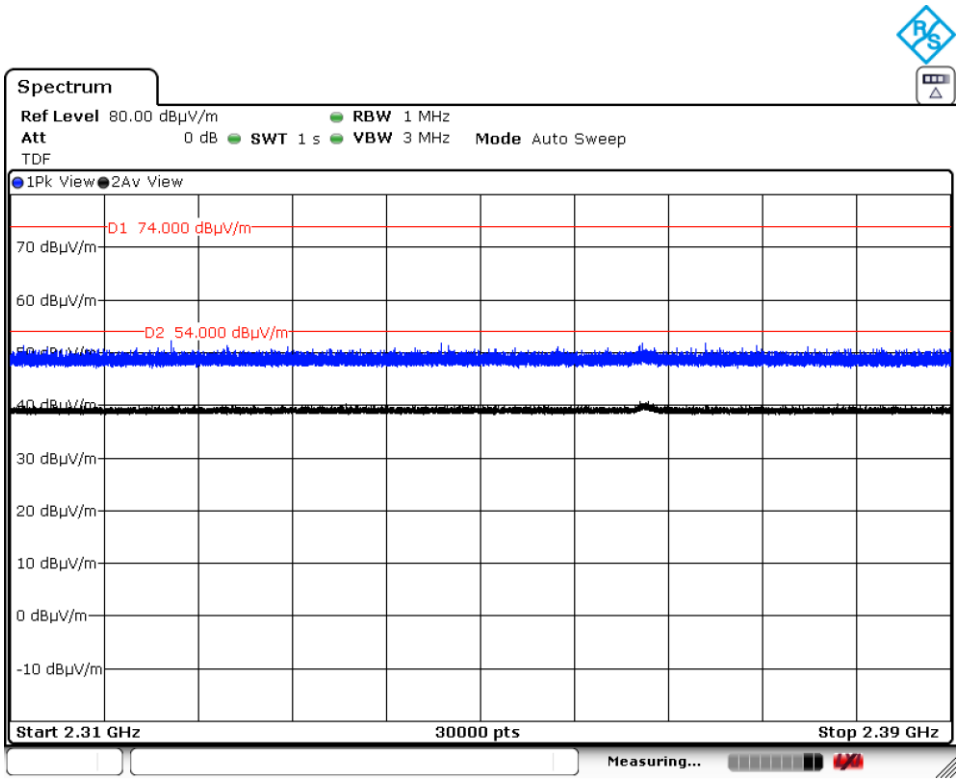
This plot is valid for the Low, Middle and High Channels.

FREQUENCY RANGE 2.31 - 2.39 GHz (Restricted Band 1)

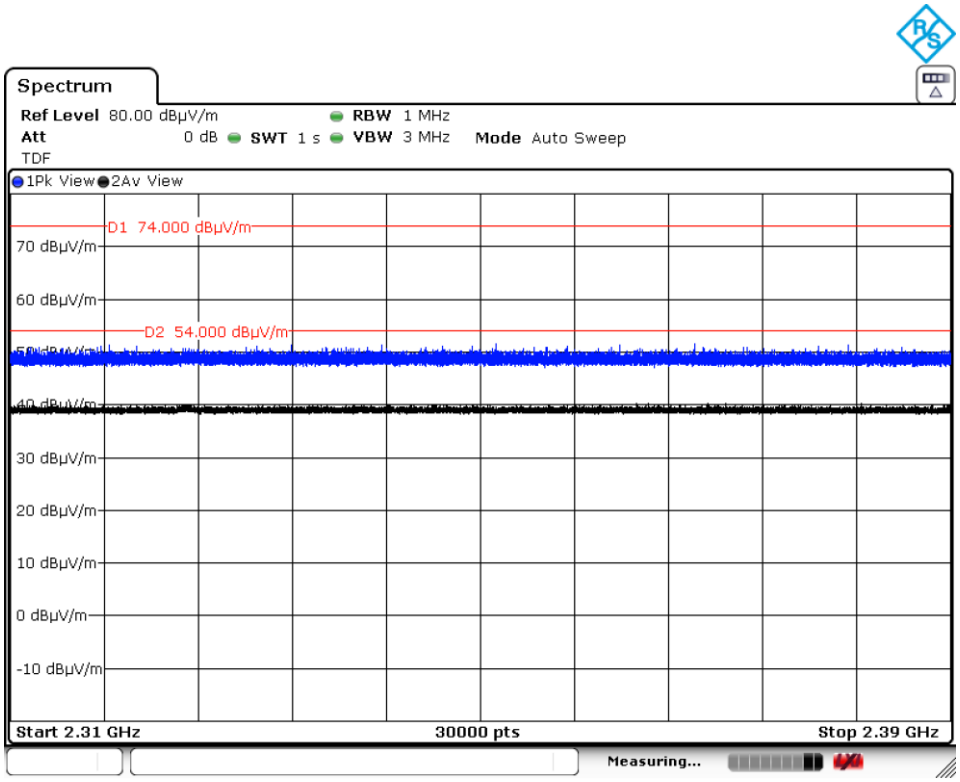
- Low Channel:



- Middle Channel:

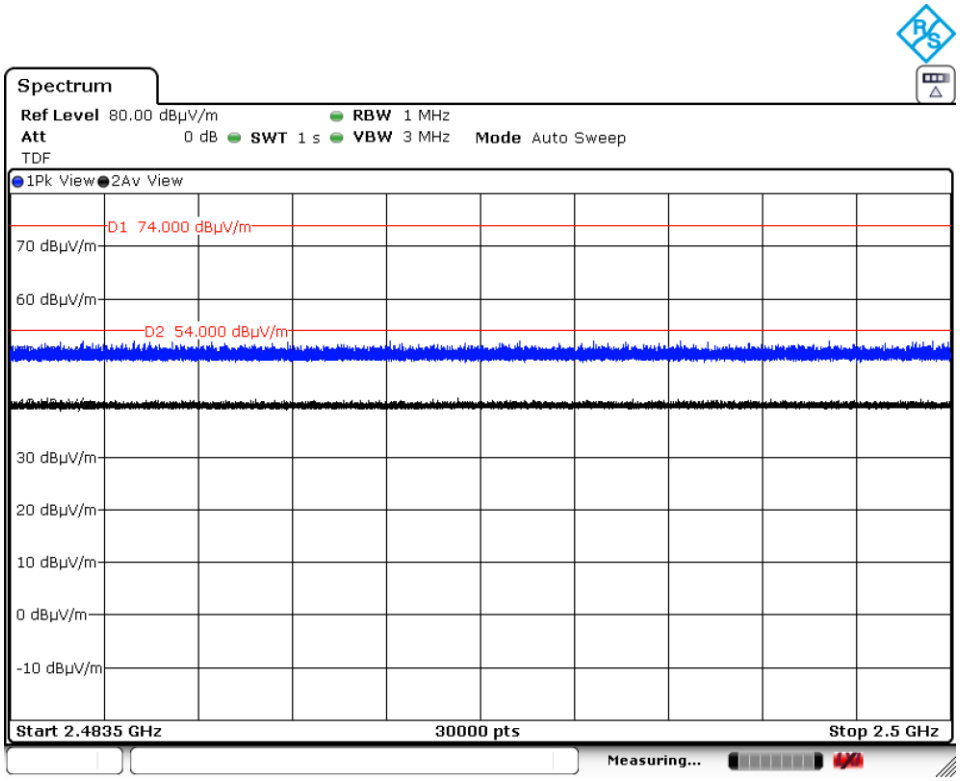


- High Channel:

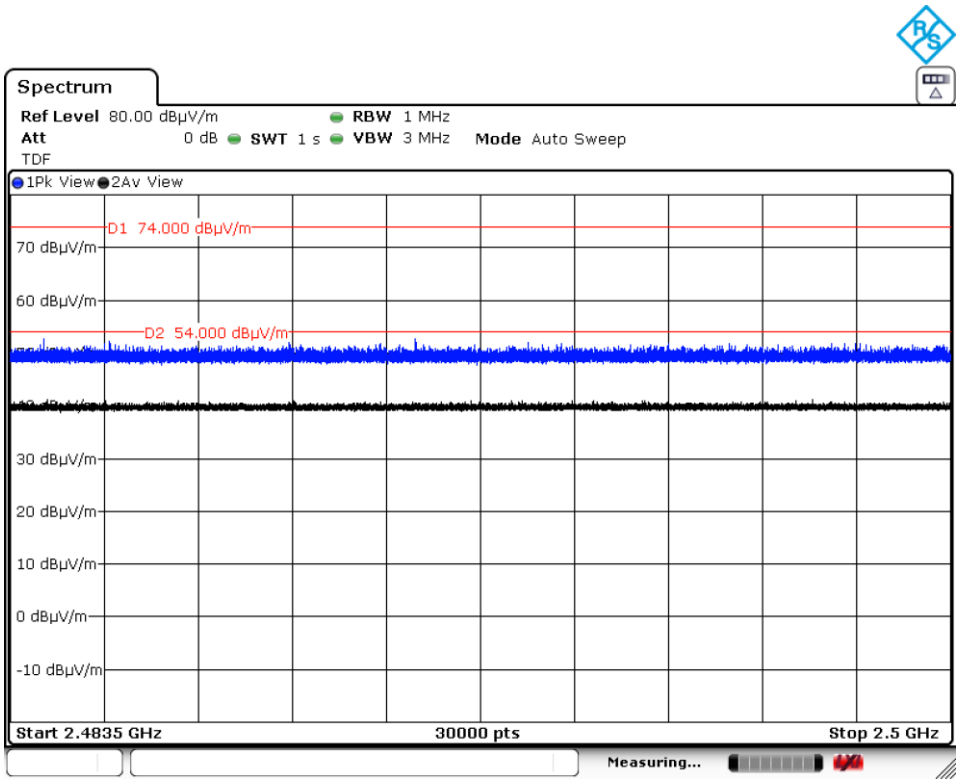
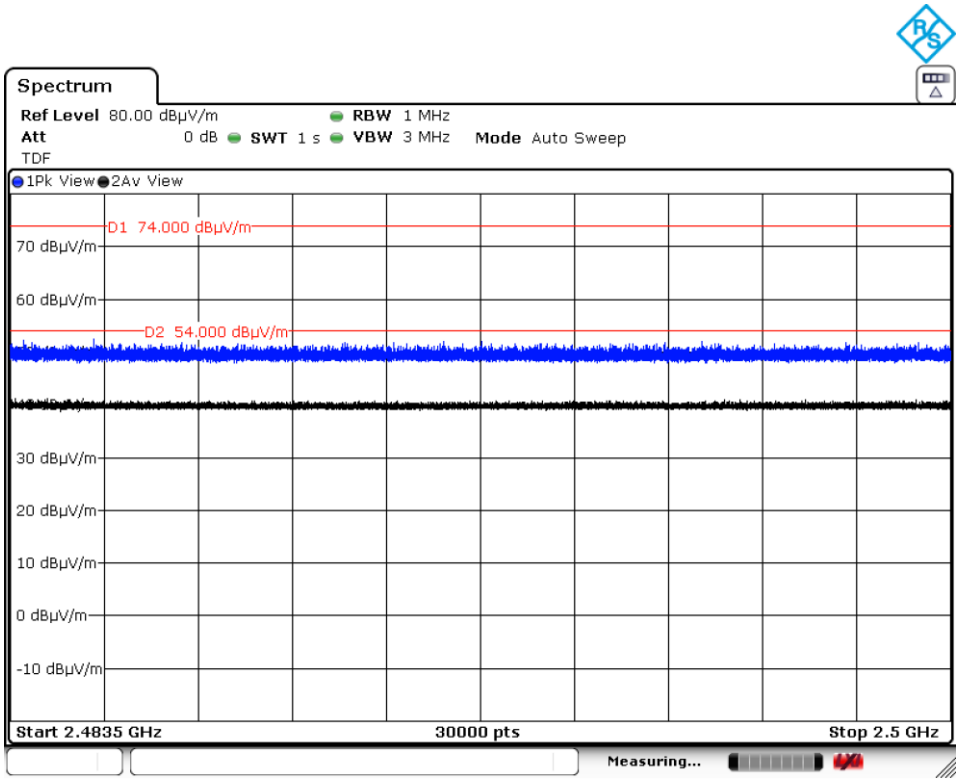


FREQUENCY RANGE 2.4835 - 2.5 GHz (Restricted Band 2)

- Low Channel:



- Middle Channel:



- High Channel: