



ISED LISTED
 REGISTRATION
 NUMBER 4621A-4

Test report No:
 NIE: 60372RRF.001A1

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	Indoor locator.
Trademark	Nokia HAIP Locator.
Model and /or type reference	LD-6L.
Other identification of the product	HW version: 2. SW version: 1. FCC ID: 2AEJSLD-6L. IC: 661F-LD6L.
Features	Data not provided.
Applicant	NOKIA INNOVATIONS OY, Karaportti 3, 02610 Espoo, Finland
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. - Section 15.247 Subclause (b) / RSS-247 5.4. (d) Maximum output power and antenna gain. - Section 15.247 Subclause (d) / RSS-247 5.5. Emission limitations radiated (Transmitter).

Approved by (name / position & signature)	A. Llamas RF Lab. Manager
Date of issue	2019-06-18
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.

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 sample consists of an indoor locator.

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 S/01 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Reception
60372/003	Indoor locator	LD-6L	P2R91160782	2019/04/17

Auxiliary elements used with the sample S/01:

Control Nº	Description	Model	Serial Nº	Reception
60372/007	AC Charging Cable	--	--	2019/04/17

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

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

Control Nº	Description	Model	Serial Nº	Reception
60372/002	Indoor locator	LD-6L	P2R91160791	2019/04/17

Auxiliary elements used with the sample S/02:

Control Nº	Description	Model	Serial Nº	Reception
60372/007	AC Charging Cable	--	--	2019/04/17

Sample S/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⁾		
	LAN 10/100 PoE	10 m	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Supplementary information to the ports..... :							
Rated power supply	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	<input type="checkbox"/>	AC:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	AC:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input checked="" type="checkbox"/>	DC: PoE power 48V					
<input checked="" type="checkbox"/>	DC: 12V						
Rated Power	< 1.92W (<40mA @48V PoE supply power)						
Clock frequencies	Crystal frequencies 16MHz, 25MHz, 32MHz						
Other parameters..... :							
Software version							
Hardware version..... :							
Dimensions in cm (W x H x D)..... :							
Mounting position..... :	<input type="checkbox"/>	Table top equipment					
	<input type="checkbox"/>	Wall/Ceiling mounted equipment					
	<input type="checkbox"/>	Floor standing equipment					
	<input type="checkbox"/>	Hand-held equipment					
	<input type="checkbox"/>	Other:					

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

Identification of the client

HALTIAN LTD
 YRTTIPELLONTIE 1D, 90230 OULU, FINLAND

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2019-04-17
Date (finish)	2019-04-24

Document history

Report number	Date	Description
60372RRF.001	2019-06-07	First release
60372RRF.001A1	2019-06-18	Second release. Correction of wrong information about the Applicant in the cover sheet. This modification test report cancels and replaces the test report 60372RRF.001.

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 %

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 %

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

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 35 %

Remarks and comments

The tests have been performed by the technical personnel: Francisco José Alcaide, Nicolás Salguero Camarena and Miguel Ángel Torres.

Used instrumentation:

Conducted Measurements:

	Last Calibration	Due Calibration
1. Spectrum Analyzer ROHDE AND SCHWARZ FSW50	2018/02	2020/02

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. Biconical/Log Antenna 30MHz - 6GHz ETS LINDGREN 3142E	2017/09	2020/09
4. RF Pre-amplifier 40 dB, 10 MHz - 6 GHz BONN ELEKTRONIK BLNA 0160-01N	2019/02	2020/08
5. Signal and Spectrum Analyzer ROHDE AND SCHWARZ FSV40	2018/02	2020/02
6. RF Pre-amplifier G>30dB, 1-18GHz BONN ELEKTRONIK BLMA 0118-3A	2019/04	2020/04
7. RF Pre-amplifier, G>48dB, 18-40GHz NARDA JS44-18004000-33-8P	2018/02	2020/02
8. Broadband Horn antenna 1-18 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9120 D	2018/01	2021/01
9. 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 radio

FCC PART 15 PARAGRAPH / RSS-247			
Requirement – Test case		Verdict	Remark
Section 15.247 Subclause (a) (2) / RSS-247 5.2. (a)	6 dB Bandwidth	N/M	(1)
Section 15.247 Subclause (b) / RSS-247 5.4. (d)	Maximum output power and antenna gain	P	
Section 15.247 Subclause (d) / RSS-247 5.5	Emission limitations conducted (Transmitter)	N/M	(1)
Section 15.247 Subclause (d) / RSS-247 5.5.	Band-edge emissions compliance (Transmitter)	N/M	(1)
Section 15.247 Subclause (e) / RSS-247 5.2. (b)	Power spectral density	N/M	(1)
Section 15.247 Subclause (d) / RSS-247 5.5.	Emission limitations radiated (Transmitter)	P	
<u>Supplementary information and remarks:</u>			
(1) Test not requested.			

Appendix A: Test results. Proprietary radio.

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TEST CONDITIONS

POWER SUPPLY (V):

V nominal:	48 Vdc
Type of Power Supply:	PoE.
Type of Antenna:	Internal (Printed).
Maximum Declared Antenna Gain:	-4.5 dBi

TEST FREQUENCIES:

Low Channel:	2401 MHz
Middle Channel:	2441 MHz
High Channel:	2481 MHz

CONDUCTED MEASUREMENTS

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



RADIATED MEASUREMENTS

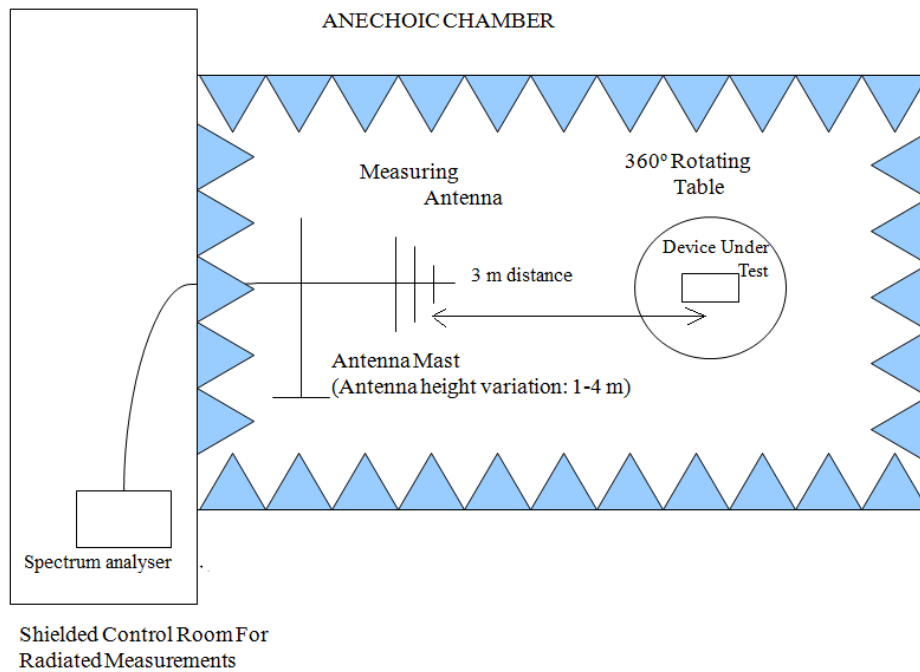
All radiated tests were performed in a semi-anechoic chamber. The measurement antenna (Bilog antenna for the range between 30 MHz to 1000 MHz) is situated at a distance of 3 m and at a distance of 1m for the frequency range 1 GHz-26 GHz (1 GHz-18 GHz Double ridge horn antenna and 18 GHz-40 GHz horn antenna).

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.

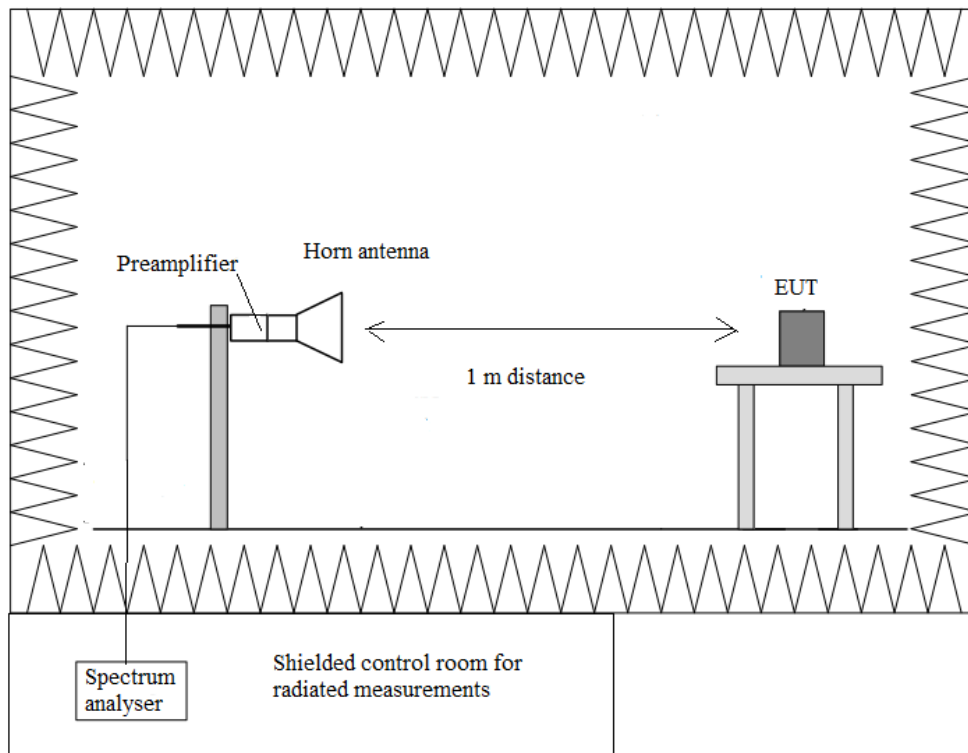
The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height (Bilog antenna and Double ridge horn antenna) was varied from 1 to 4 meters to find 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 $f > 1$ GHz:



FCC Section 15.247 Subclause (b) / RSS-247 Clause 5.4 (d) Maximum output power and antenna gain

SPECIFICATION:

For systems using digital modulation in the 2400-2483.5 MHz band: 1 watt (30 dBm).

The e.i.r.p. shall not exceed 4 W (36 dBm) (Canada).

RESULTS:

The maximum peak conducted output power was measured using the method according to point 8.3.1.1. of Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under Section 15.247 558074 D01 DTS Meas Guidance v05r02 dated 2019/04/02.

The EIRP power (dBm) is calculated by adding the declared maximum antenna gain to the measured conducted power.

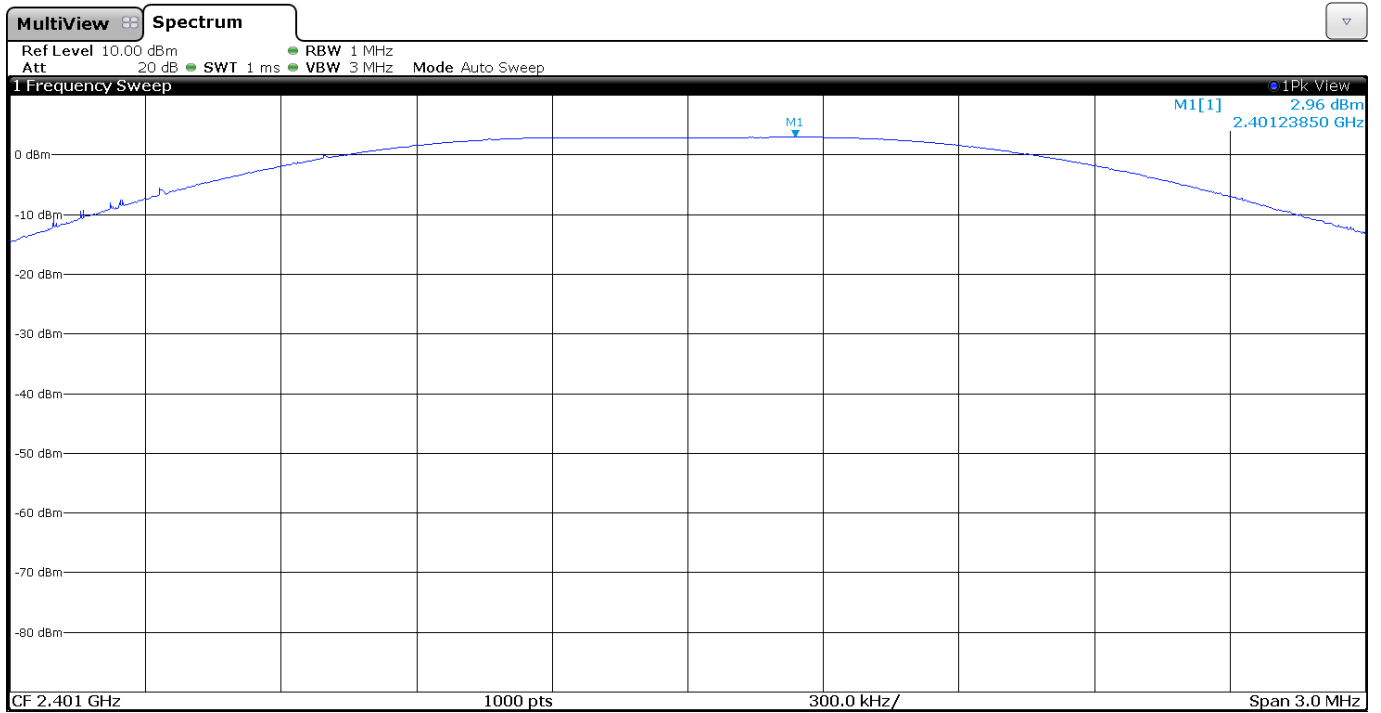
Maximum Declared Antenna Gain: -4.5 dBi

	Low Channel 2401 MHz	Middle Channel 2441 MHz	High Channel 2481 MHz
Maximum Conducted Power (dBm)	+2.96	+2.88	+2.67
Maximum EIRP Power (dBm)	-1.54	-1.62	-1.83
Measurement uncertainty (dB)	<±1.20		

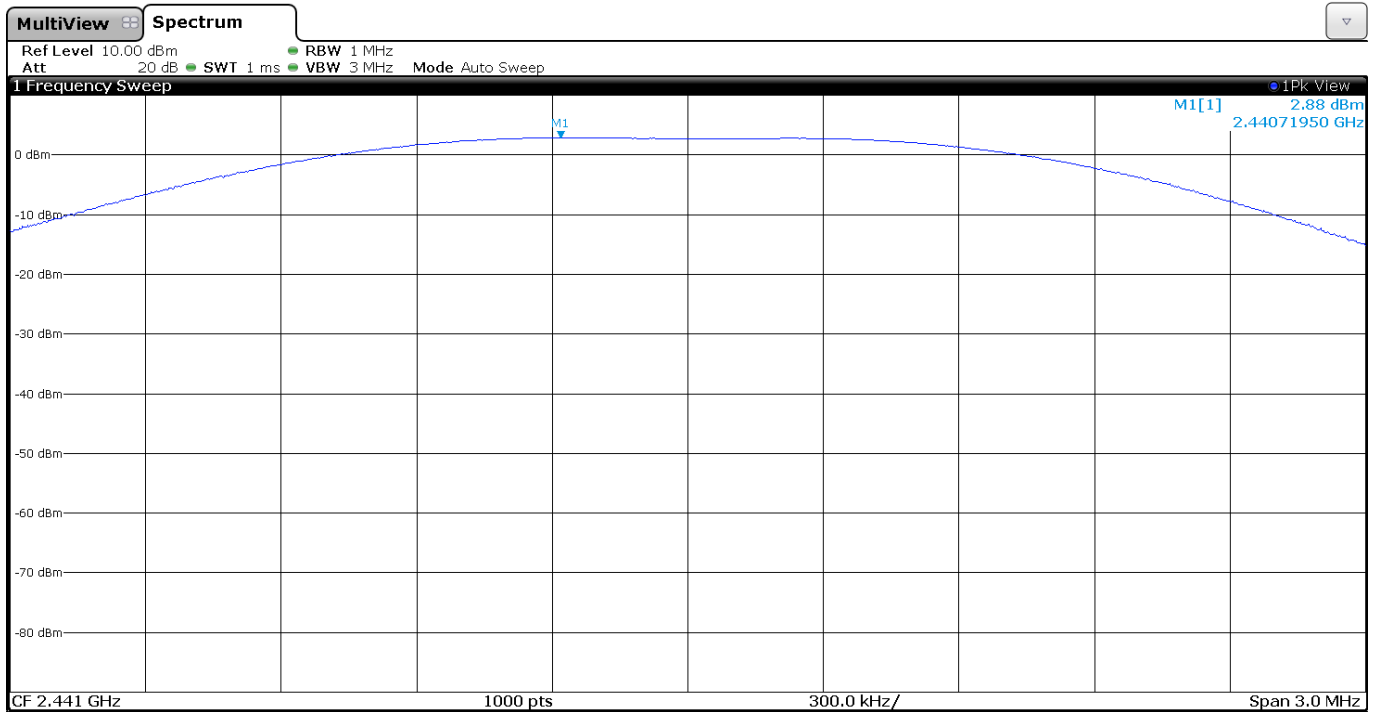
The maximum directional gain of the antenna is less than 6 dBi and therefore the maximum output power is not required to be reduced from the stated values.

Verdict: PASS

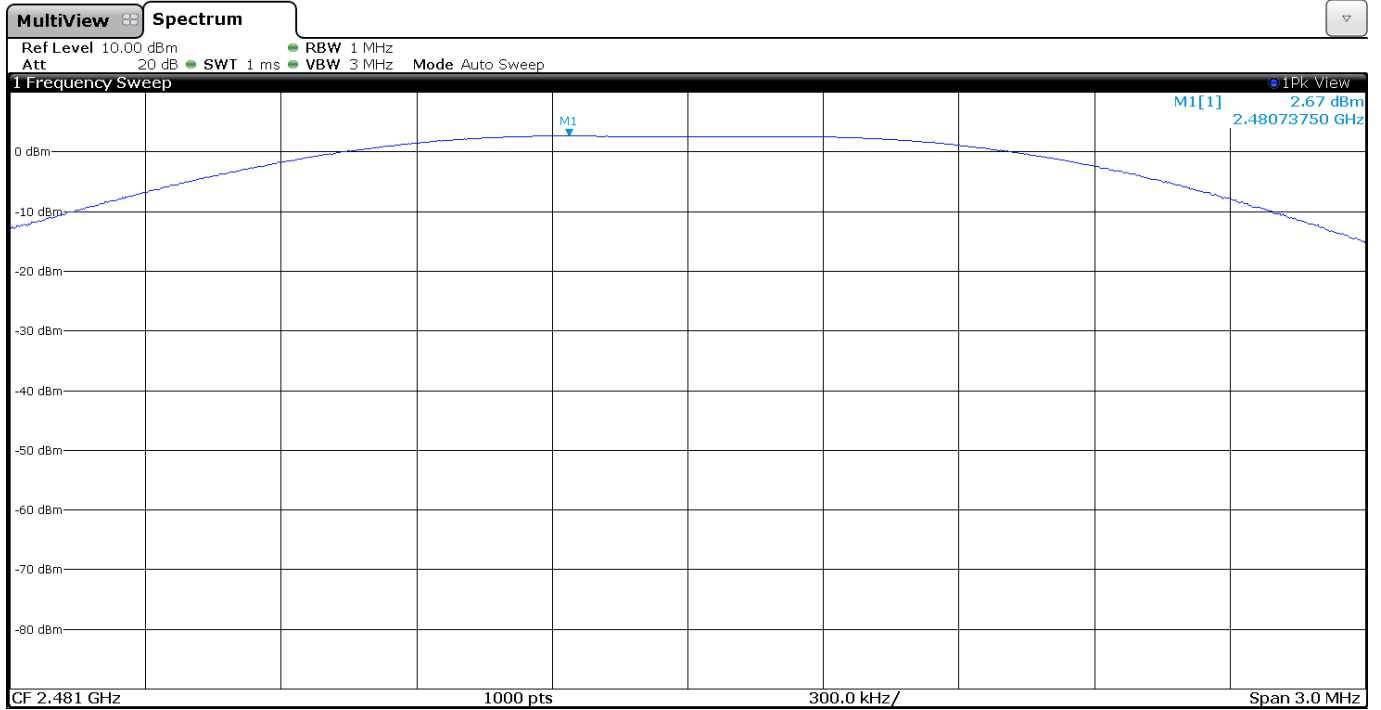
- Low Channel:



- Middle Channel:



- High Channel:



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

SPECIFICATION:

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 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 - 10000	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-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:

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

Spurious signals closest to the limit:

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
51.13	V	Quasi peak	28.1	<± 3.86
64.257	V	Quasi peak	25.2	<± 3.86
432.017	V	Quasi peak	38.7	<± 3.86
479.999	V	Quasi peak	33.4	<± 3.86
528.014	V	Quasi peak	31.8	<± 3.86
624.012	V	Quasi peak	26.4	<± 3.86

Frequency range 1 - 26 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.

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.

1. CHANNEL: LOWEST (2402 MHz).

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.37070	V	Peak	52.52	<± 4.72
4.80228	V	Peak	42.82	<± 4.72
7.20377	V	Peak	43.15	<± 4.72

2. CHANNEL: MIDDLE (2441 MHz).

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

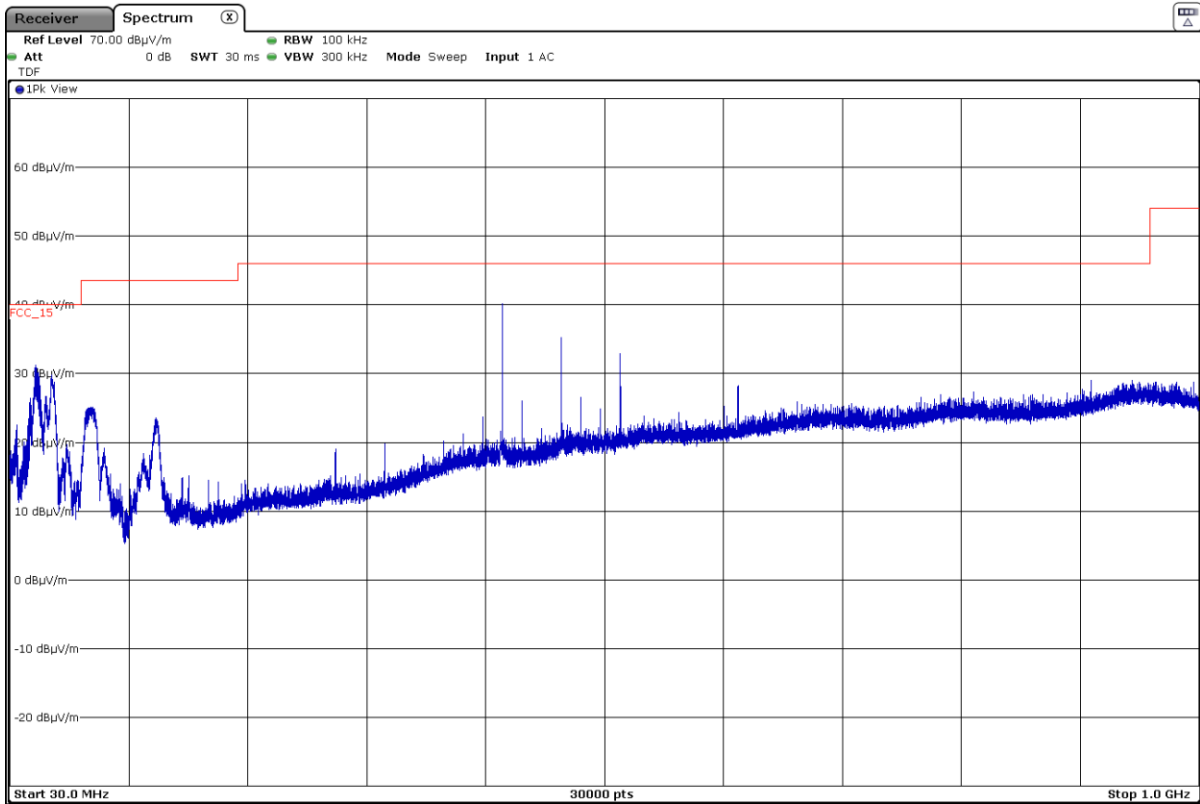
3. CHANNEL: HIGHEST (2480 MHz).

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.48983	H	Peak	53.7	<± 4.72
4.96009	H	Peak	39.64	<± 4.72

Verdict: PASS

FREQUENCY RANGE 30 MHz - 1 GHz:

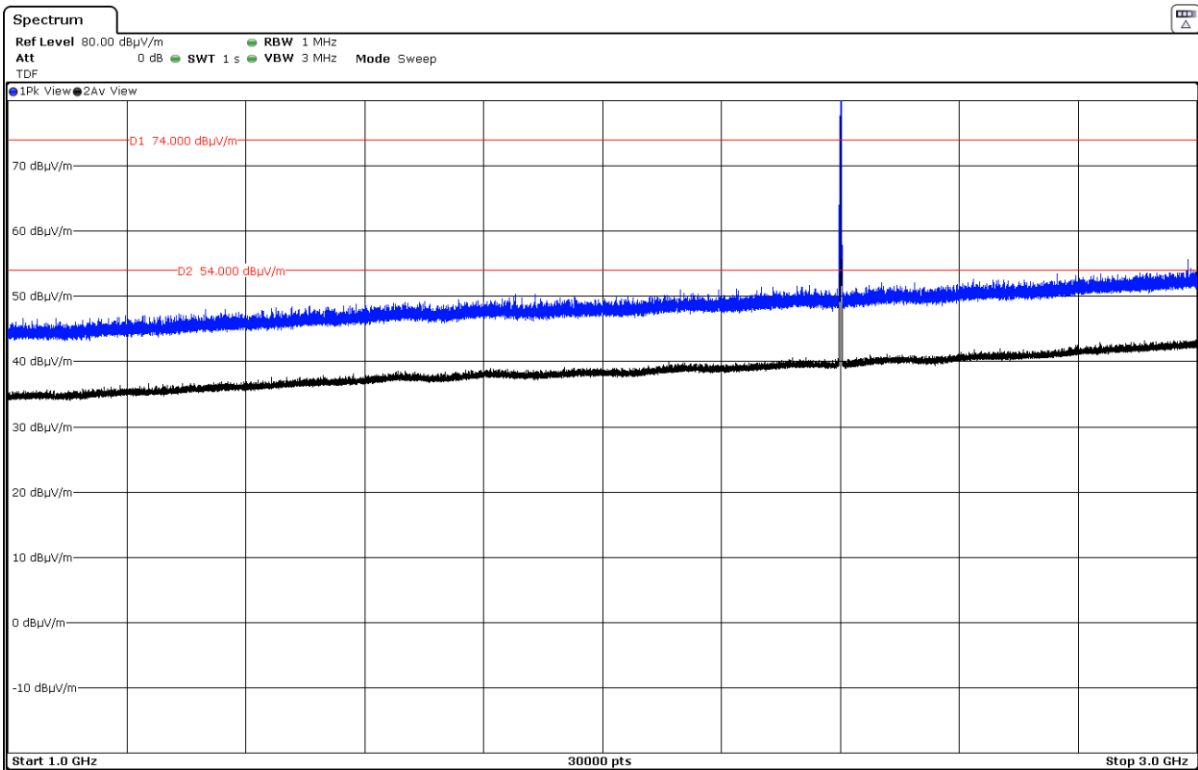
The spurious signals detected do not depend on the operating channel.



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

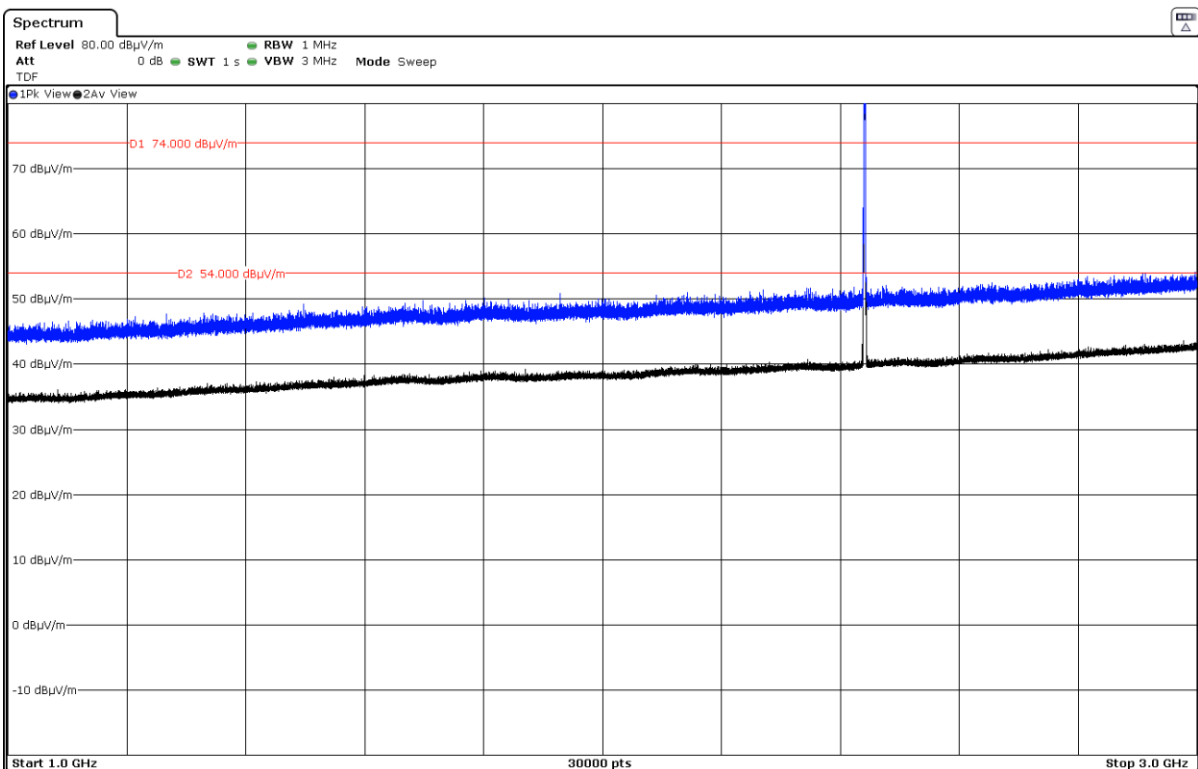
FREQUENCY RANGE 1 - 3 GHz:

CHANNEL: LOWEST (2402 MHz).



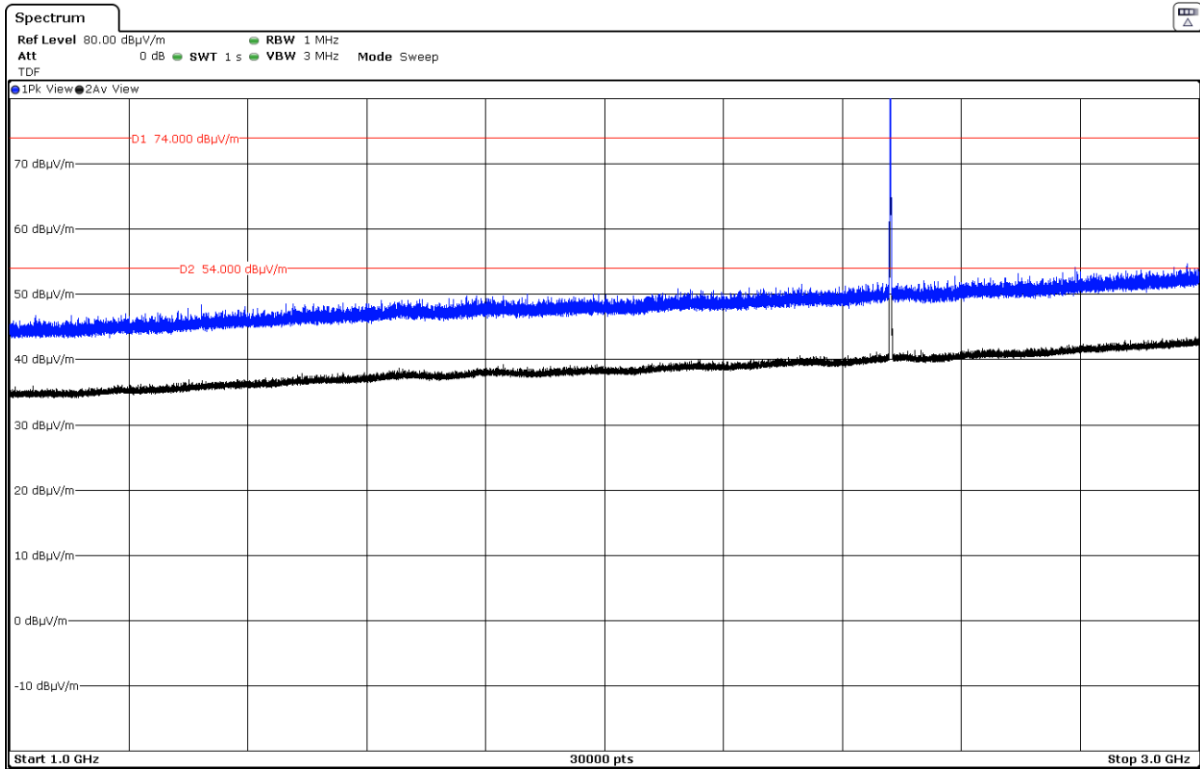
The peak above the limit is the carrier frequency.

CHANNEL: MIDDLE (2440 MHz).



The peak above the limit is the carrier frequency.

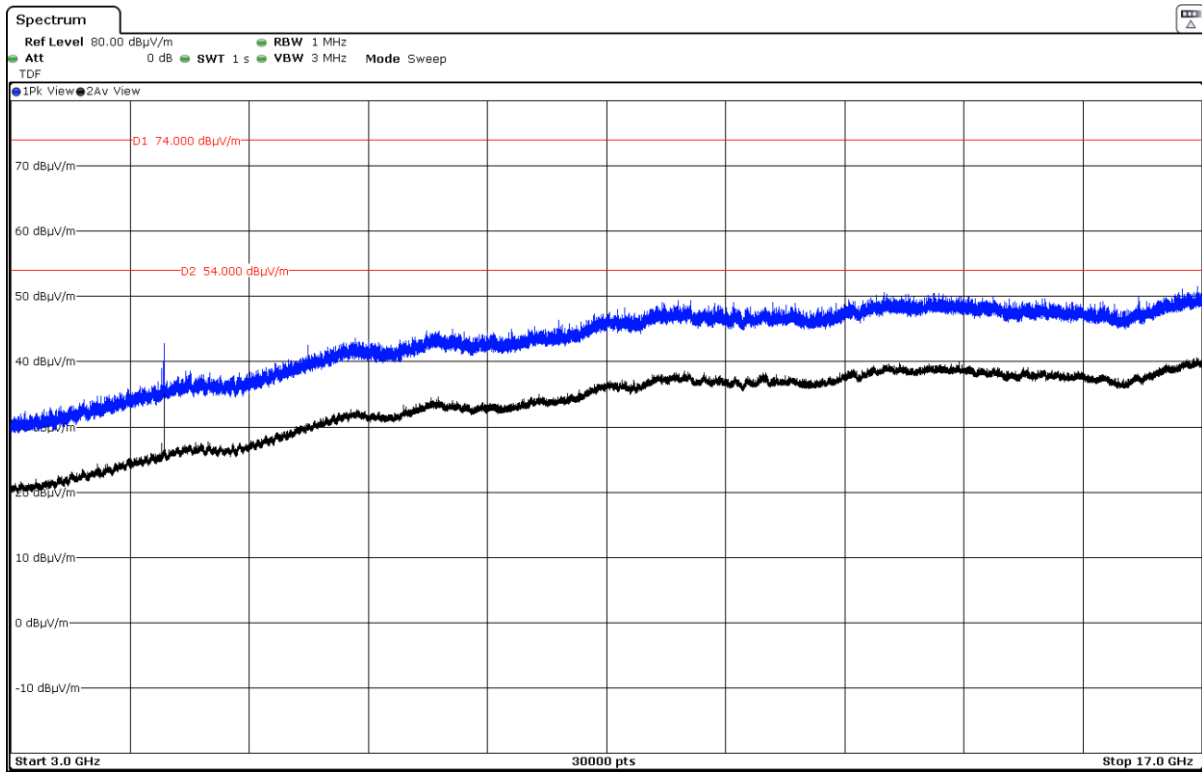
CHANNEL: HIGHEST (2480 MHz).



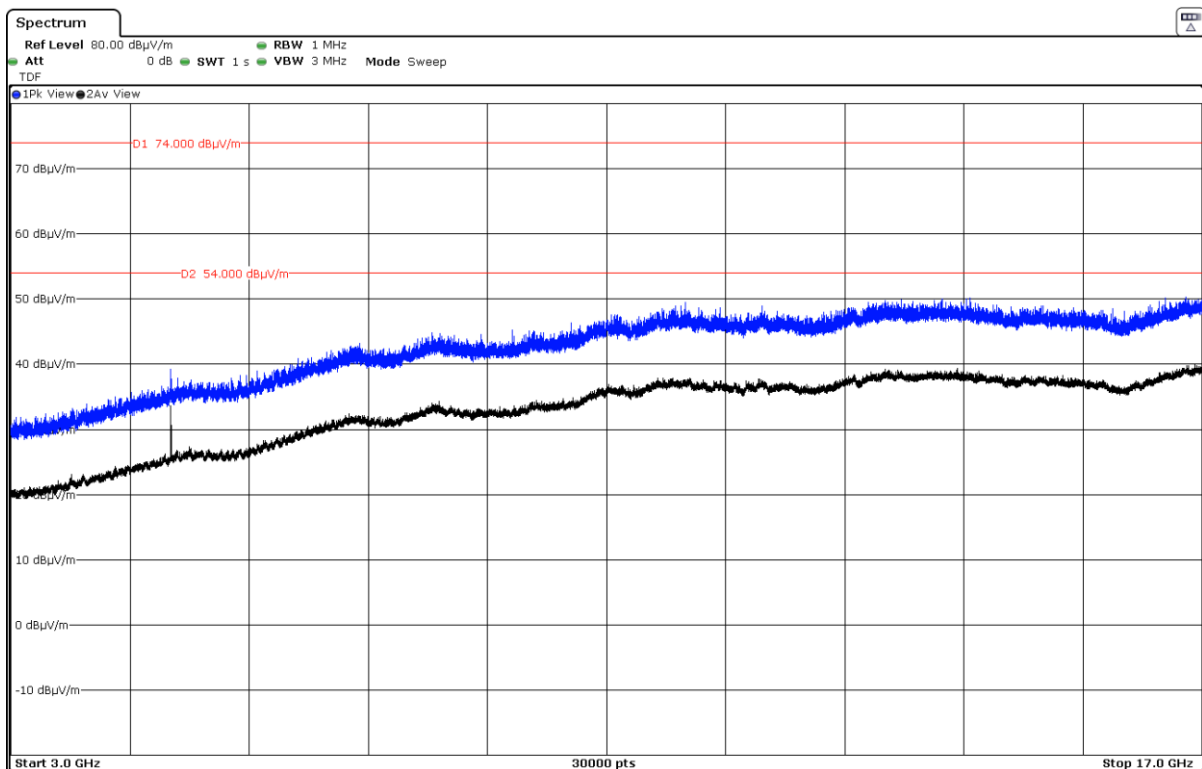
The peak above the limit is the carrier frequency.

FREQUENCY RANGE 3 - 17 GHz:

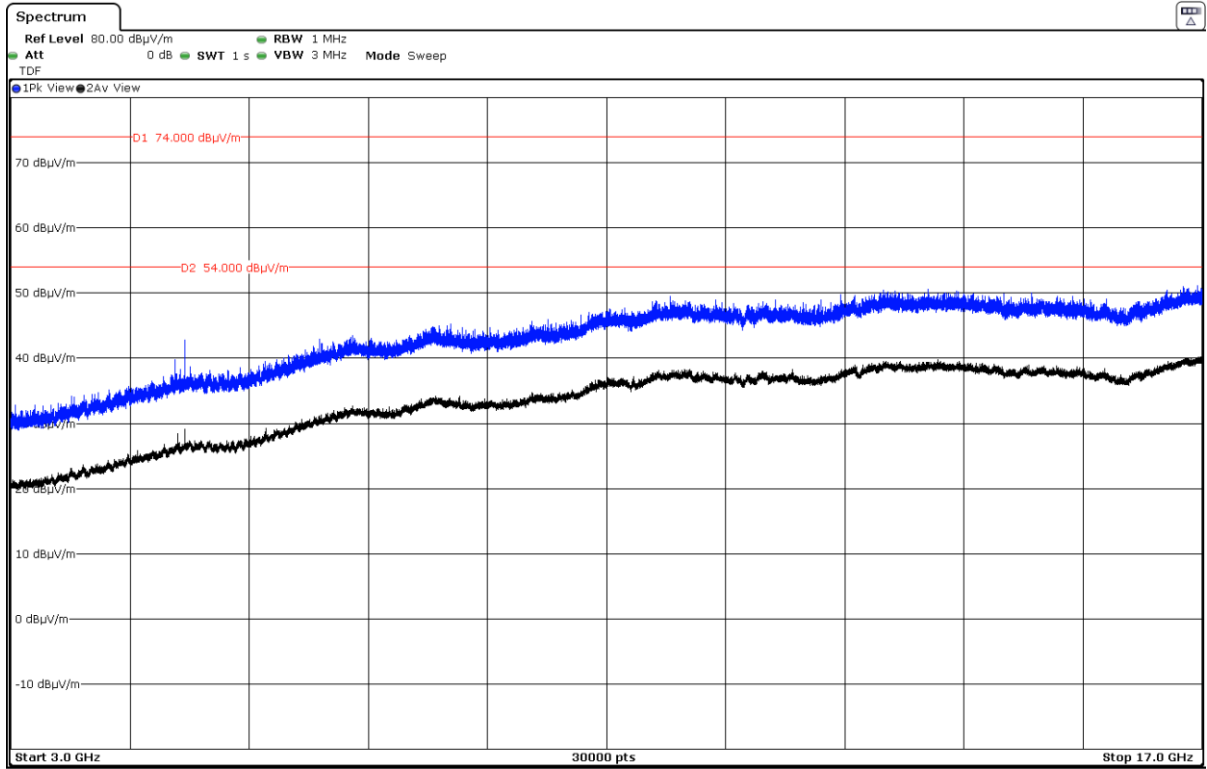
CHANNEL: LOWEST (2402 MHz).



CHANNEL: MIDDLE (2440 MHz).

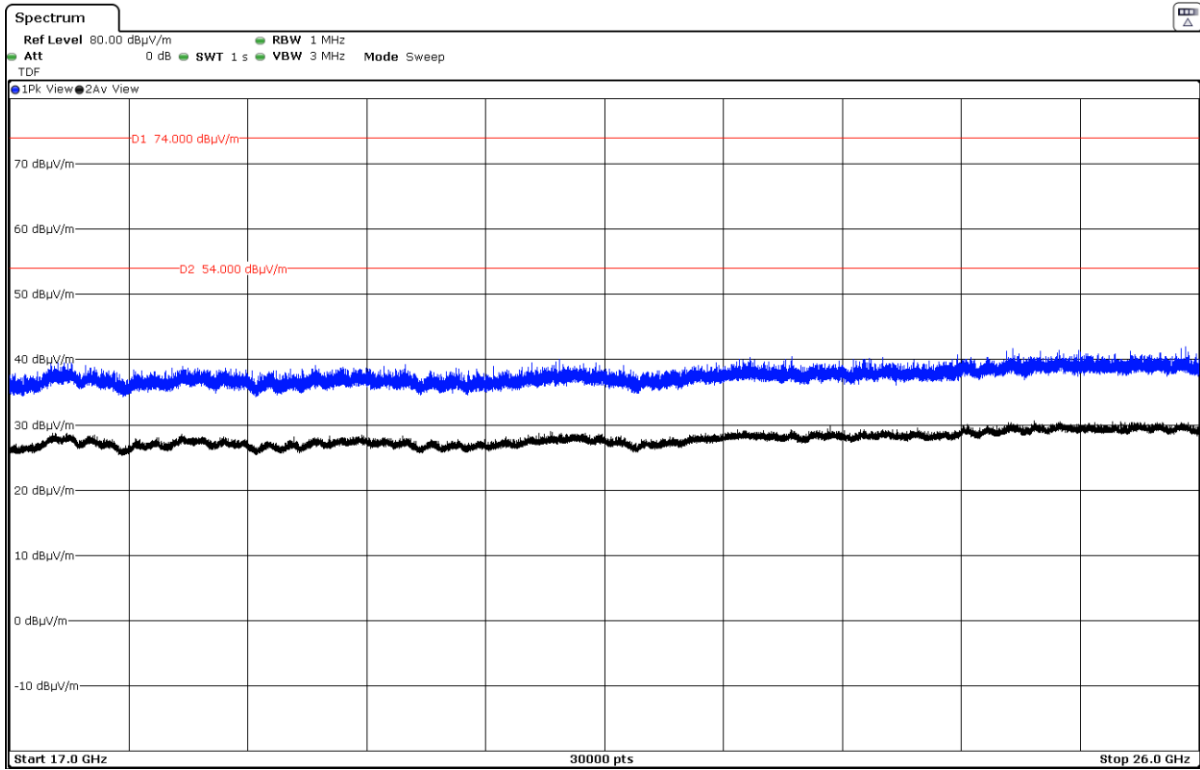


CHANNEL: HIGHEST (2480 MHz).



FREQUENCY RANGE 17 - 26 GHz:

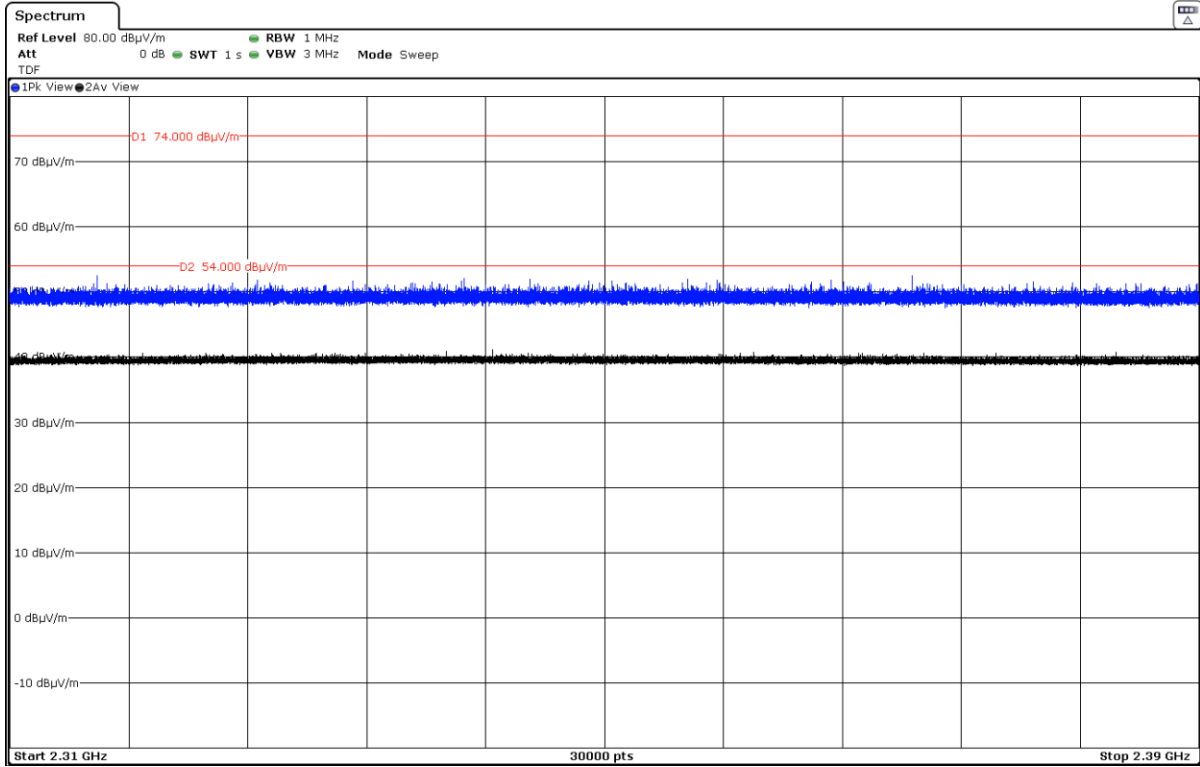
The spurious signals detected do not depend on the operating channel.



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

FREQUENCY RANGE 2.31-2.39 GHz (Restricted Band 1):

CHANNEL: LOWEST (2401 MHz).



FREQUENCY RANGE 2.4835-2.5 GHz (Restricted Band 2):

CHANNEL: HIGHEST (2481 MHz).

