DEKRA Testing and Certification, S.A.U.
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ISED LISTED
REGISTRATION NUMBER
4621A-4

Test report No:
NIE: 60358RRF.001

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	iSmartgate Wireless Sensor.
Trademark	REMSOL EUROPE
Model and /or type reference	iSG-TWS
Other identification of the product	FCC ID: 2AD3LISG-TWS HW version: V3.3 SW version: V1.0
Features	Proprietary protocol
Applicant	REMSOL EUROPE S.L. Potent n8, Sant Pau de Ordal, 08739 Barcelona (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.
Approved by (name / position & signature)	A. Llamas RF Lab. Manager Firmado digitalmente por ALEJANDRO LLAMAS RODRIGUEZ Fecha: 2019.03.12 14:31:58 +01'00'
Date of issue	2019-03-12
Report template No	FDT08_21

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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 S.A.U. is a laboratory with a measurement site in compliance with the requirements of RSS 212, Issue 1 (Provisional) and has been added to the list of filed sites of the Canadian Certification and Engineering Bureau. Reference File Number: ISED 4621A-4.

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.

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

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 sample consists of a wireless sensor that must be used in conjunction with iSmartgate device. Once it is installed on the garage door, it will send the current status to the iSmartgate device every time that the garage door changes its status (Open <-> closed).

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	Reception
60358/001	iSmartgate Wireless Sensor	iSG-TWS	--	2019/02/13

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

Test sample description

<table>
<tr><td rowspan="2">Ports…… :</td><td rowspan="2">Port name and description</td><td colspan="4">Cable</td></tr>
<tr><td>Specified max length [m]</td><td>Attached during test</td><td>Shielded</td><td>Coupled to patient(3)</td></tr>
<tr><td></td><td>N.A.</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Supplementary information to the ports…… :</td><td colspan="5">N.A.</td></tr>
<tr><td rowspan="3">Rated power supply .....:</td><td colspan="2" rowspan="2">Voltage and Frequency</td><td colspan="5">Reference poles</td></tr>
<tr><td>L1</td><td>L2</td><td>L3</td><td>N</td><td>PE</td></tr>
<tr><td></td><td>AC:</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td colspan="6">DC: Batteries 2x 1.5V (Alkaline).</td></tr>
<tr><td>Rated Power .....:</td><td colspan="6">300nW (average)</td></tr>
<tr><td>Clock frequencies .....:</td><td colspan="6">4Mhz CPU internal clock.</td></tr>
<tr><td>Other parameters.....:</td><td colspan="6"></td></tr>
<tr><td>Software version .....:</td><td colspan="6">V1.0</td></tr>
<tr><td>Hardware version.....:</td><td colspan="6">V3.3</td></tr>
<tr><td>Dimensions in cm (W x H x D)....:</td><td colspan="6">42.4 x 70.4 x 15.5 mm</td></tr>
</table>

Mounting position.....:	X	Other: Garage door Mounted equipment.		
Modules/parts .....:	Module/parts of test item		Type	Manufacturer
Accessories (not part of the test item) .....:	Description		Type	Manufacturer
Documents as provided by the applicant.....:	Description		File name	Issue date

(3) Only for Medical Equipment

Identification of the client

REMSOL EUROPE S.L.
Potent n8, Sant Pau de Ordal, 08739 Barcelona (SPAIN)

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2019-02-13
Date (finish)	2019-02-13

Document history

Report number	Date	Description
60358RRF.001	2019-03-12	First release

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 %
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 1 Ω

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
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 1 Ω
Normal site attenuation (NSA)	< ±4 dB at 10 m distance between item under test and receiver antenna, (30 MHz to 1000 MHz)
Field homogeneity	More than 75% of illuminated surface is between 0 and 6 dB (26 MHz to 1000 MHz).

Remarks and comments

The tests have been performed by the technical personnel: Ignacio Cabra.

Used instrumentation:

Radiated Measurements:

		Last Calibration	Due Calibration
1.	Semianechoic Absorber Lined Chamber ETS LINDGREN FACT 3 200 STP	N.A.	N.A.
2.	EMI Test Receiver 7 GHz ROHDE AND SCHWARZ ESR7	2018/10	2020/10
3.	Pre-amplifier 40 dB, 10 MHz - 6 GHz BONN ELEKTRONIK BLNA 0160-01N	2019/02	2020/08
4.	Biconical/Log Antenna 30MHz - 6GHz ETS LINDGREN 3142E	2017/09	2020/09
5.	Signal and Spectrum Analyzer ROHDE AND SCHWARZ FSV 40	2018/02	2020/02
6.	Pre-amplifier G>30dB, 1-18GHz BONN ELEKTRONIK BLMA 0118-3A	2018/03	2019/03
7.	Broadband Horn antenna 1-18 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9120 D	2018/01	2021/01
8.	Broadband Horn antenna 18 - 40 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9170	2018/07	2021/07

Testing verdicts

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

Summary

1. Proprietary protocol 2.4 GHz

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

Appendix A: Test results. Proprietary protocol 2.4 GHz

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TEST CONDITIONS

POWER SUPPLY (V):

V nominal:	3.0 Vdc
Type of power supply:	Batteries 2x1.5V (Alkaline).
Type of antenna:	Inverted F.
Declared antenna gain:	1.52 dBi

TEST FREQUENCY:

Single Channel:	2401 MHz

RADIATED MEASUREMENTS

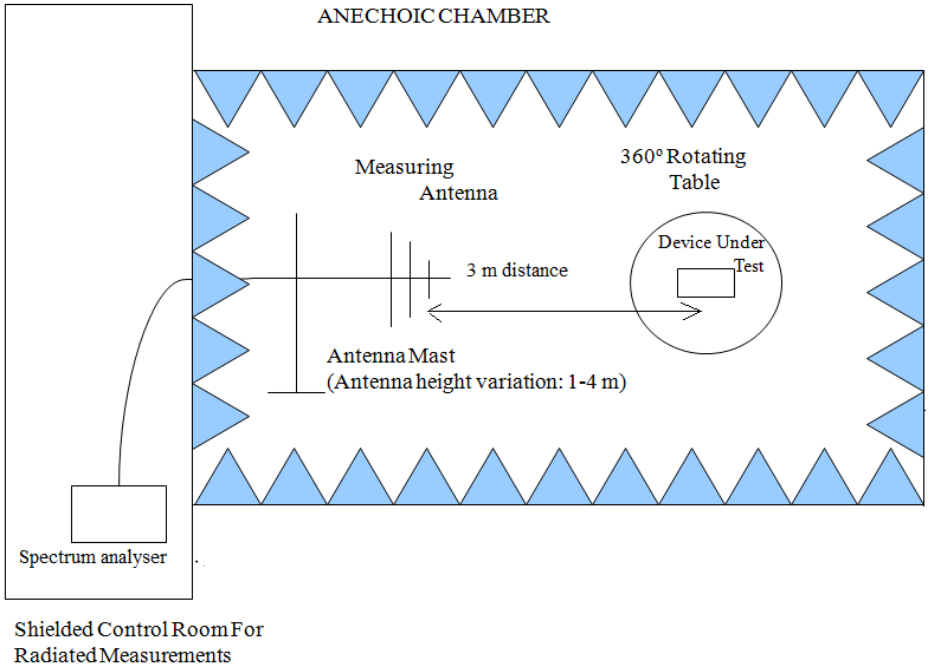
All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m for the frequency range 30 MHz-1000 MHz (30 MHz-1000 MHz Bilog antenna) and at a distance of 1m for the frequency range 1 GHz-26 GHz (1 GHz-18 GHz Double ridge horn antenna and 18 GHz-40 GHz horn antenna).

For radiated emissions in the range 1 GHz-26 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.

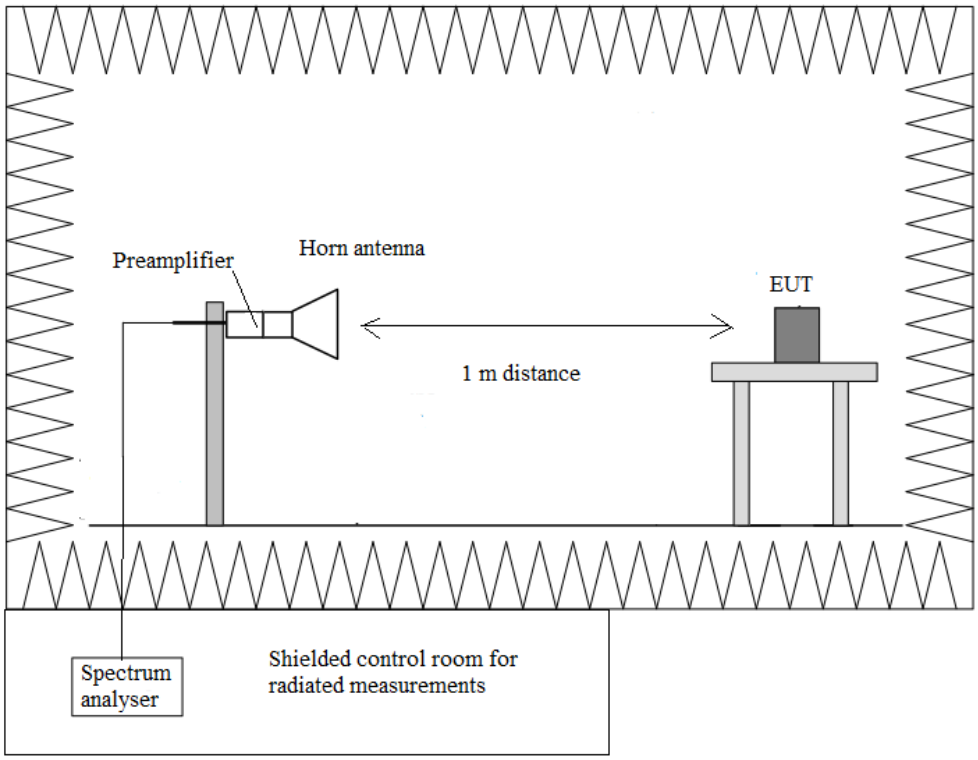
The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

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

Radiated measurements setup f < 1 GHz:



Radiated measurements setup f > 1 GHz:

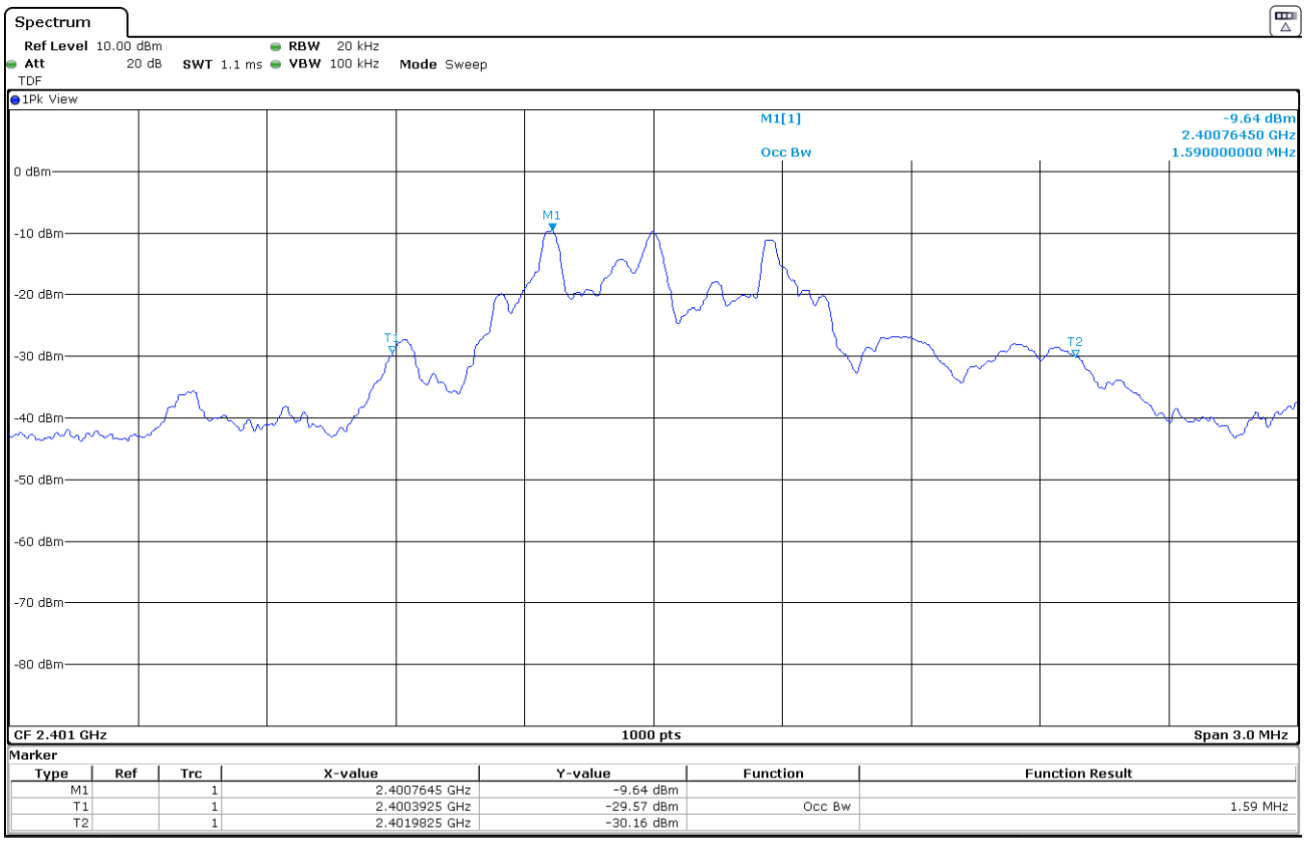


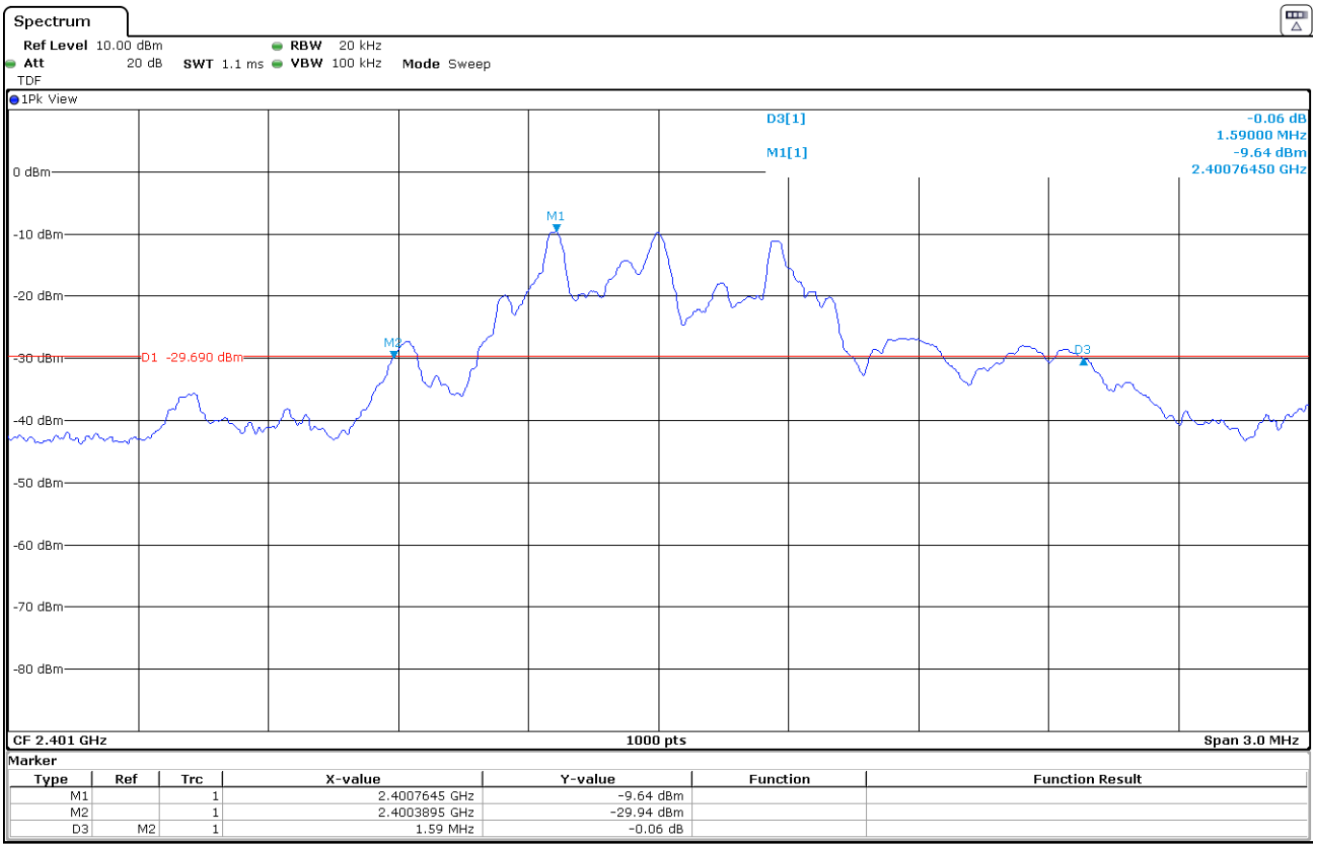
Occupied Bandwidth

RESULTS:

	Single Channel 2401 MHz
99% Bandwidth (MHz)	1.59
-20 dBc Bandwidth (MHz)	1.59
Measurement Uncertainty (kHz)	<±0.35

- Single Channel:




Spectrum
Ref Level 10.00 dBm
RBW 20 kHz
Att 20 dB
SWT 1.1 ms
VBW 100 kHz
Mode Sweep
TDF
1Pk View
D3[1]
-0.06 dB
1.59000 MHz
M1[1]
-9.64 dBm
2.40076450 GHz
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
M1
M2
D1 -29.690 dBm
D3
CF 2.401 GHz
1000 pts
Span 3.0 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.4007645 GHz -9.64 dBm
M2 1 2.4003895 GHz -29.94 dBm
D3 M2 1 1.59 MHz -0.06 dB

Section 15.249 Subclause (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

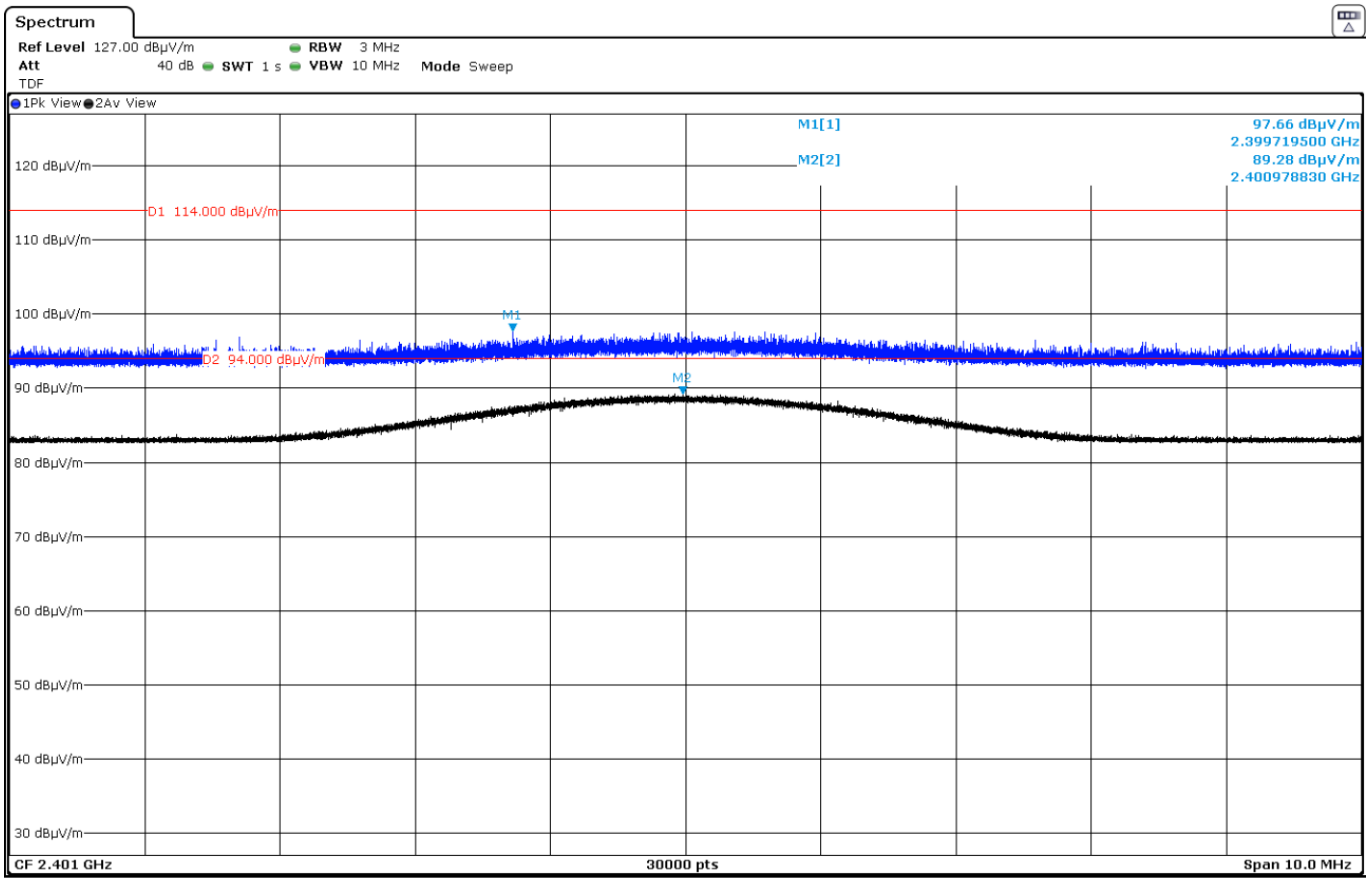
For frequencies above 1000 MHz, the above field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

RESULTS:

	Single Channel 2401 MHz
Average Field Strength (dBµV/m)	89.28
Peak Field Strength (dBµV/m)	97.66
Measurement Uncertainty (dB)	<±3.05

Verdict: PASS

- Single Channel:



Section 15.249 Subclause (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-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.

Frequency range 30 MHz - 1 GHz.

No spurious frequencies at less than 20 dB of the limit.

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 (see next plots).

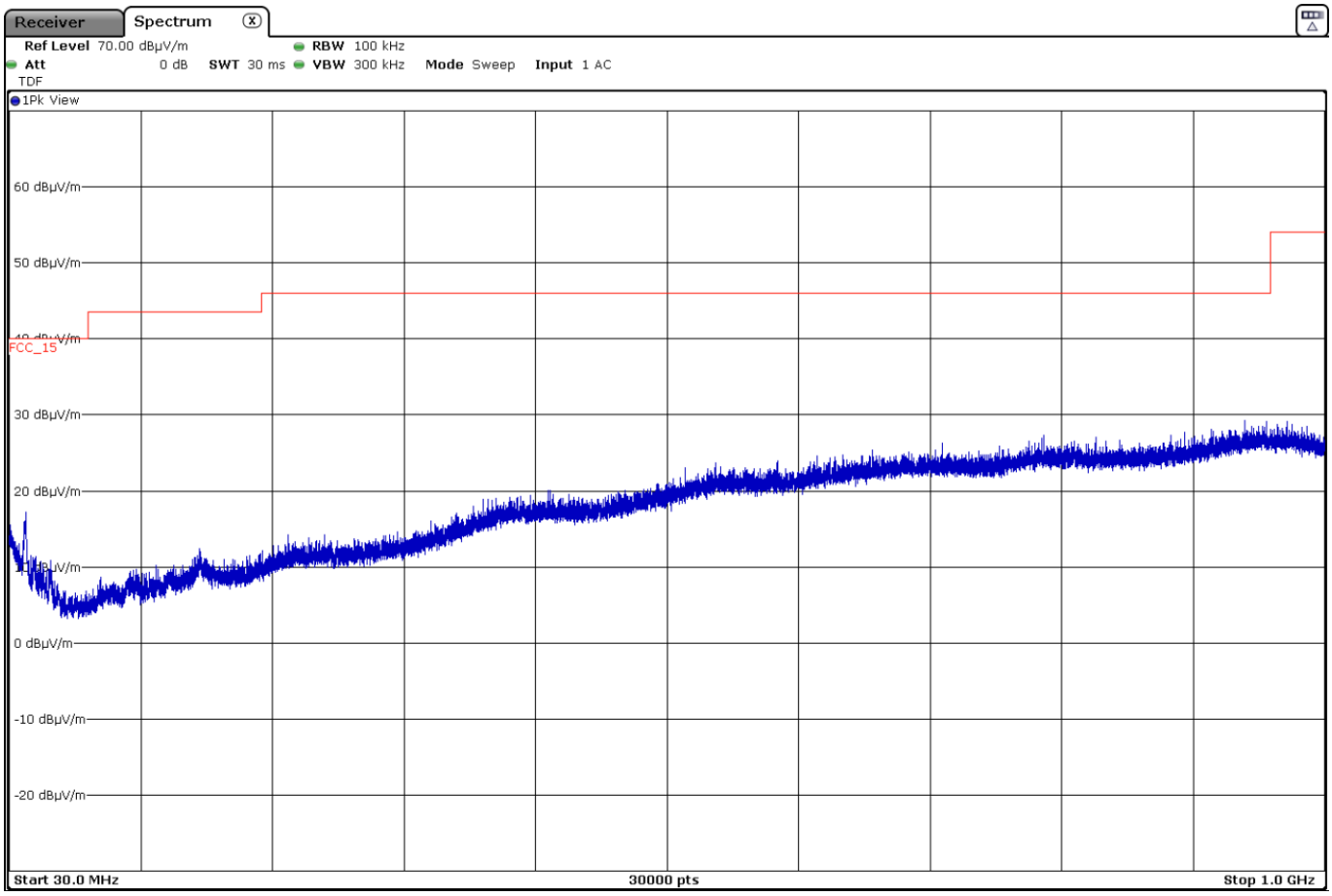
Spurious signals with peak levels above the average limit (54 dBµV/m at 3 m) are measured with average detector for checking compliance with the average limit.

- Single Channel (2401 MHz):

Spurious frequency (GHz)	Detector	Emission Level (dBµV/m)	Polarization	Measurement Uncertainty (dB)
2.38980	Peak	55.45	V	<±3.70
	Average	40.12		<±3.70
2.49306	Peak	51.99	H	<±3.70
4.80250	Peak	47.20	H	<±3.70

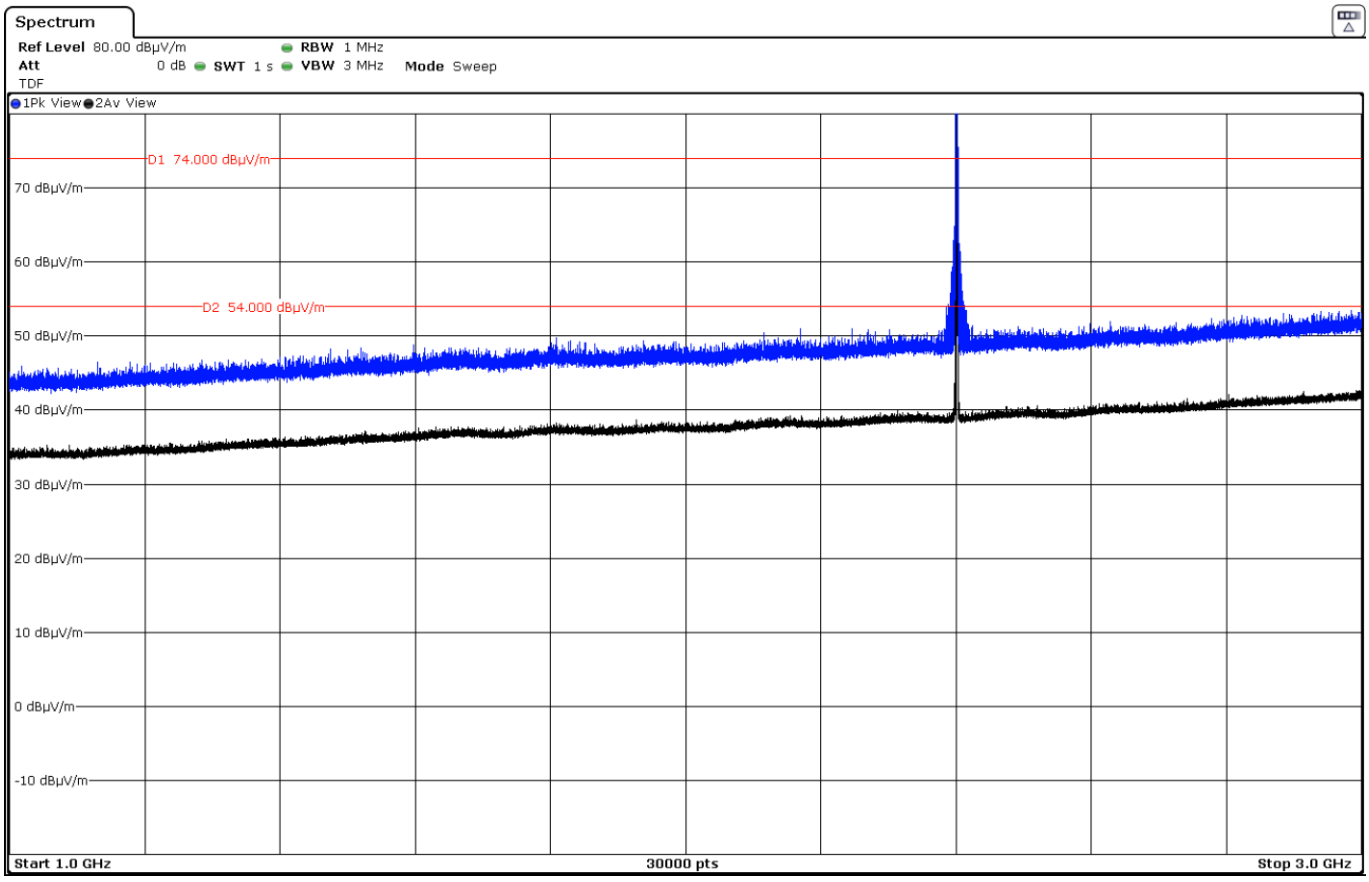
Verdict: PASS

FREQUENCY RANGE 30 MHz - 1 GHz



FREQUENCY RANGE 1 - 3 GHz

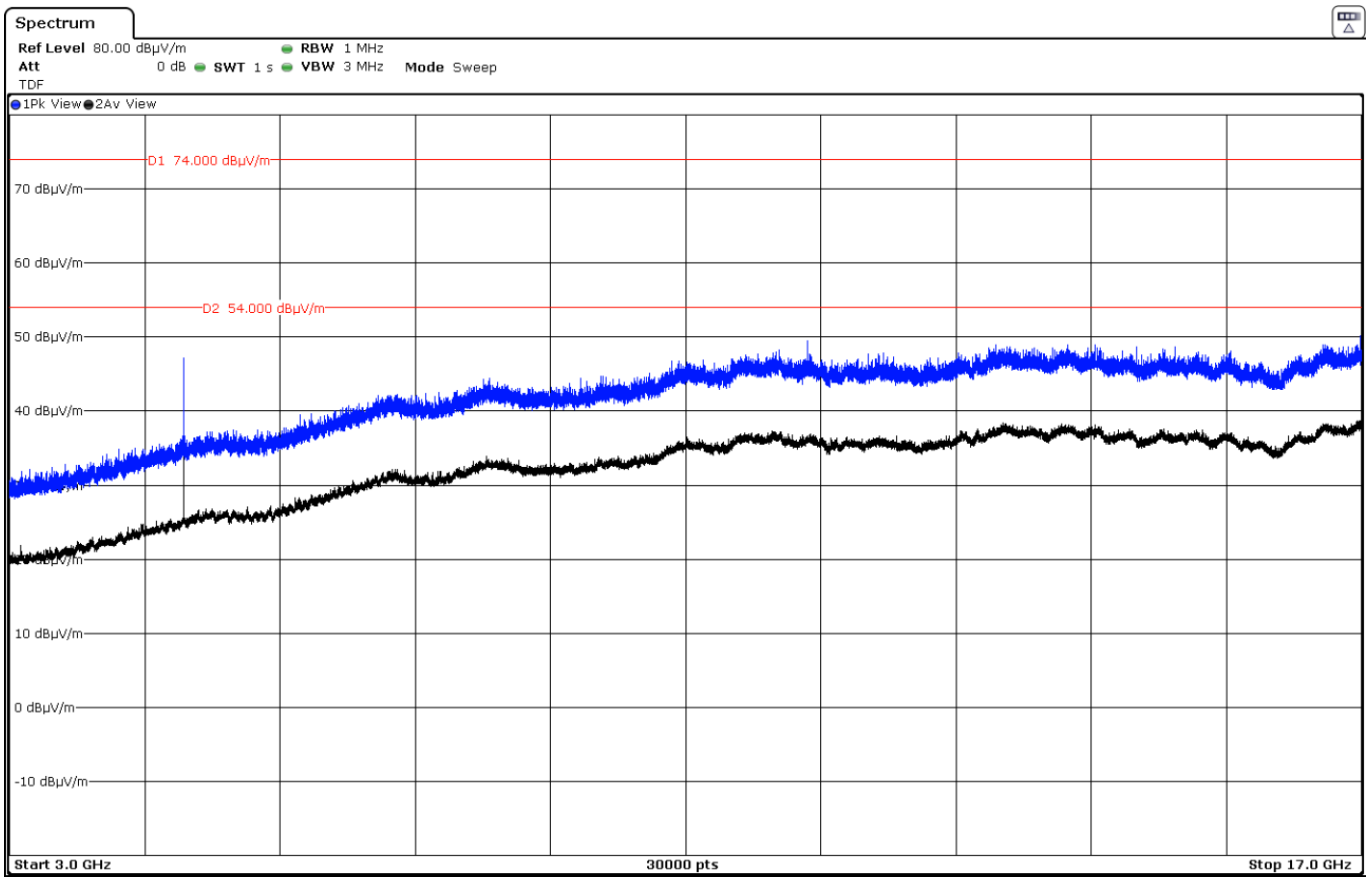
- Single Channel:



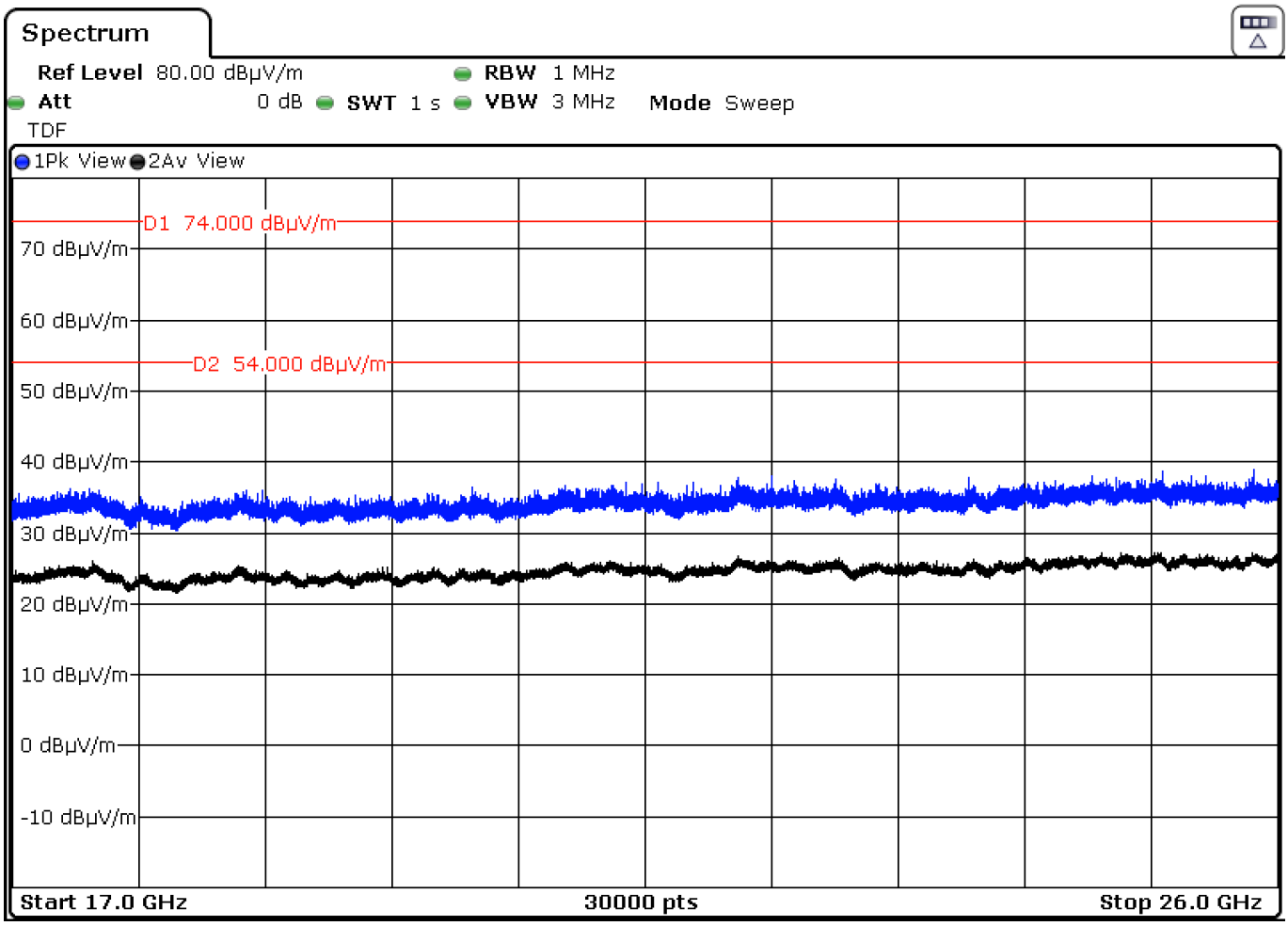
The peak shown in the plot above the limit is the carrier frequency.

FREQUENCY RANGE 3 - 17 GHz

- Single Channel:

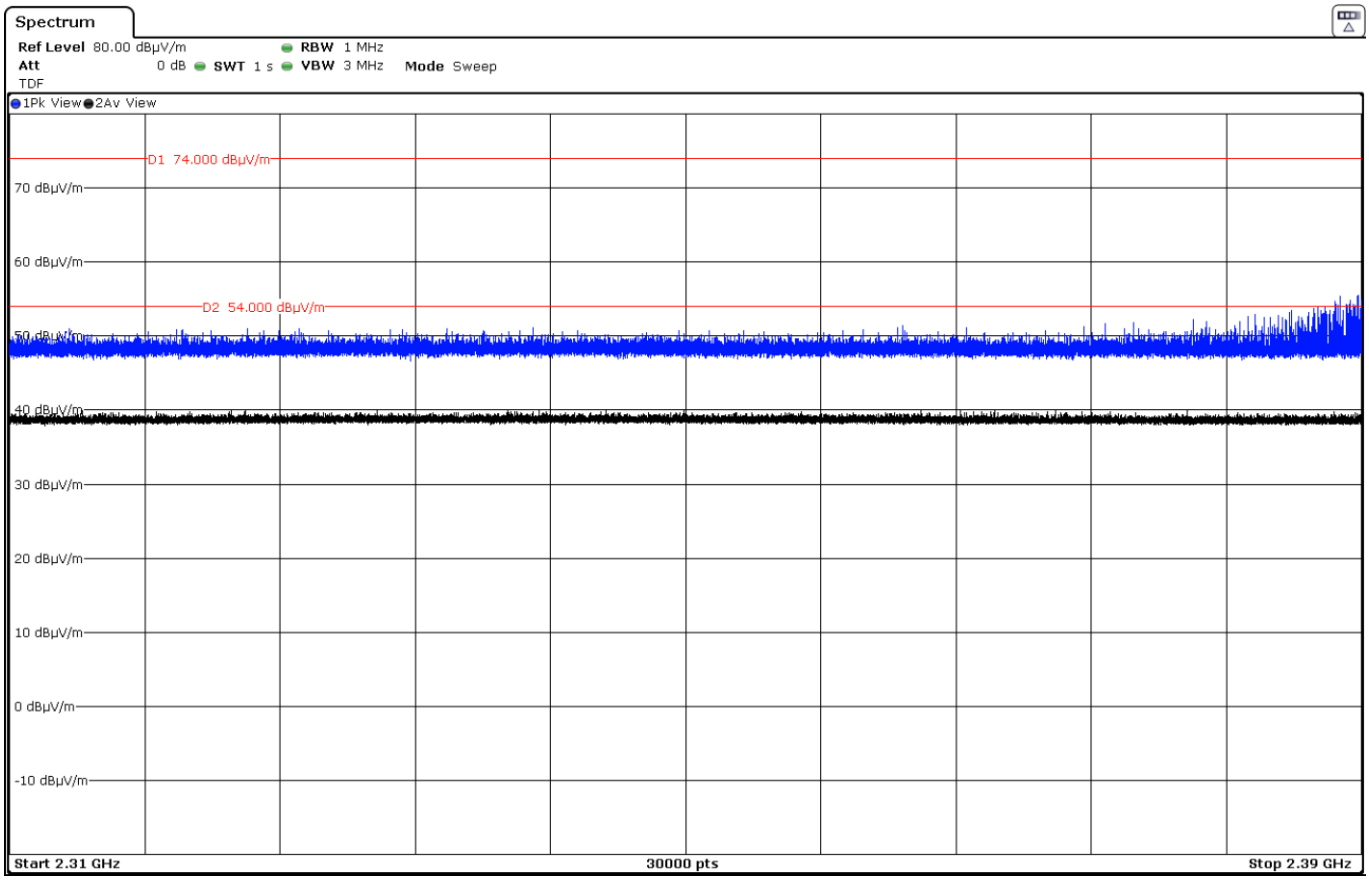


FREQUENCY RANGE 17 - 26 GHz



FREQUENCY RANGE 2.31 - 2.39 GHz (Restricted Band 1)

- Single Channel:



FREQUENCY RANGE 2.4835 - 2.5 GHz (Restricted Band 2)

- Single Channel: