

Test report No:
 NIE: 64669RRF.003

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	Hearing aid
(*) Trademark	Phonak
(*) Model and /or type reference	Phonak Naída P90-PR
(*) Derived model not tested	Phonak Naída P70-PR; Phonak Naída P50-PR Phonak Naída P30-PR; Phonak Naída P-PR Trial
Other identification of the product	HW version: 050-0810 SW version: 067-1454 FCC ID: KWC-BPR IC: 2262A-BPR
(*) Features	BT Classic, BLE, DM and Flora
Applicant	FCC: SONOVA USA INC. 4520 Weaver Parkway, 60555 Warrenville, IL, USA. IC: PHONAK CANADA LTD. 80 Courtneypark Dr West, Unit 1, Mississauga, ON, L5W 0B3, Canada.
Test method requested, standard	USA FCC Part 15.249 (10-1-19 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 (10-1-19 Edition): Radiated emission limits; general requirements. CANADA RSS-210 Issue 10 (December 2019). CANADA RSS-Gen Issue 5 Amendment 1 (March 2019). ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Rafael López EMC Consumer & RF Lab. Manager
Date of issue	2020-11-30
Report template No	FDT08_23 (*) "Data provided by the client"

Index

Competences and guarantees	3
General Conditions	3
Uncertainty.....	3
Data provided by the client	3
Usage of samples	5
Test sample description	6
Identification of the client	7
Testing period and place	7
Document history	7
Environmental conditions	7
Remarks and comments.....	8
Testing verdicts.....	8
Summary	9
Appendix A: Test results. Bluetooth Low Energy	10
Appendix B: Test results. Bluetooth Basic Rate	28
Appendix C: Test results. Proprietary protocol DM 2.4 GHz	46
Appendix D: Test results. Proprietary protocol Flora 2.4 GHz	64

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 the model Phonak Naída P90-PR is a hearing aid with wireless connectivity.
3. Derived model not tested. These models have been declared by the supplier of the sample as being the same as the model under test



Date: 30 September 2020

Authorisation letter
(Power of attorney)

We,

Sonova AG
Laub Laubisruetistrasse 28, 8712 Staefa
Switzerland

, hereby authorize

DEKRA Testing and Certification, S.A.U.
Parque Tecnológico de Andalucía
C/ Severo Ochoa nº 2
29590 Campanillas - Malaga
Spain

to act as our agent in all matters relating to applications for approval activities in Japan, including the signing of all documents relating to these matters. The present authorization considers the development of documents on behalf of the client, written under his own letterhead and related to the necessary information to be provided on his behalf to complete the certification process.

This authorisation is applicable to the models:

Phonak Naída P90-PR
Phonak Naída P70-PR
Phonak Naída P50-PR
Phonak Naída P30-PR
Phonak Naída P-PR Trial

Phonak Naída P90-UP
Phonak Naída P70-UP
Phonak Naída P50-UP
Phonak Naída P30-UP
Phonak Naída P-UP Trial

This agreement expires one year from the current date.

Signed on behalf of Sonova AG in Staefa-Switzerland,



Glenn Borrett
Senior Regulatory Affairs Manager

FCE02_02

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 N°	Description	Model	Serial N°	Date of reception
64669/005	Hearing aid	Phonak Naída P90-PR	--	2020/10/05
64669/007	Battery compartment (3 slot)	--	--	2020/10/05

Sample S/01 has undergone the following test(s): All the Conducted tests indicated in Appendixes A, B, C, D.

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

Control N°	Description	Model	Serial N°	Date of reception
64669/019	Hearing aid	Phonak Naída P90-PR	2032H008U	2020/10/05

Sample S/02 has undergone the following test(s): All the Radiated tests indicated in Appendixes A, B, C, D.

Test sample description

Ports..... :	Port name and description	Cable			
		Specified max length [m]	Attached during test	Shielded	Coupled to patient ⁽³⁾
	N/A		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Supplementary information to the ports..... :	--				
Rated power supply	Voltage and Frequency				
	<input checked="" type="checkbox"/>	DC: Naída P90-PR Vnom=3.7 V rechargeable battery; battery charging case supplied by a power supply 5Vdc, 1A			
Rated Power	--				
Clock frequencies	--				
Other parameters..... :	--				
Software version	067-1454				
Hardware version..... :	050-0810				
Dimensions in cm (W x H x D).... :	--				
Mounting position..... :	<input checked="" type="checkbox"/>	Other: Hearing Aid			
Modules/parts	Module/parts of test item		Type	Manufacturer	
	N/A				
Accessories (not part of the test item)	Description		Type	Manufacturer	
	N/A				
Documents as provided by the applicant..... :	Description		File name	Issue date	
	--				

⁽³⁾ Only for Medical Equipment

Identification of the client

SONOVA AG
Laubisruetistrasse 28, 8712 Staefa, Switzerland

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2020-10-06
Date (finish)	2020-10-10

Document history

Report number	Date	Description
64669RRF.003	2020-11-30	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 %

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. = 75 %

Remarks and comments

The tests have been performed by the technical personnel: Nicolás Salguero, Cristina Calle and Miguel Manuel López.

Used instrumentation:

Conducted Measurements:

	Last Calibration	Due Calibration
1. Shielded Room ETS LINDGREN S101	N.A.	N.A.
2. Signal and Spectrum Analyzer 10Hz-40GHz Rohde and Schwarz FSV40	2020/03	2022/03

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	2020/04	2023/04
3. RF Pre-amplifier, 40 dB ,10MHz-6 GHz BONN ELEKTRONIK BLMA 0160-01N	2020/02	2021/02
4. EMI Test Receiver 9kHz-7GHz ROHDE AND SCHWARZ ESR7	2018/10	2020/10
5. Broadband Horn antenna 1-18 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9120 D	2019/11	2022/11
6. RF Pre-amplifier, 40 dB ,1-18 GHz BONN ELEKTRONIK BLMA 0118-1M	2020/05	2021/05
7. Spectrum Analyzer ROHDE AND SCHWARZ FSW50	2020/07	2022/07
8. Broadband Horn antenna 18 - 40 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9170	2020/05	2023/05
9. Pre-amplifier, G>30 dB, 18-40 GHz BONN ELEKTRONIK BLMA 1840-1M	2019/02	2021/02

Testing verdicts

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

Summary

1. Bluetooth Low Energy

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	
<u>Supplementary information and remarks:</u> None.			

2. Bluetooth Basic Rate

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	
<u>Supplementary information and remarks:</u> None.			

3. Proprietary protocol DM 2.4 GHz

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	
<u>Supplementary information and remarks:</u> None.			

4. Proprietary protocol Flora 2.4 GHz

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	
<u>Supplementary information and remarks:</u> None.			

Appendix A: Test results. Bluetooth Low Energy

INDEX

TEST CONDITIONS	12
Occupied Bandwidth	15
15.249 (a) / RSS-210 B.10 (a) Field strength of fundamental and harmonics emissions	17
15.249 (d) / RSS-210 B.10 (b) Emissions radiated outside of the specific frequency bands.....	19

TEST CONDITIONS

POWER SUPPLY (V) and ANTENNA:

V nominal:	3.7 Vdc
Type of Power Supply:	Rechargeable battery.
Type of Antenna:	Integral
Declared Antenna Gain:	-6 dBi

TEST FREQUENCIES:

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

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.



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 and 1 GHz-17 GHz double ridge horn antenna) is situated at a distance of 3 m and at a distance of 1 m for the frequency range 17 GHz-26 GHz (17 GHz-40 GHz horn antenna).

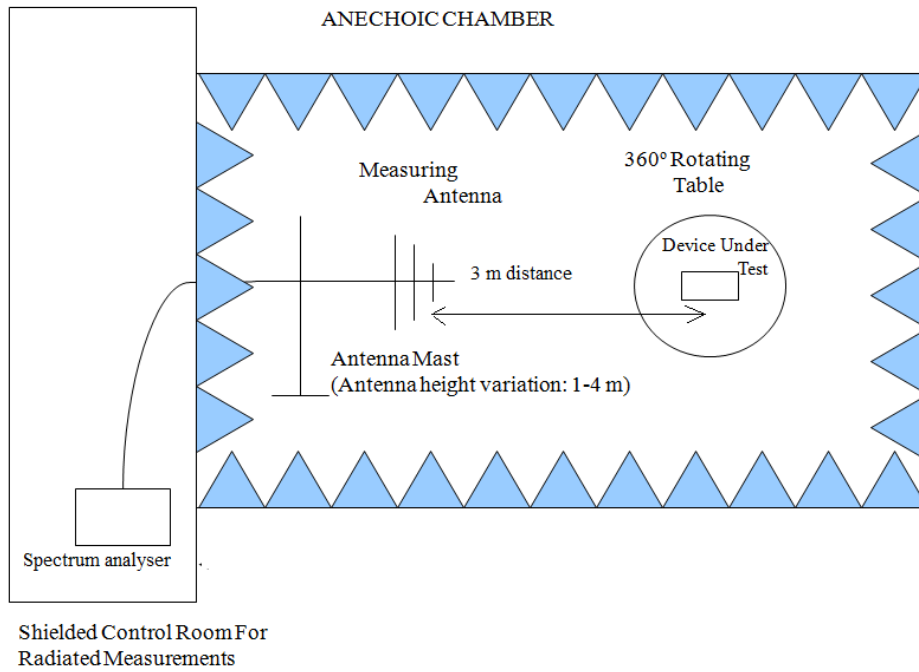
For radiated emissions in the range 17 GHz-26 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

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 was varied from 1 to 4 meters to find the maximum radiated emission.

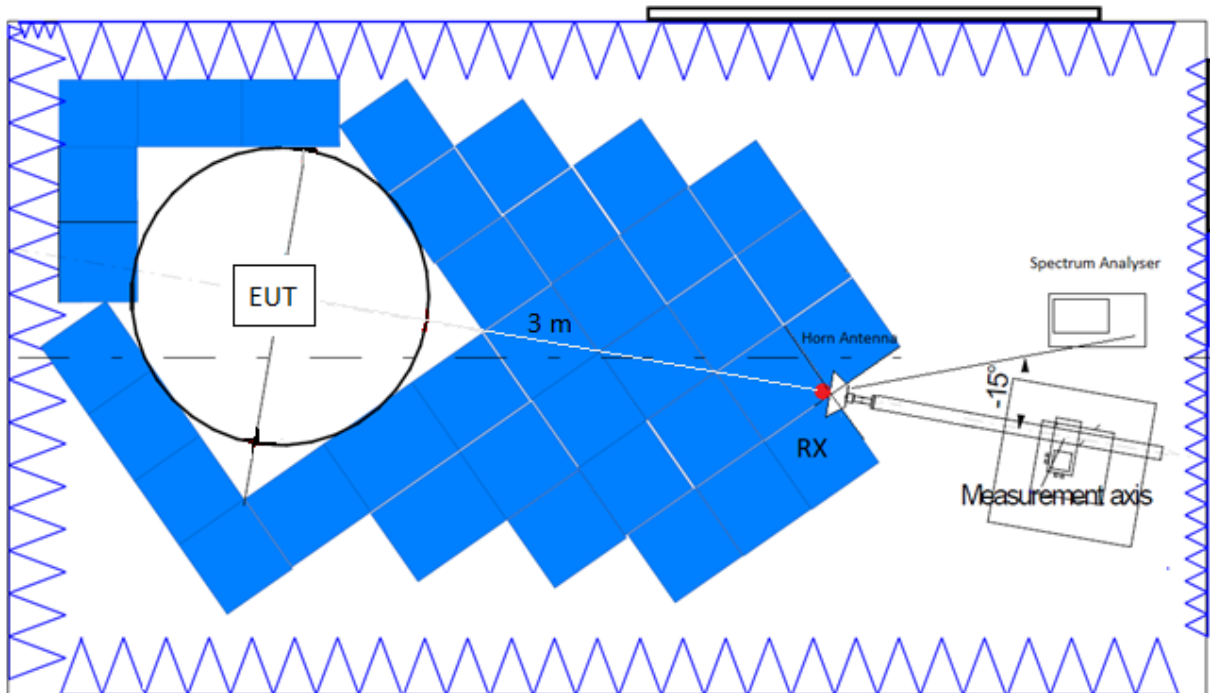
Measurements were made in both horizontal and vertical planes of polarization.

A resolution bandwidth/video bandwidth of 100 kHz/300 kHz was used for frequencies below 1 GHz and 1MHz/3MHz for frequencies above 1 GHz.

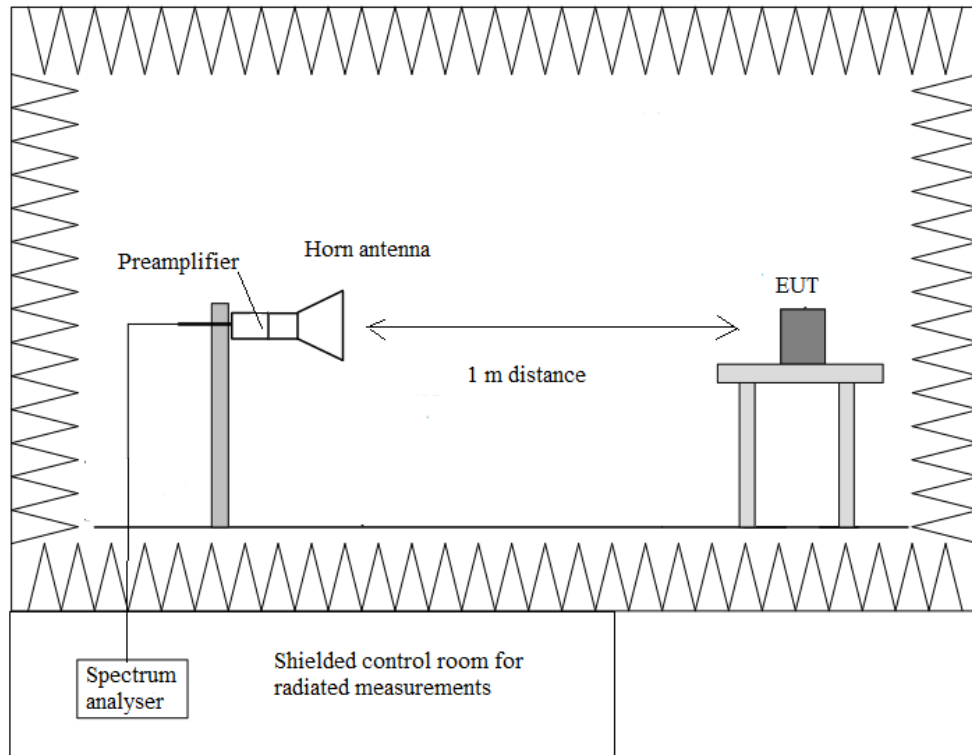
Radiated measurements setup $f < 1$ GHz:



Radiated measurements setup from 1 GHz to 17 GHz:



Radiated measurements setup $f > 17$ GHz:



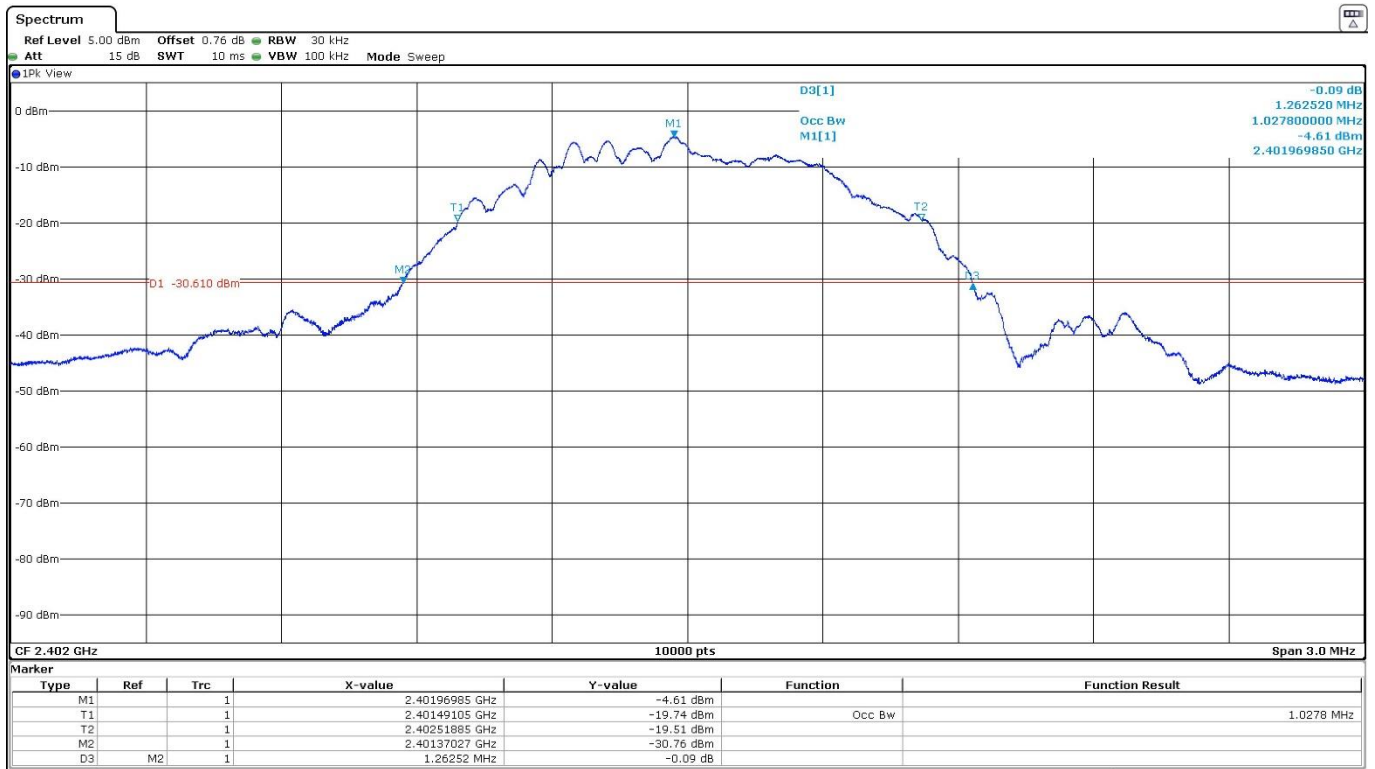
Occupied Bandwidth

RESULTS:

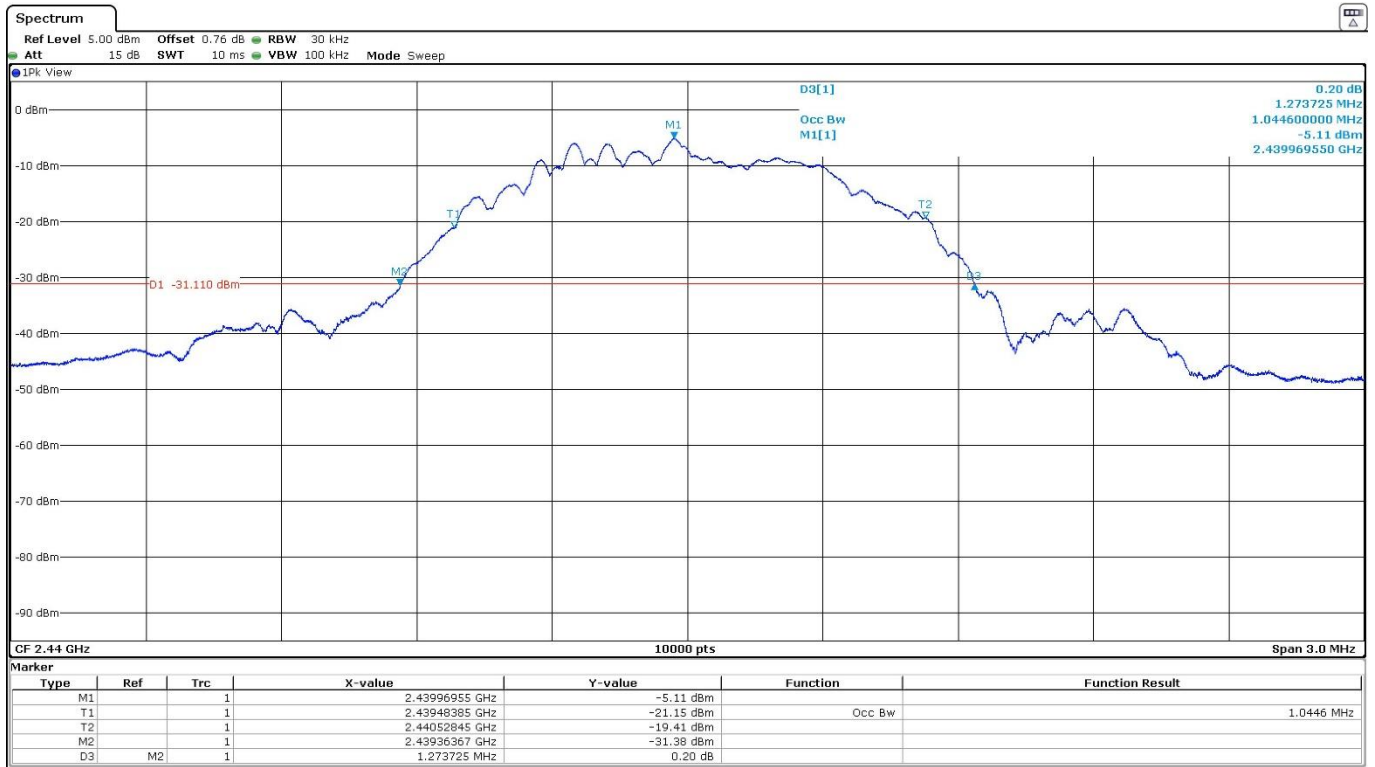
	Low Channel 2402 MHz	Middle Channel 2440 MHz	High Channel 2480 MHz
99% Bandwidth (MHz)	1.0278	1.0446	1.0611
Measurement Uncertainty (kHz)	<±1.42		

Verdict: PASS

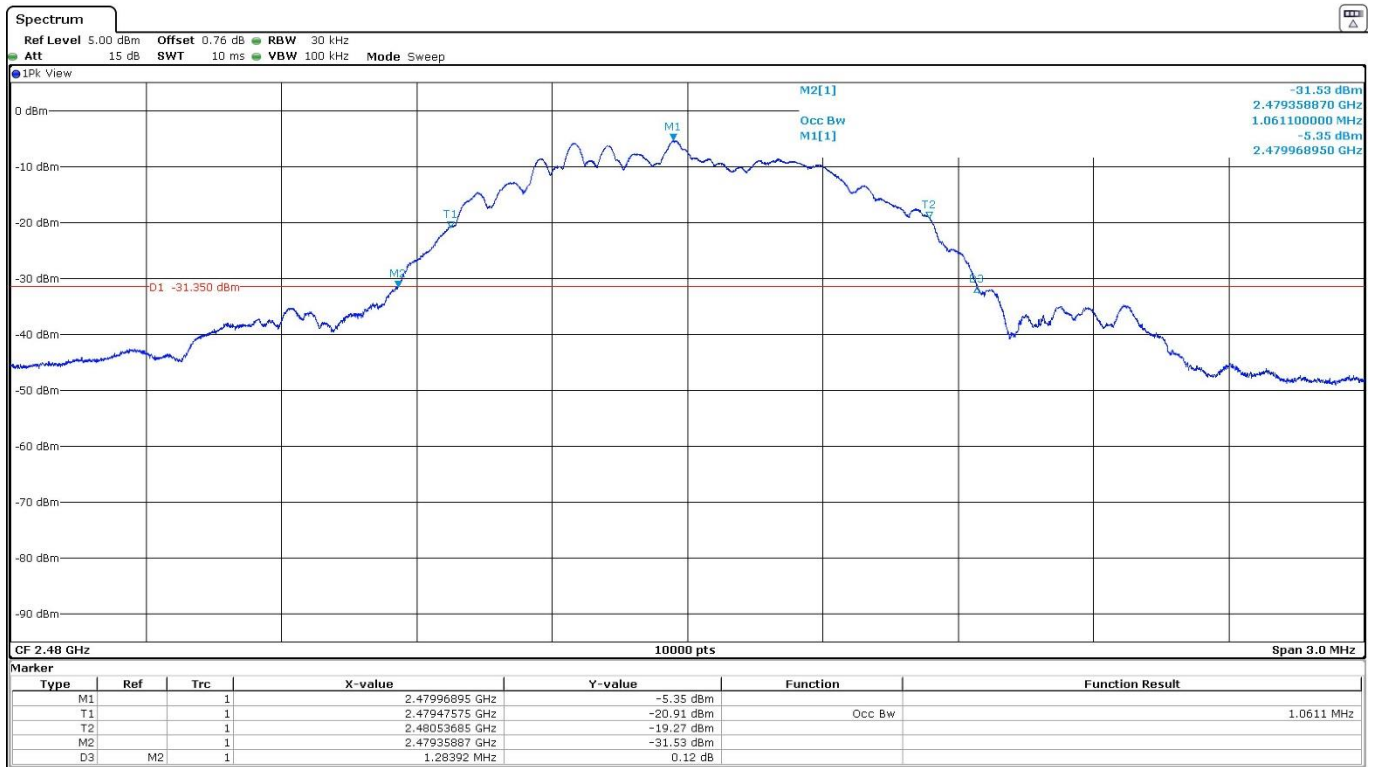
- Low Channel:



- Middle Channel:



- High Channel:



15.249 (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

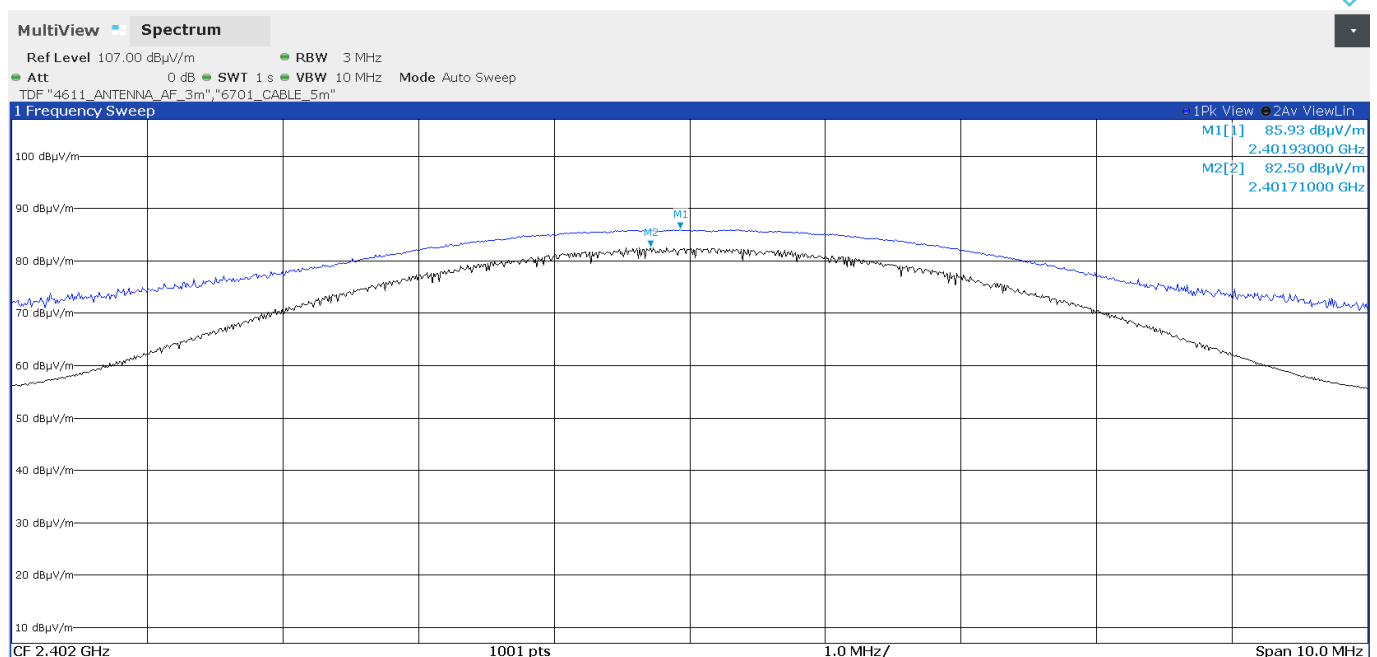
For frequencies above 1000 MHz, the above field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

RESULTS:

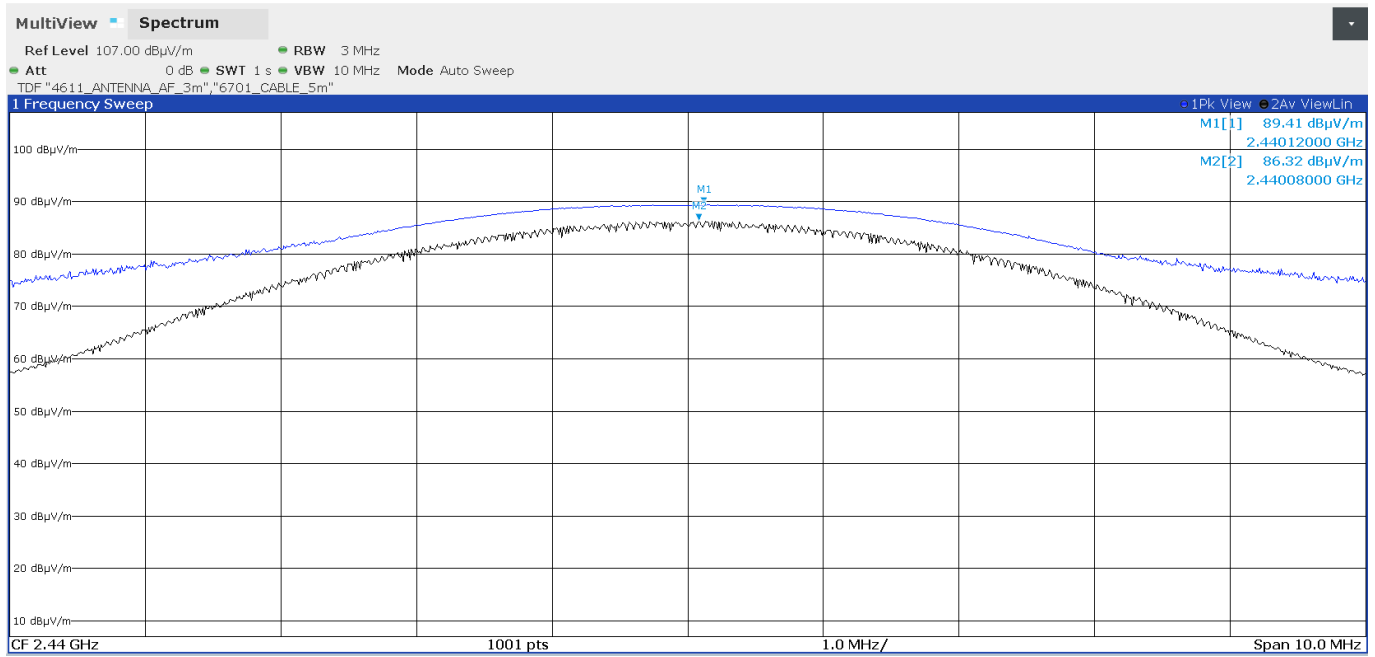
	Low Channel 2402 MHz	Middle Channel 2440 MHz	High Channel 2480 MHz
Average Field Strength (dBµV/m)	82.50	86.32	85.14
Peak Field Strength (dBµV/m)	85.93	89.41	88.53
Measurement Uncertainty (dB)	<±3.98		

Verdict: PASS

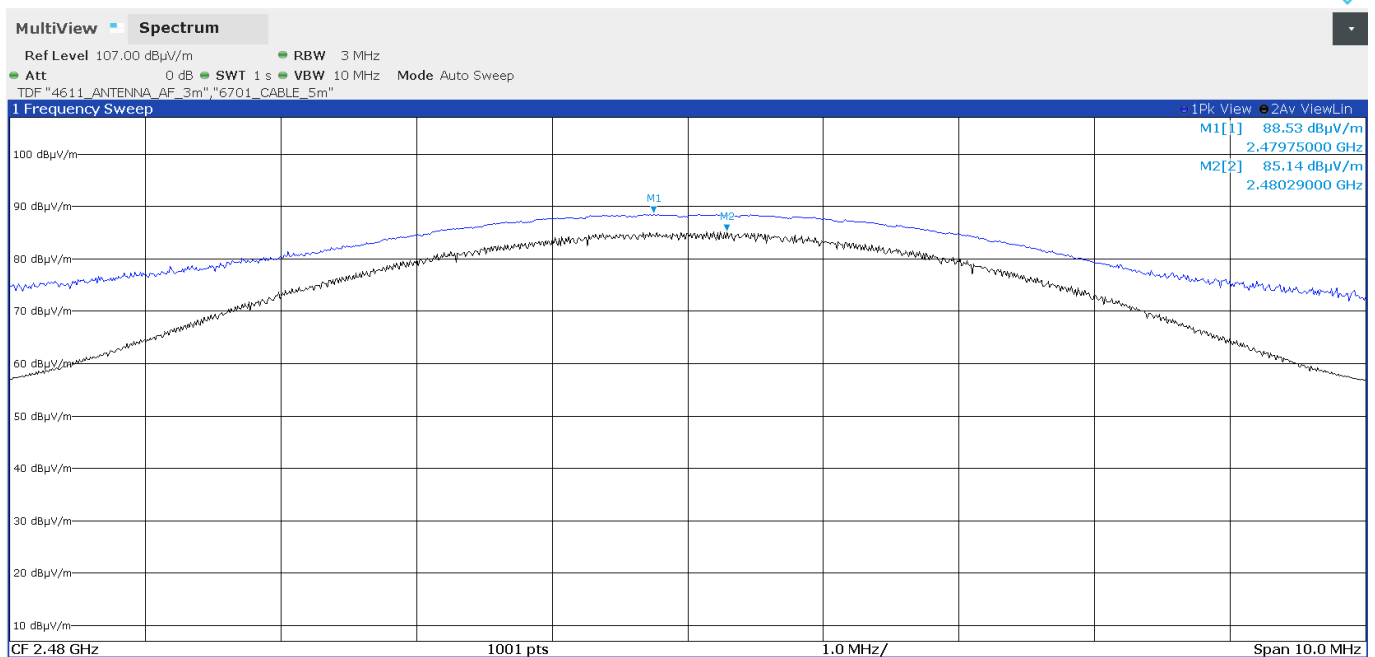
- Low Channel:



- Middle Channel:



- High Channel:



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 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-17 GHz and at distance of 1m for the frequency range 17 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 signals detected do not depend on the operating channel.

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

Spurious frequency (MHz)	Emission Level (dB μ V/m)	Polarization	Detector	Measurement Uncertainty (dB)
30.8245	12.12	V	Quasi peak	<±4.99
31.9885	16.15	V	Quasi peak	<±4.99

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 dB μ V/m at 3 m) are measured with average detector for checking compliance with the average limit.

Duty cycle correction +3.60 dB

- Low Channel (2402 MHz):

Spurious frequency (GHz)	Emission Level (dB μ V/m)	Corrected Emission Level (dB μ V/m)	Polarization	Detector	Measurement Uncertainty (dB)
4.80350	47.43	47.43	V	Peak	<±4.98

- Middle Channel (2440 MHz):

Spurious frequency (GHz)	Emission Level (dB μ V/m)	Corrected Emission Level (dB μ V/m)	Polarization	Detector	Measurement Uncertainty (dB)
4.88000	45.53	45.53	V	Peak	<±4.98

- High Channel (2480 MHz):

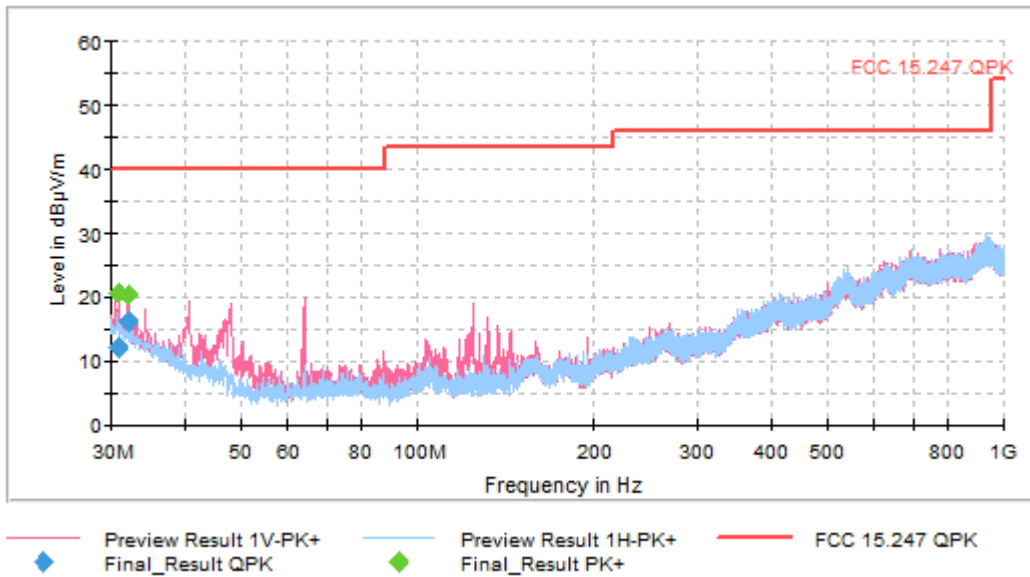
Spurious frequency (GHz)	Emission Level (dB μ V/m)	Corrected Emission Level (dB μ V/m)	Polarization	Detector	Measurement Uncertainty (dB)
2.48373	65.02	65.02	V	Peak	<±3.98
	41.36	44.96	V	Average	<±3.98
2.48426	62.14	62.14	V	Peak	<±3.98
	41.33	44.93	V	Average	<±3.98
2.48493	61.34	61.34	V	Peak	<±3.98
	41.32	44.92	V	Average	<±3.98
4.96050	46.76	46.76	V	Peak	<±4.98

Measurement Uncertainty: 1-3 GHz <±3.98 dB
 3-17 GHz <±4.98 dB
 17-26 GHz <±5.08 dB

Verdict: PASS

FREQUENCY RANGE 30 MHz - 1 GHz

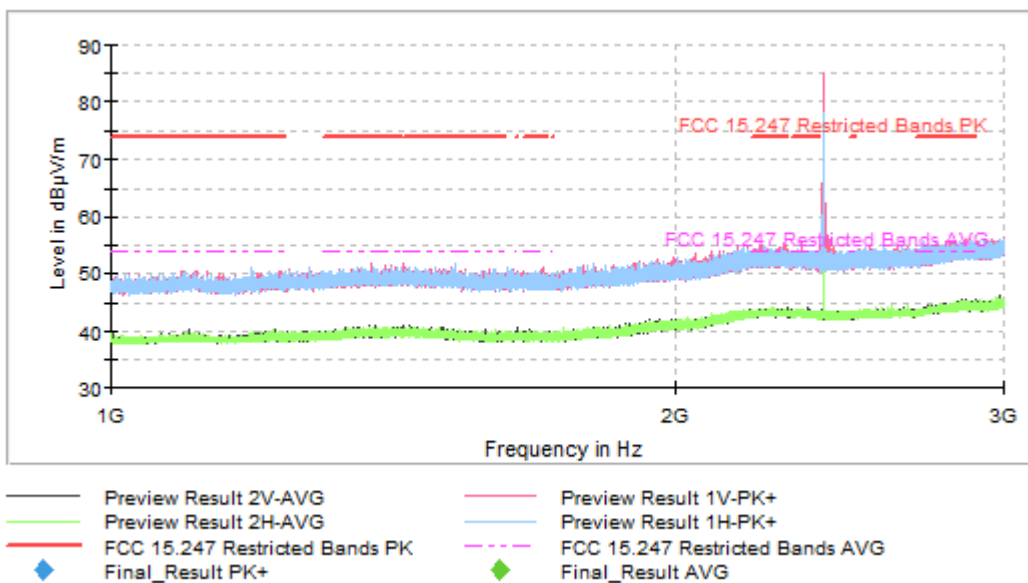
The spurious frequencies detected do not depend on the operating channel.



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

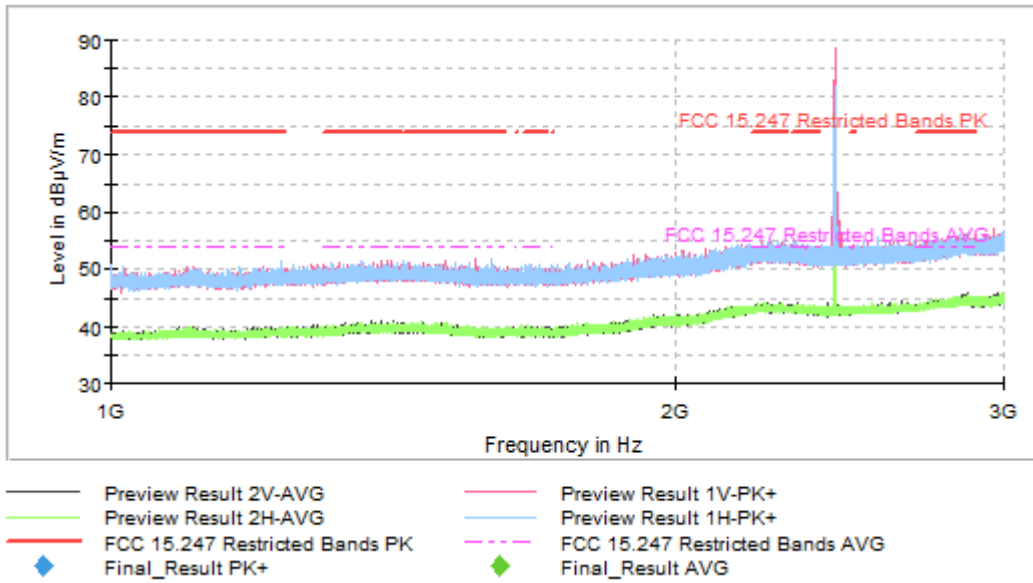
FREQUENCY RANGE 1 - 3 GHz

- Low Channel:



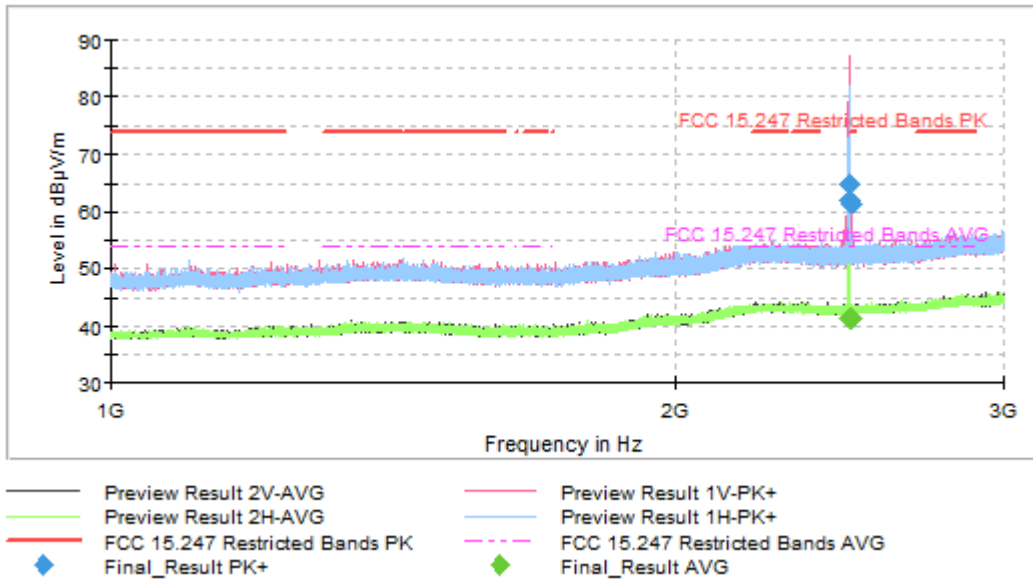
The peak above the limit is the carrier frequency.

- Middle Channel:



The peak above the limit is the carrier frequency.

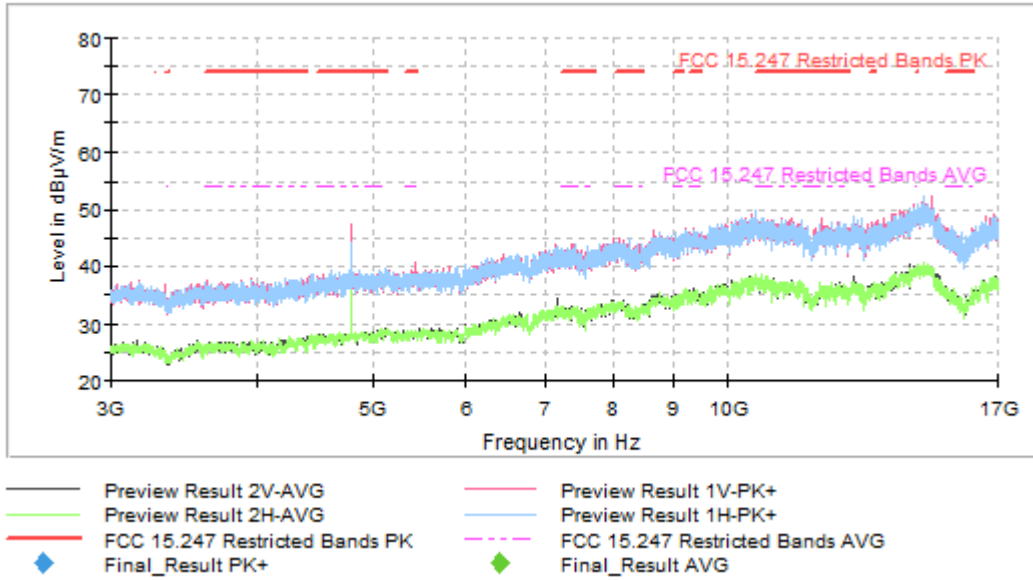
- High Channel:



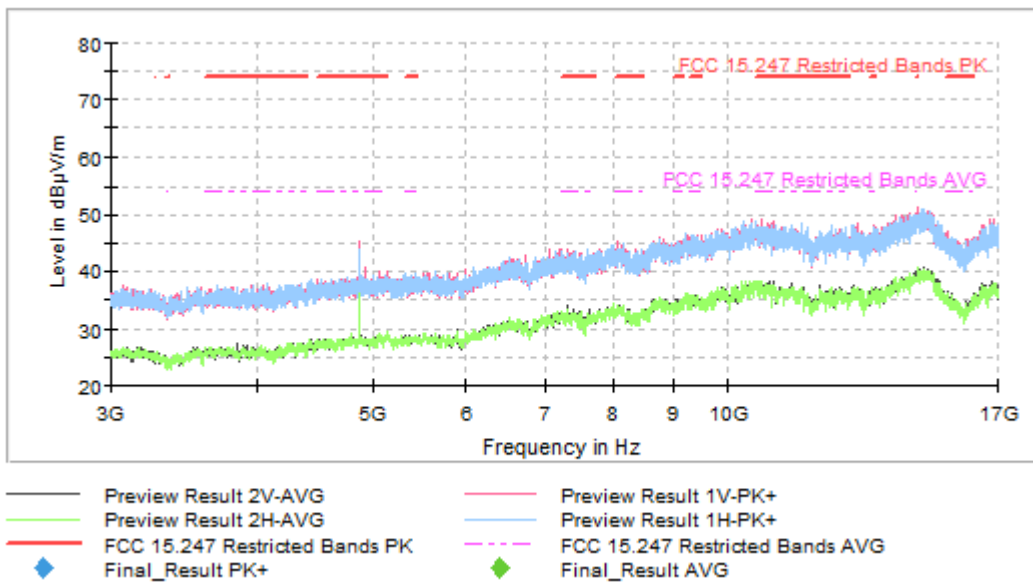
The peak above the limit is the carrier frequency.

FREQUENCY RANGE 3 - 17 GHz

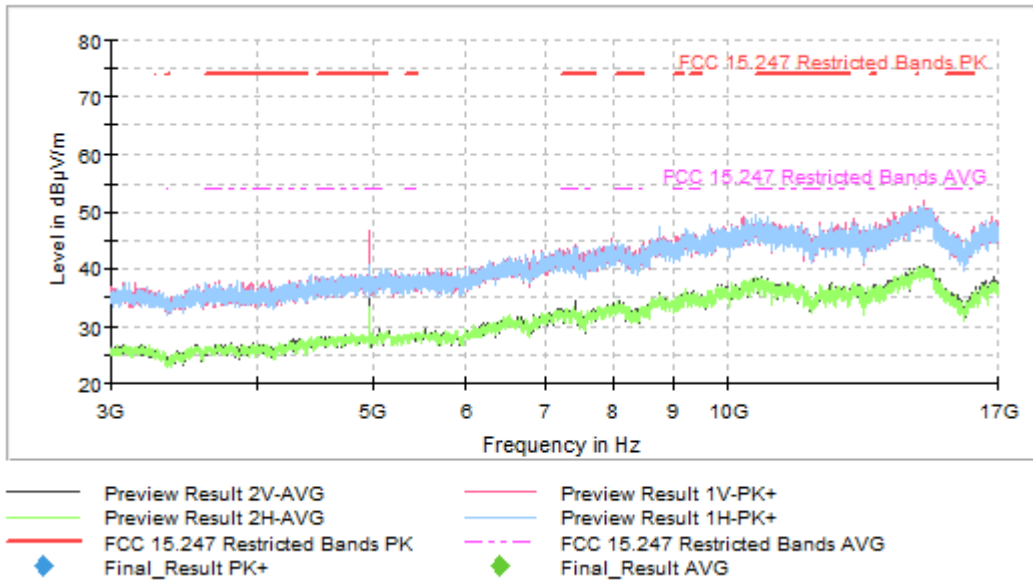
- Low Channel:



- Middle Channel:

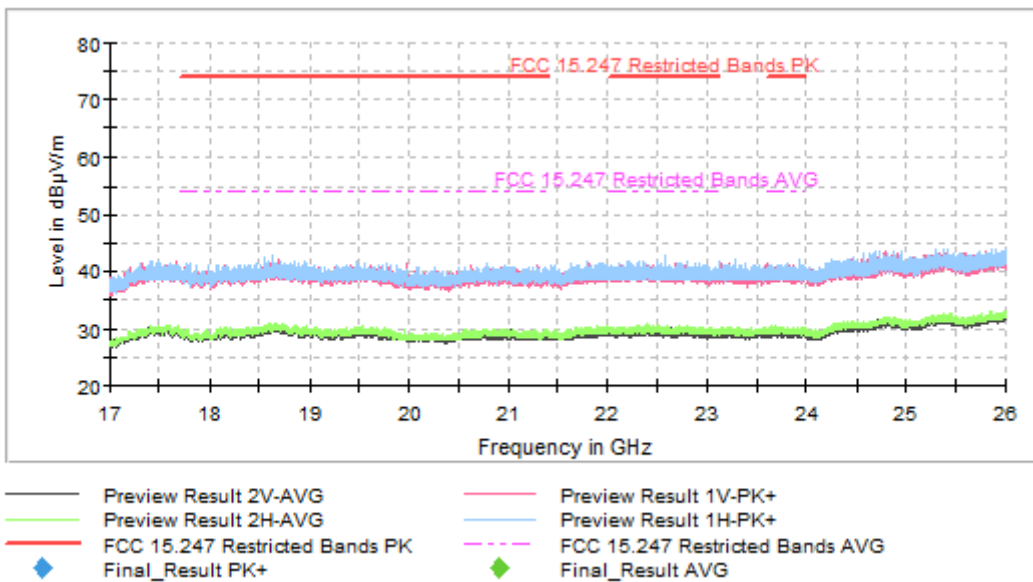


- High Channel:



FREQUENCY RANGE 17 - 26 GHz

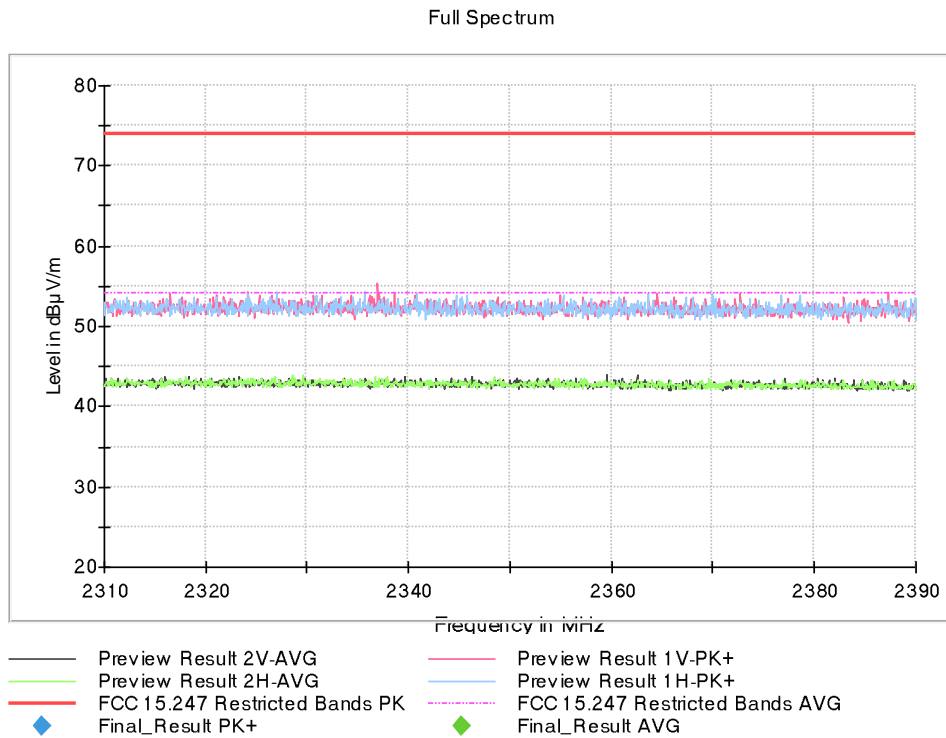
The spurious frequencies detected do not depend on the operating channel.



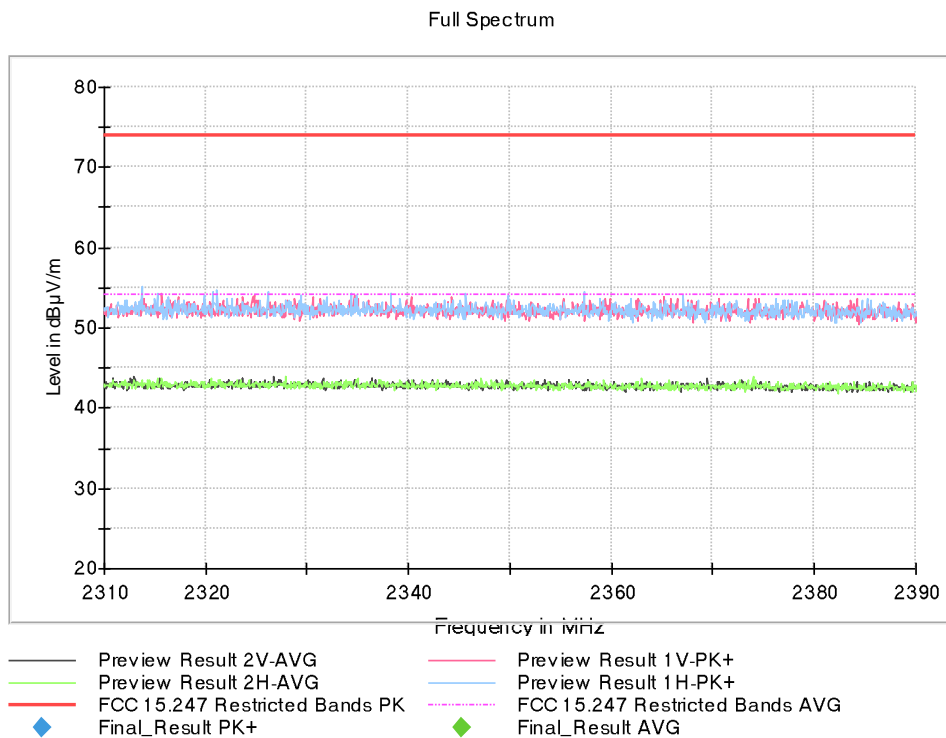
This plot is valid for the Low, Middle and High Channels.

FREQUENCY RANGE 2.31-2.39 GHZ

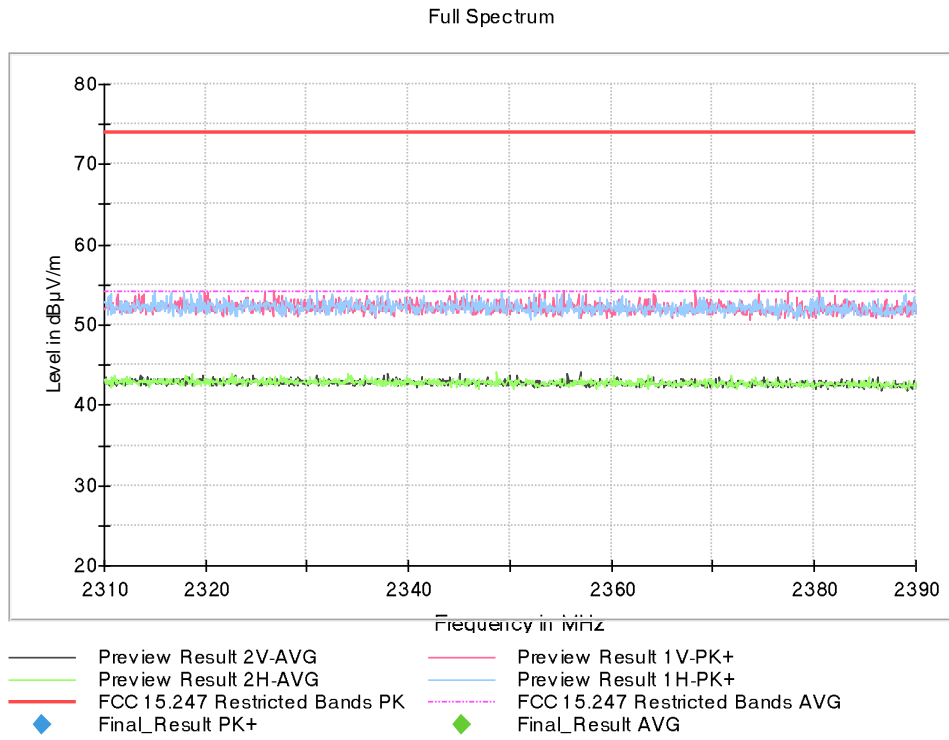
- Low Channel:



- Middle Channel:

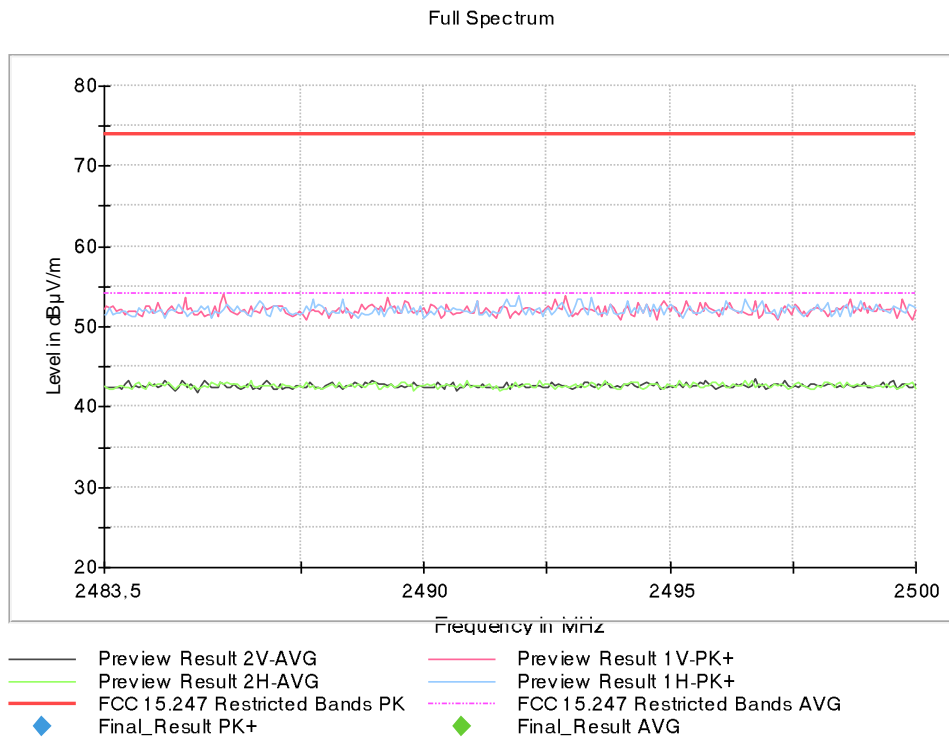


- High Channel:

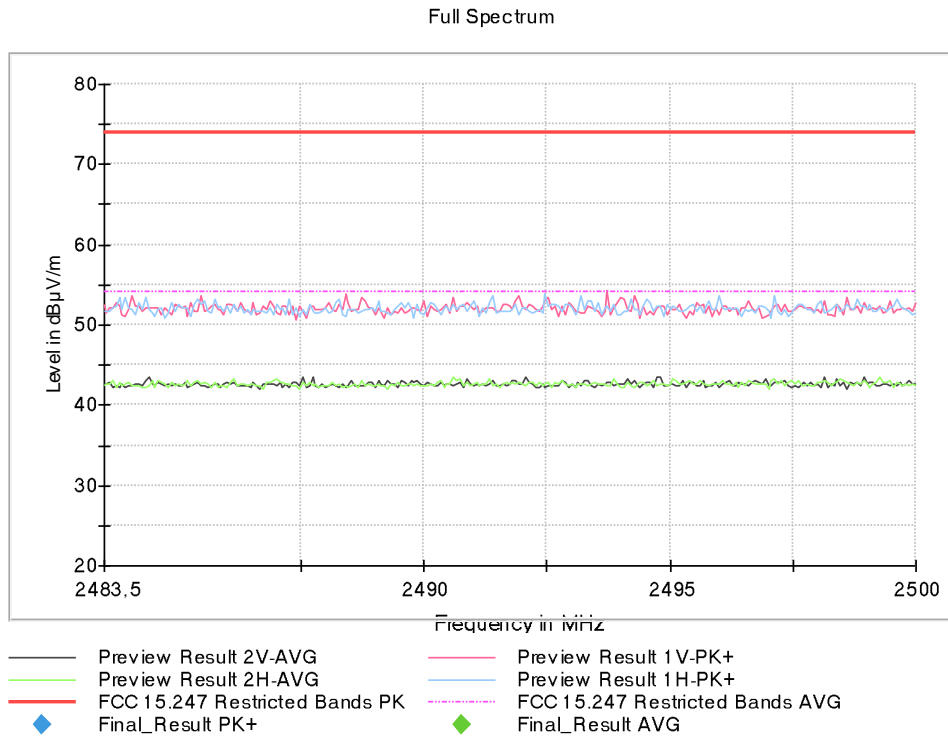


FREQUENCY RANGE 2.4835-2.5 GHz

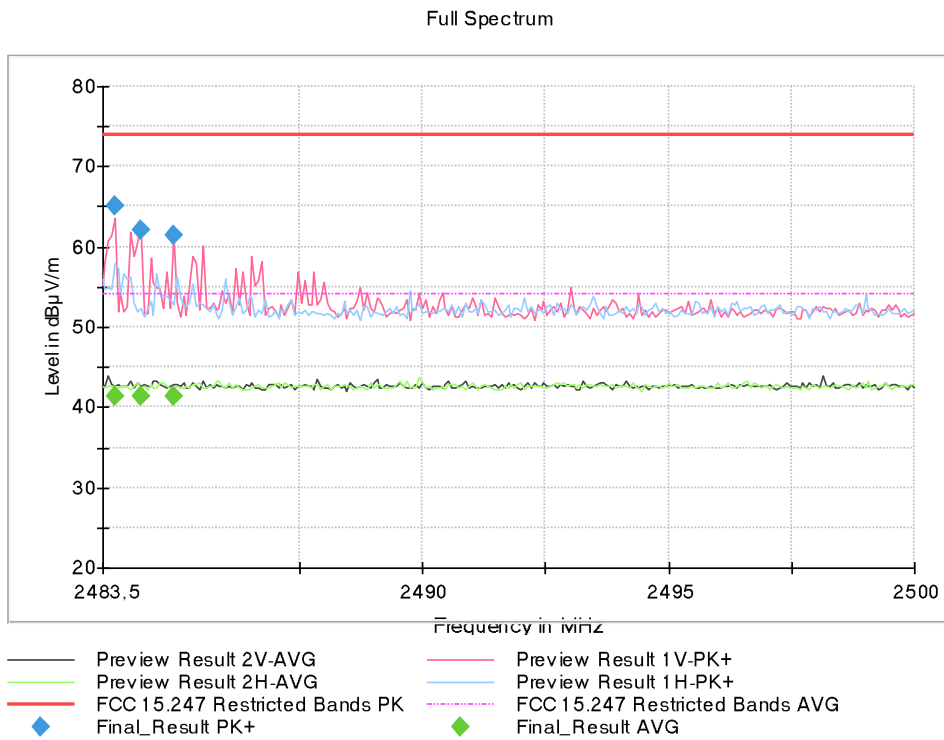
- Low Channel:



- Middle Channel:



- High Channel:



Appendix B: Test results. Bluetooth Basic Rate

INDEX

TEST CONDITIONS	30
Occupied Bandwidth	33
15.249 (a) / RSS-210 B.10 (a) Field strength of fundamental and harmonics emissions	35
15.249 (d) / RSS-210 B.10 (b) Emissions radiated outside of the specific frequency bands	37

TEST CONDITIONS

POWER SUPPLY (V) and ANTENNA:

V nominal:	3.7 Vdc
Type of Power Supply:	Rechargeable battery.
Type of Antenna:	Integral.
Declared Antenna Gain:	-6 dBi

TEST FREQUENCIES:

Low Channel:	2402 MHz
Middle Channel:	2441 MHz
High Channel:	2480 MHz

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.



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 and 1 GHz-17 GHz double ridge horn antenna) is situated at a distance of 3 m and at a distance of 1 m for the frequency range 17 GHz-26 GHz (17 GHz-40 GHz horn antenna).

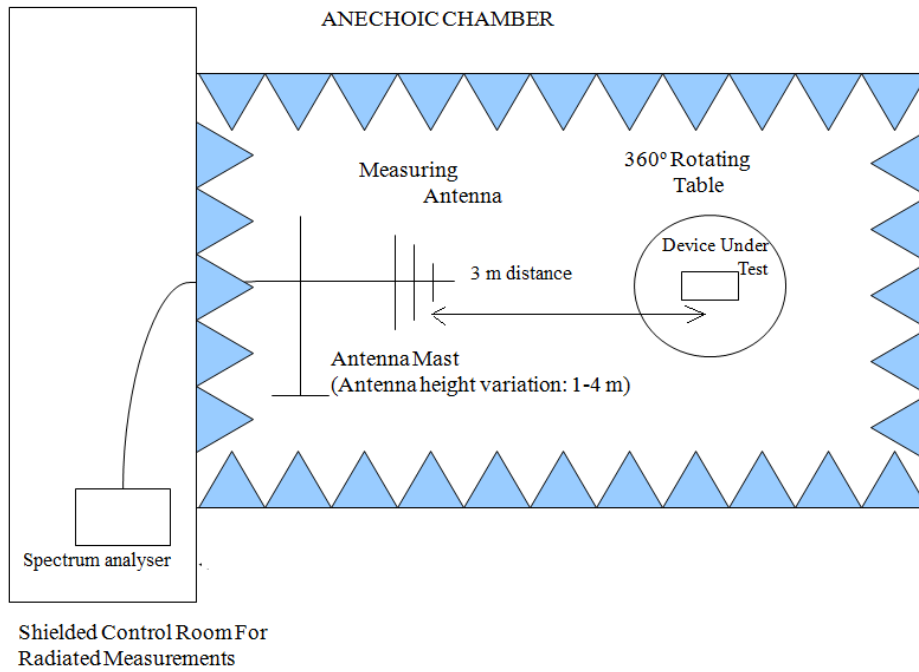
For radiated emissions in the range 17 GHz-26 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

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 was varied from 1 to 4 meters to find the maximum radiated emission.

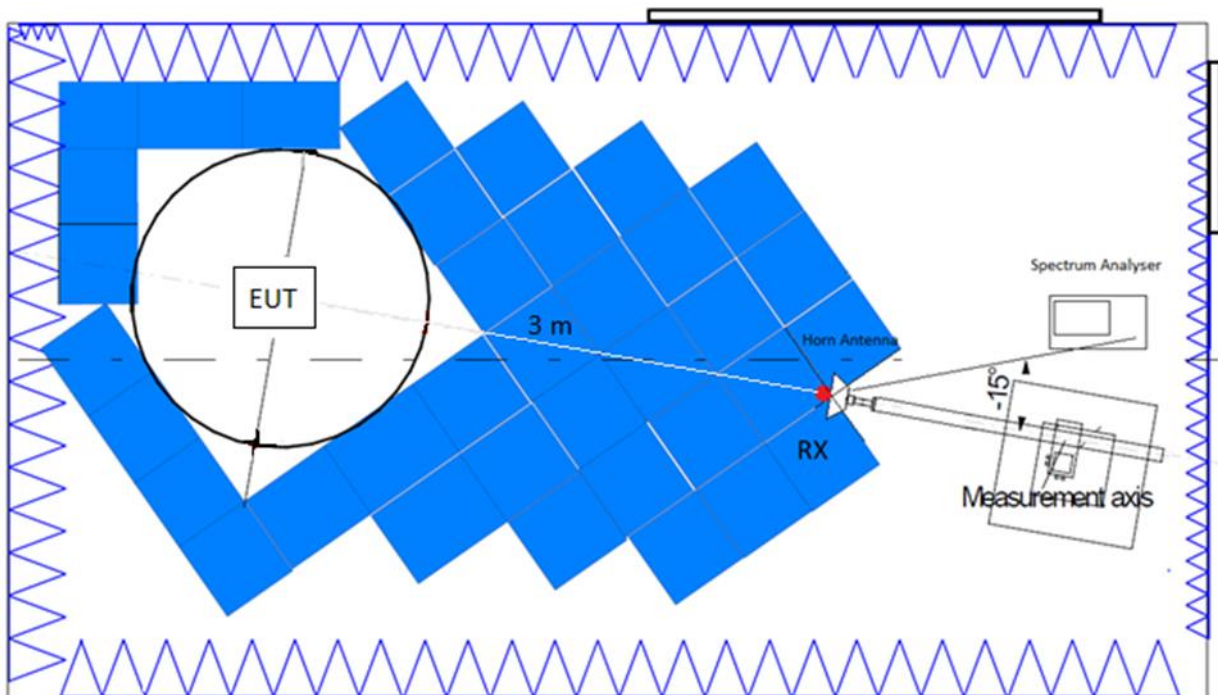
Measurements were made in both horizontal and vertical planes of polarization.

A resolution bandwidth/video bandwidth of 100 kHz/300 kHz was used for frequencies below 1 GHz and 1MHz/3MHz for frequencies above 1 GHz.

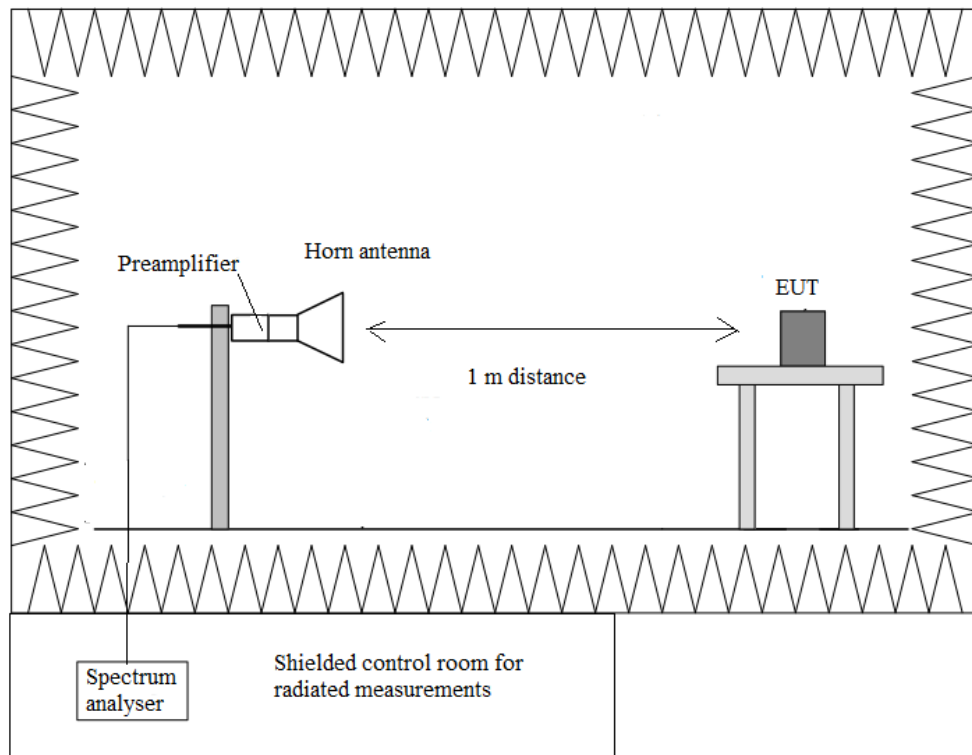
Radiated measurements setup $f < 1$ GHz:



Radiated measurements setup from 1 GHz to 17 GHz:



Radiated measurements setup $f > 17$ GHz:



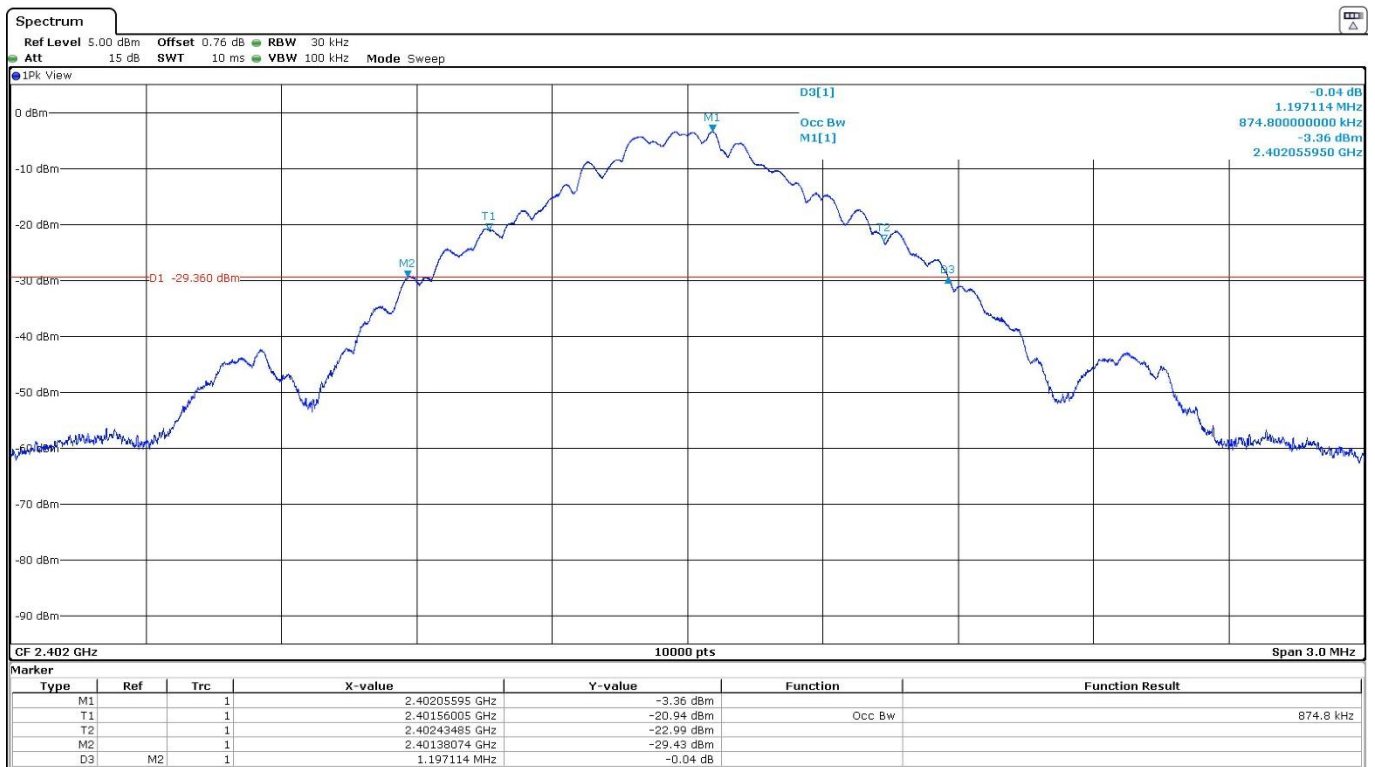
Occupied Bandwidth

RESULTS:

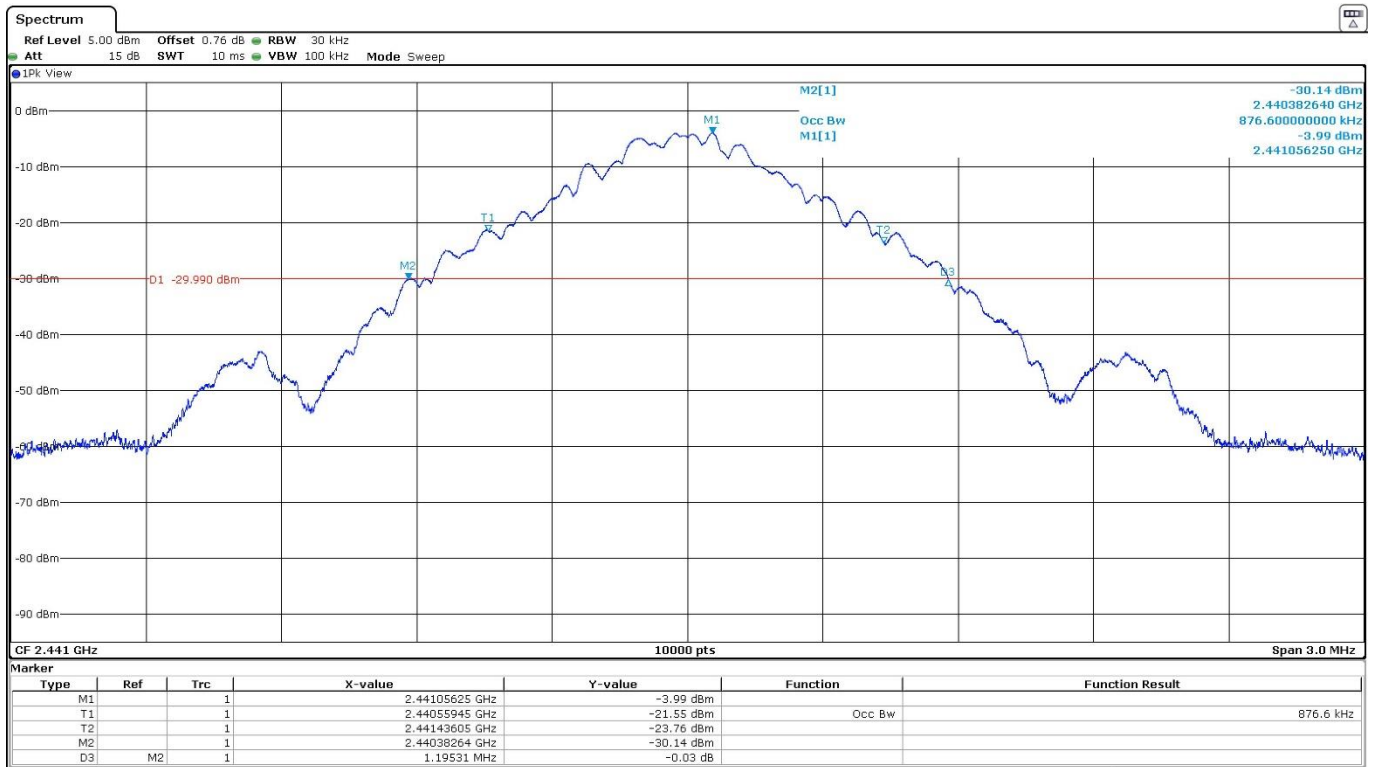
	Low Channel 2402 MHz	Middle Channel 2441 MHz	High Channel 2480 MHz
99% Bandwidth (MHz)	0.8748	0.8766	0.8754
Measurement Uncertainty (kHz)	<±1.42		

Verdict: PASS

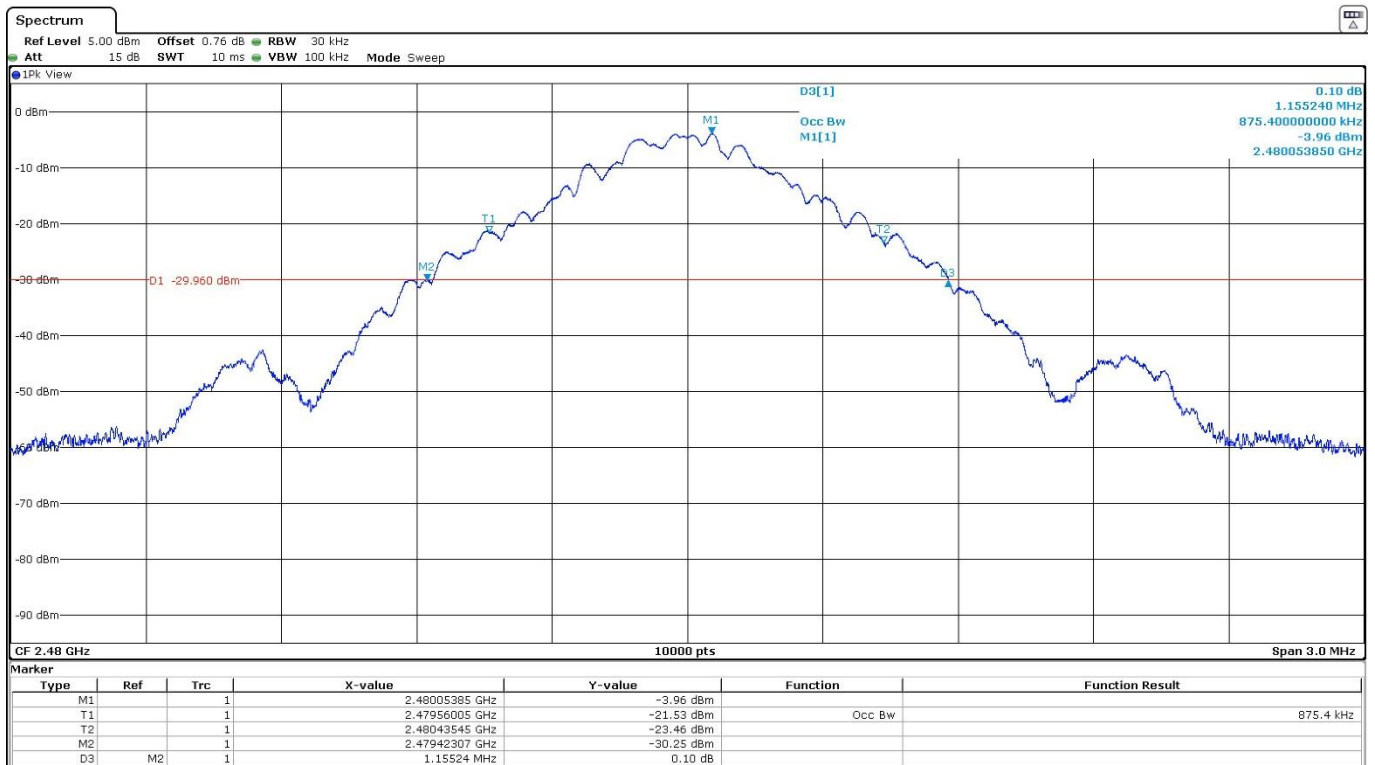
- Low Channel:



- Middle Channel:



- High Channel:



15.249 (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

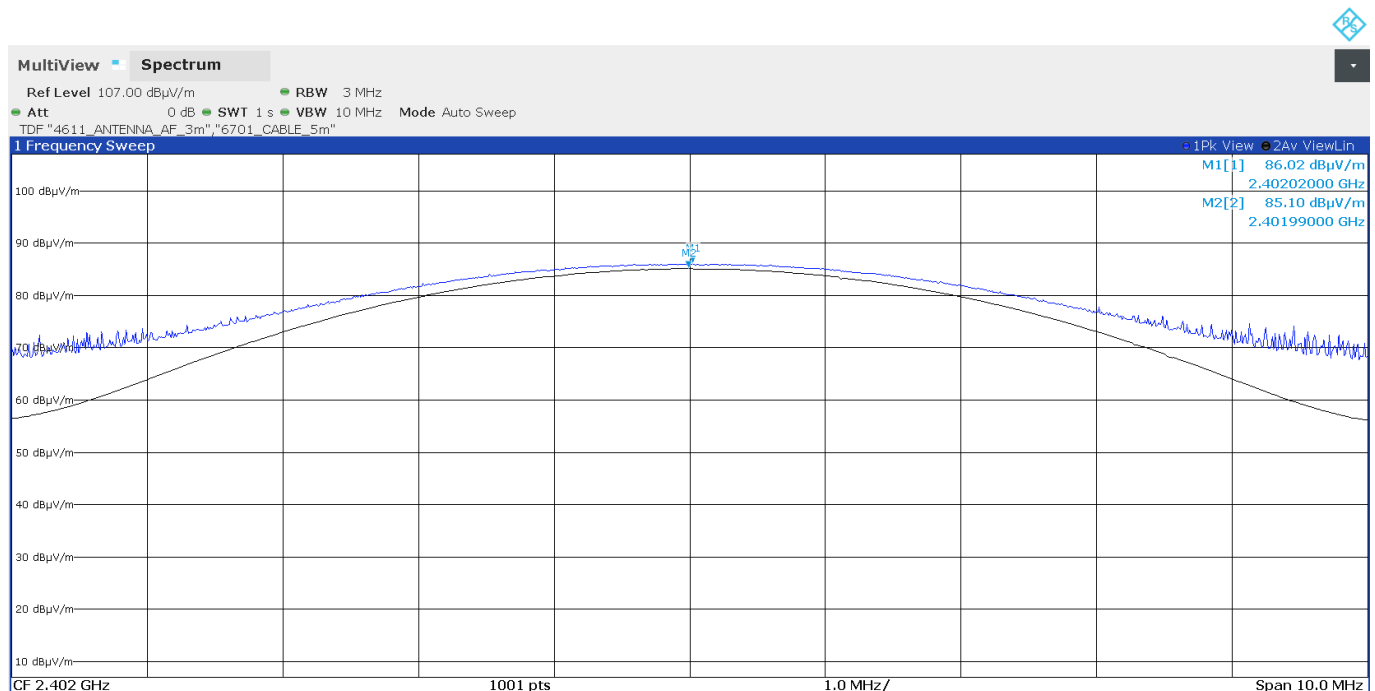
For frequencies above 1000 MHz, the above field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

RESULTS:

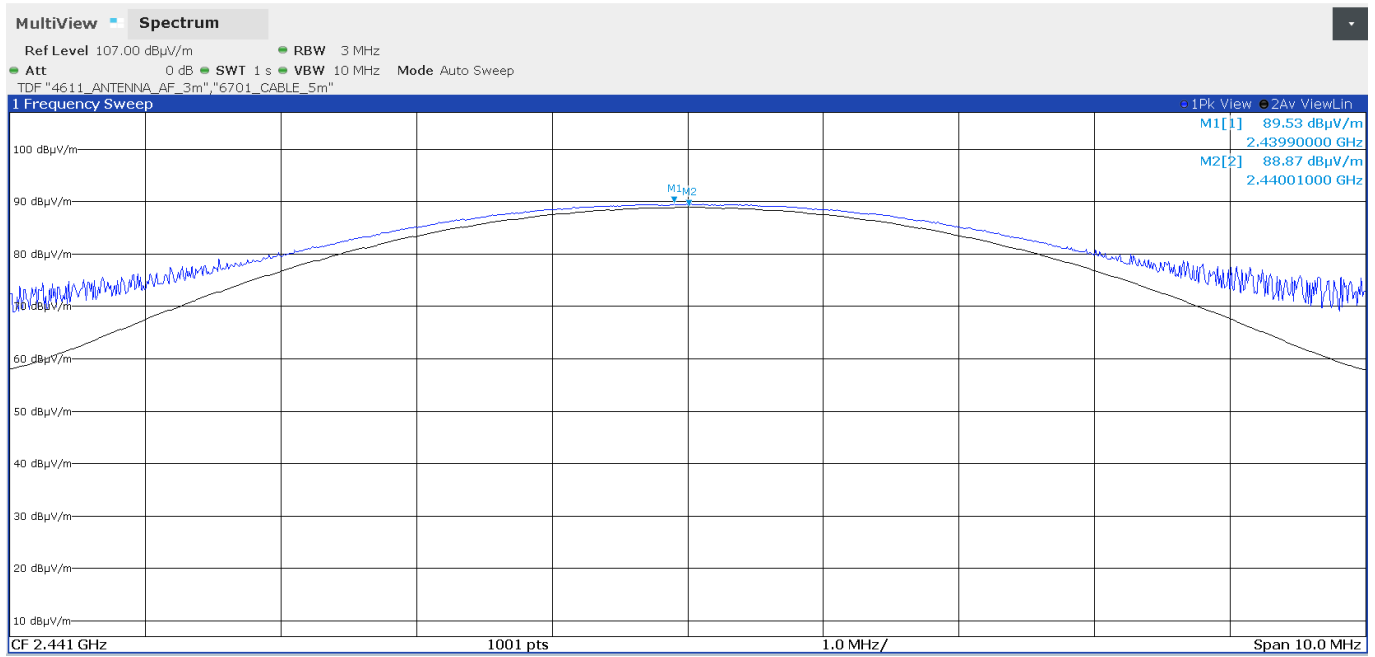
	Low Channel 2402 MHz	Middle Channel 2441 MHz	High Channel 2480 MHz
Average Field Strength (dBµV/m)	85.10	88.87	87.87
Peak Field Strength (dBµV/m)	86.02	89.53	88.60
Measurement Uncertainty (dB)	<±3.98		

Verdict: PASS

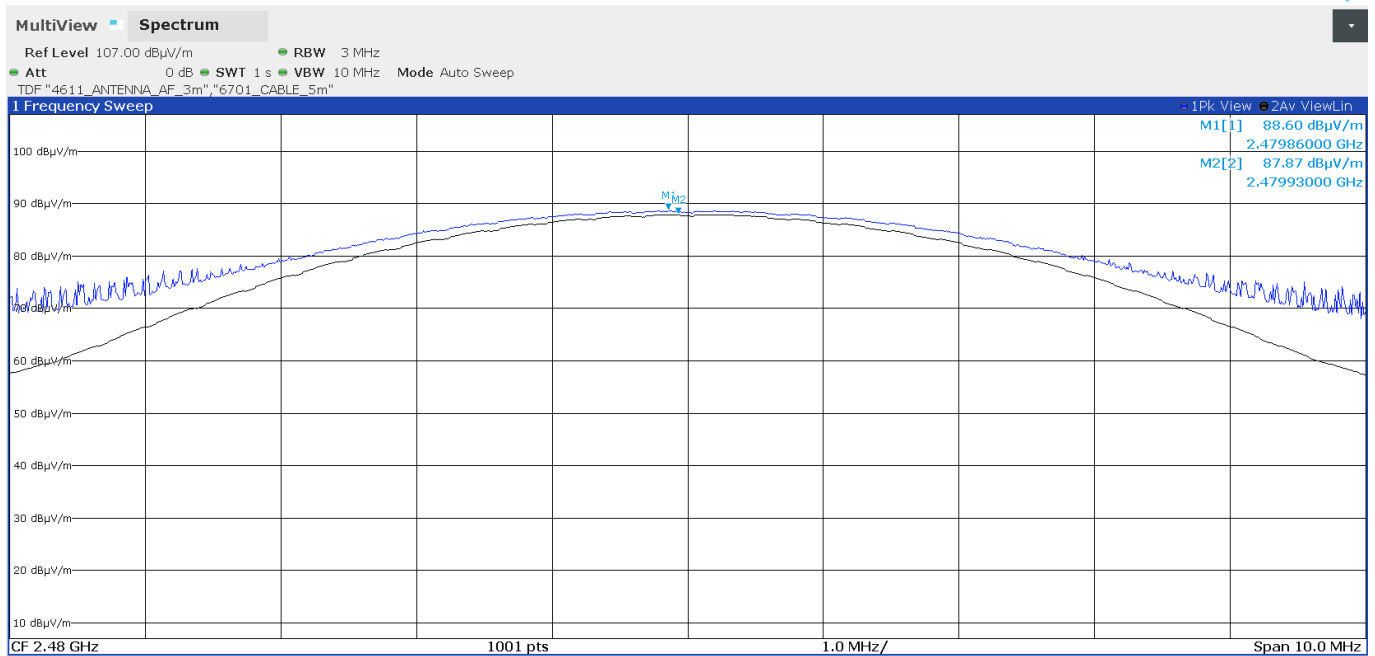
- Low Channel:



- Middle Channel:



- High Channel:



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 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-17 GHz and at distance of 1 m for the frequency range 17 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 signals detected do not depend 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)
30.7275	12.02	V	Quasi peak	<±4.99

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.

Duty cycle correction +3.00 dB

- Low Channel (2402 MHz):

Spurious frequency (GHz)	Emission Level (dBµV/m)	Corrected Emission Level (dBµV/m)	Polarization	Detector	Measurement Uncertainty (dB)
4.80400	49.06	49.06	V	Peak	<±4.98

- Middle Channel (2441 MHz):

Spurious frequency (GHz)	Emission Level (dBµV/m)	Corrected Emission Level (dBµV/m)	Polarization	Detector	Measurement Uncertainty (dB)
4.88200	46.24	46.24	V	Peak	<±4.98
7.32250	43.75	43.75	V	Peak	<±4.98

- High Channel (2480 MHz):

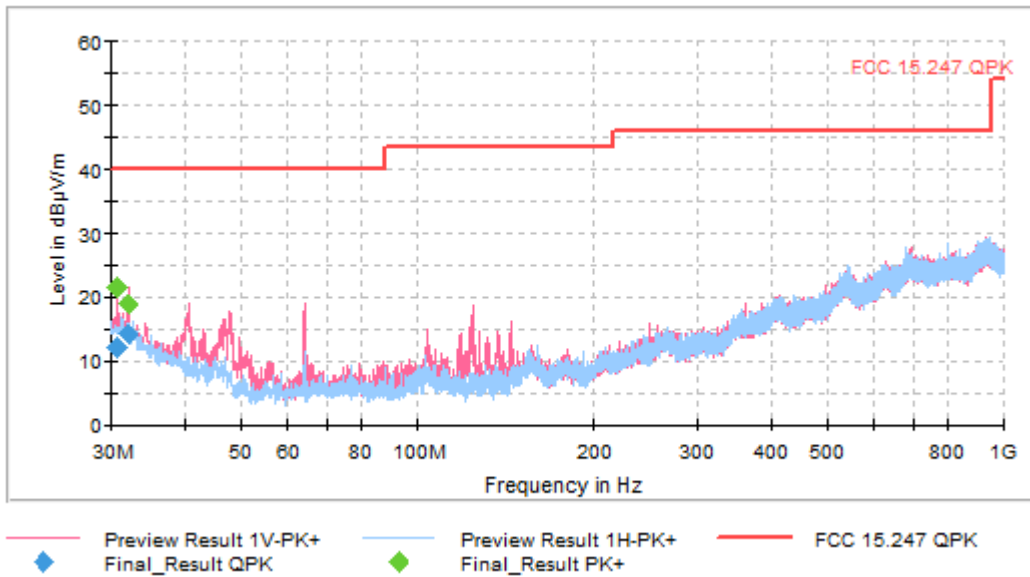
Spurious frequency (GHz)	Emission Level (dBµV/m)	Corrected Emission Level (dBµV/m)	Polarization	Detector	Measurement Uncertainty (dB)
2.48360	59.66	59.66	V	Peak	<±3.98
	41.26	44.26		Average	
2.48393	59.30	59.30	H	Peak	<±3.98
	41.27	44.27		Average	
2.48573	60.52	60.52	V	Peak	<±3.98
	41.27	44.27		Average	
2.48606	60.33	60.33	V	Peak	<±3.98
	41.31	44.31		Average	
4.9600	47.08	47.08	V	Peak	<±4.98
7.4395	43.87	43.87	V	Peak	<±4.98

Measurement Uncertainty: 1-3 GHz <±3.98 dB
 3-17 GHz <±4.98 dB
 17-26 GHz <±5.08 dB

Verdict: PASS

FREQUENCY RANGE 30 MHz - 1 GHz

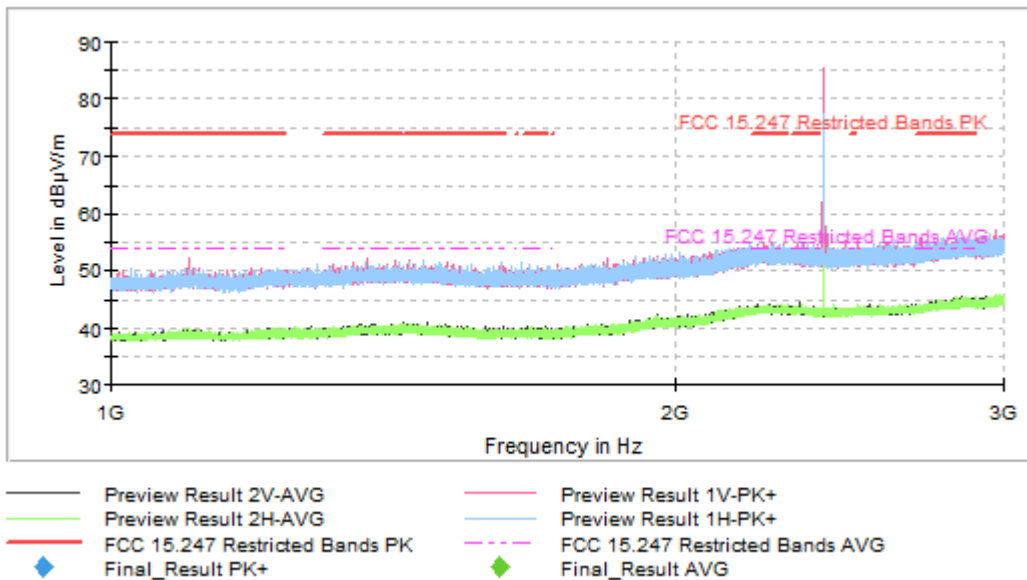
The spurious frequencies detected do not depend on the operating channel.



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

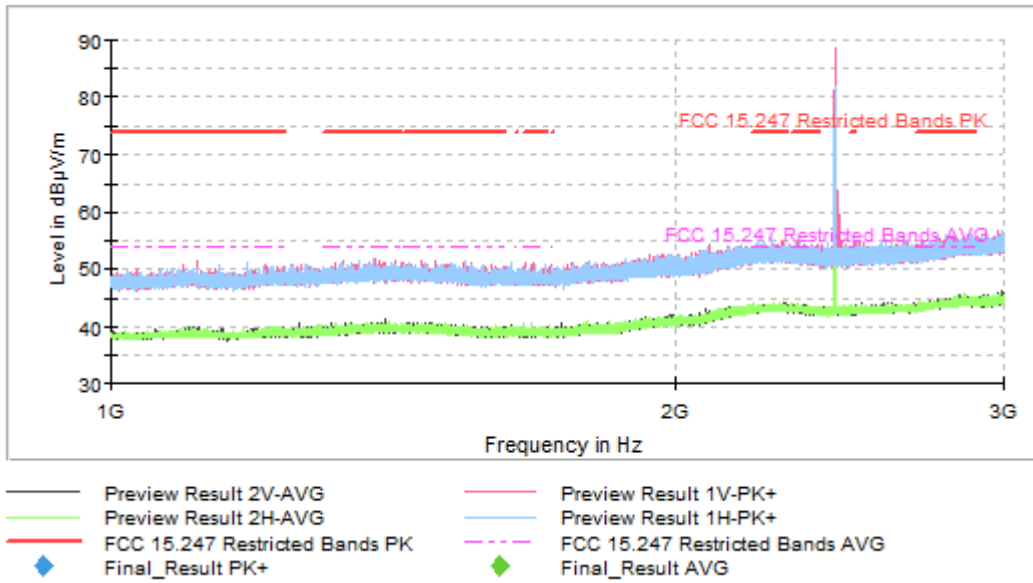
FREQUENCY RANGE 1 - 3 GHz

- Low Channel:



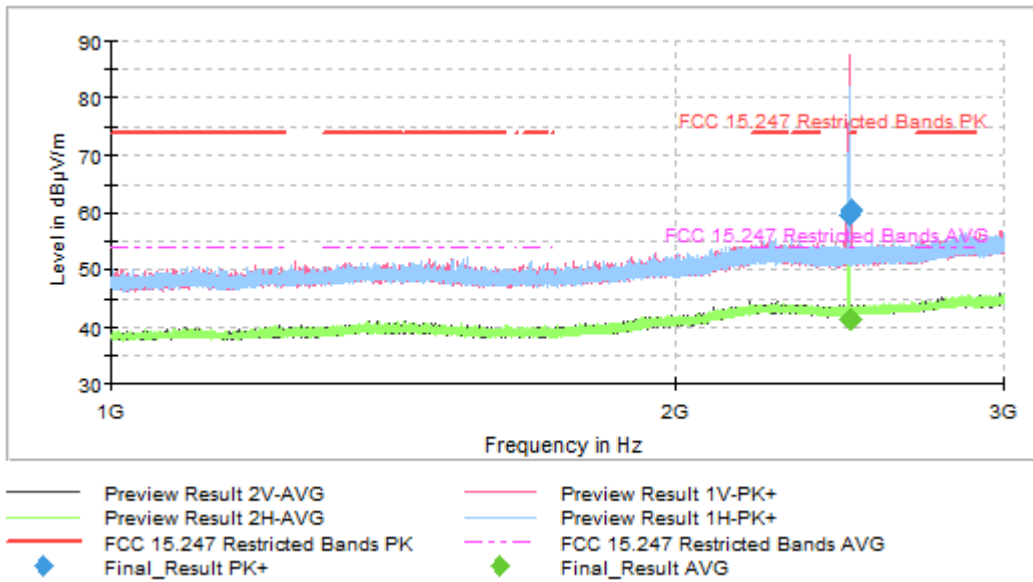
The peak above the limit is the carrier frequency.

- Middle Channel:



The peak above the limit is the carrier frequency.

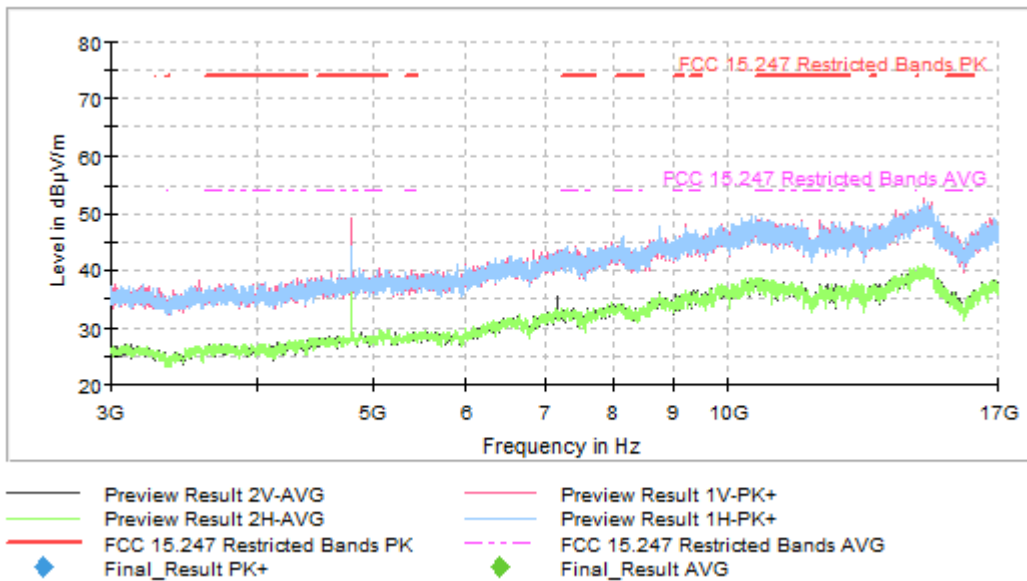
- High Channel:



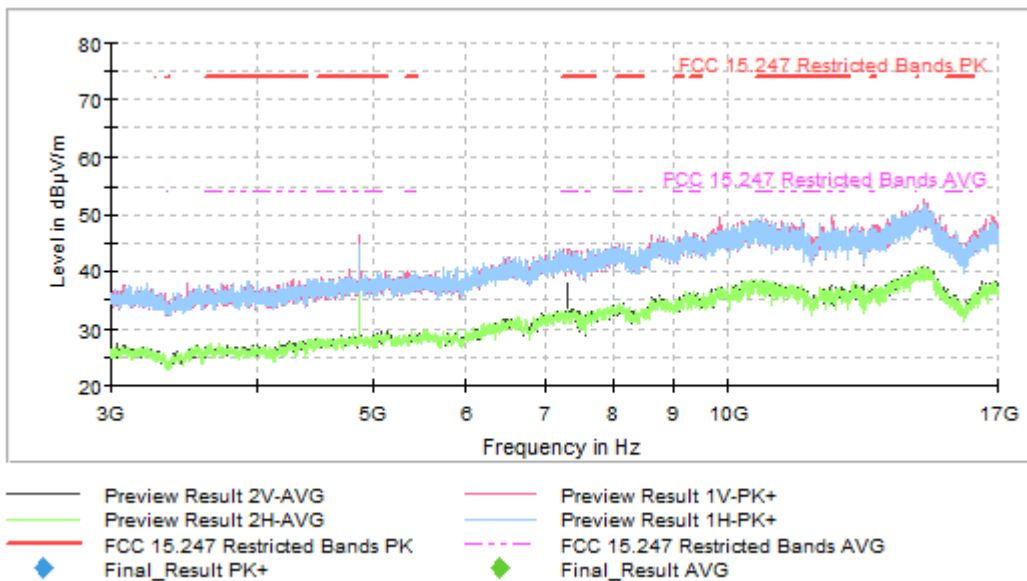
The peak above the limit is the carrier frequency.

FREQUENCY RANGE 3 - 17 GHz

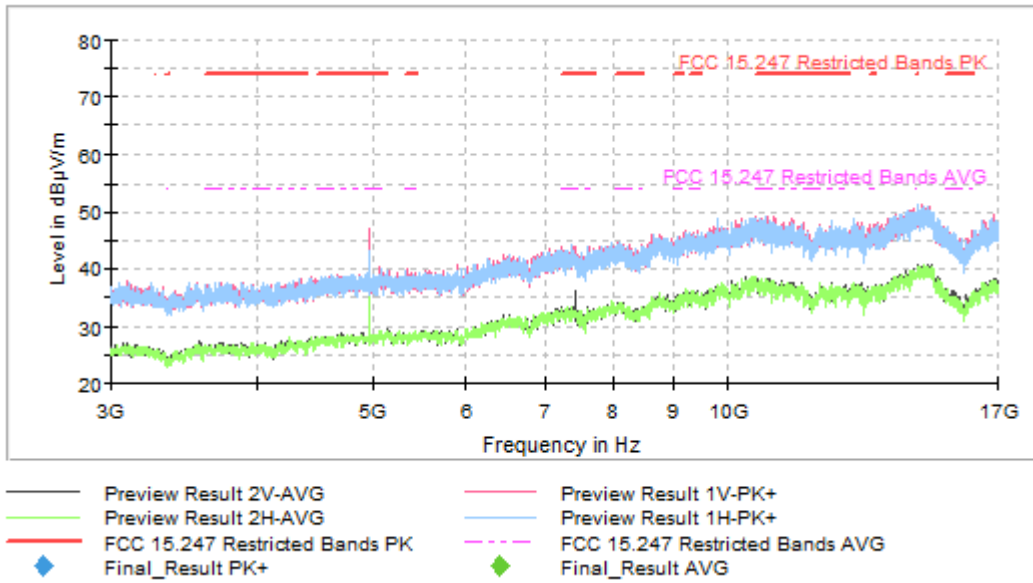
- Low Channel:



- Middle Channel:

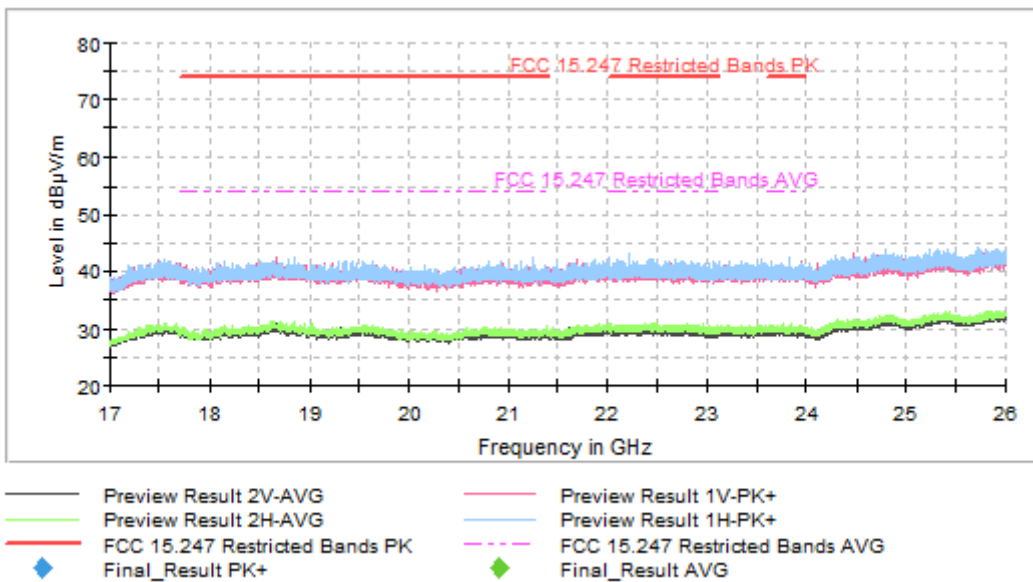


- High Channel:



FREQUENCY RANGE 17 - 26 GHz

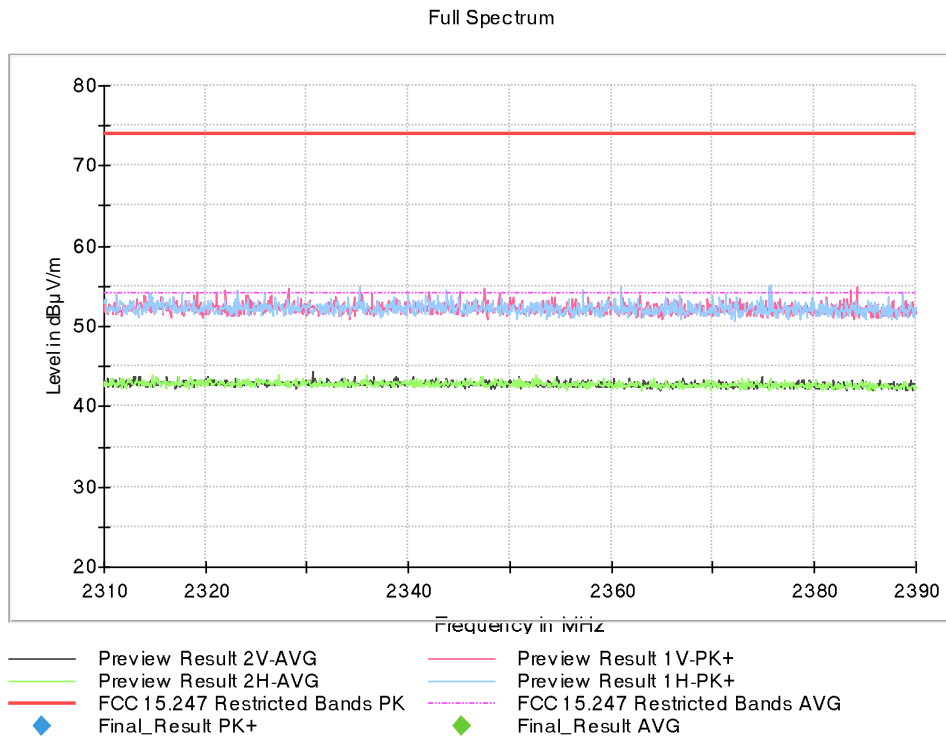
The spurious frequencies detected do not depend on the operating channel.



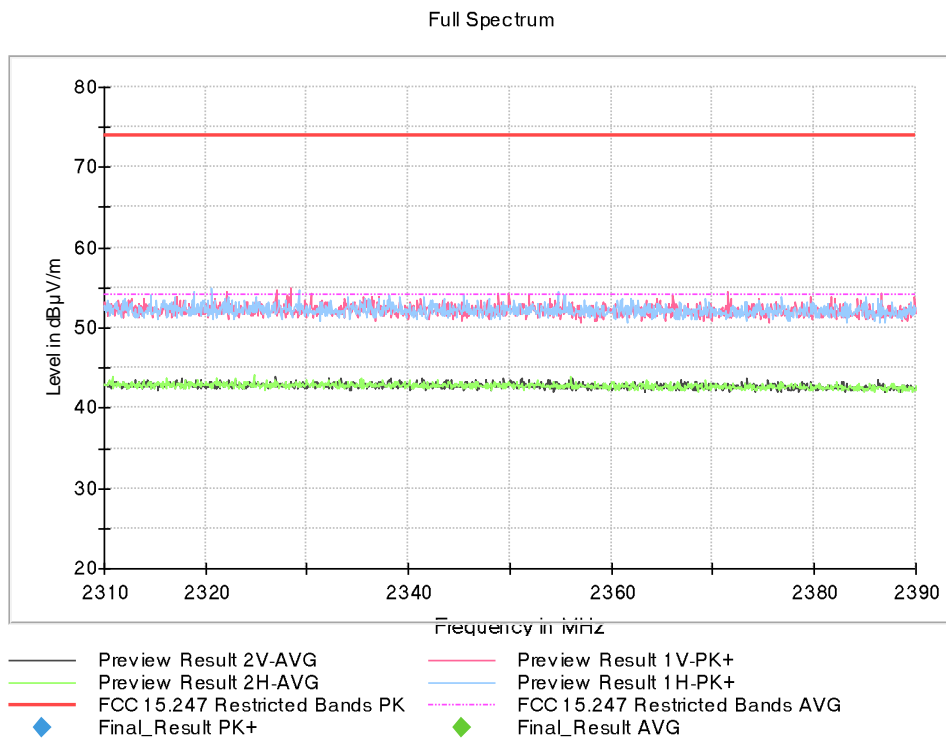
This plot is valid for the Low, Middle and High Channels.

FREQUENCY RANGE 2.31-2.39 GHz

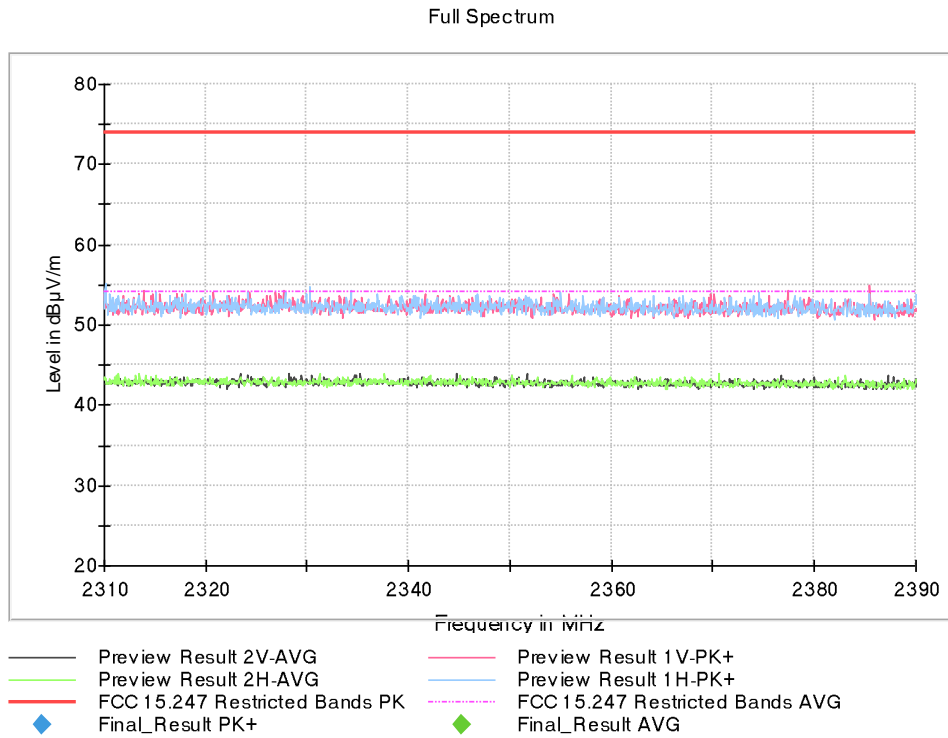
- Low Channel:



- Middle Channel:

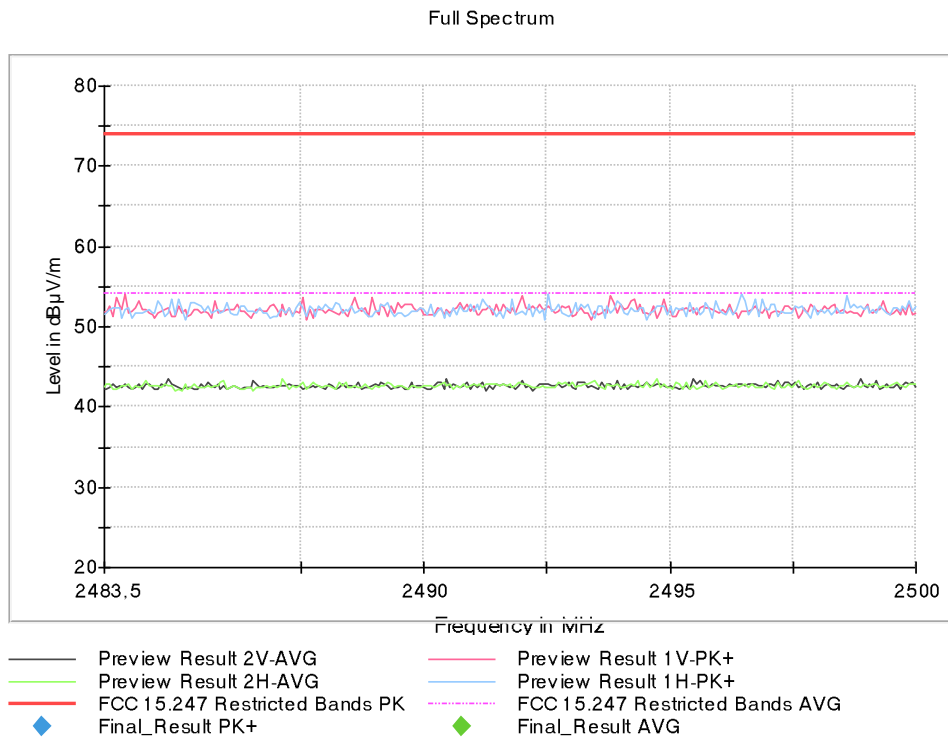


- High Channel:

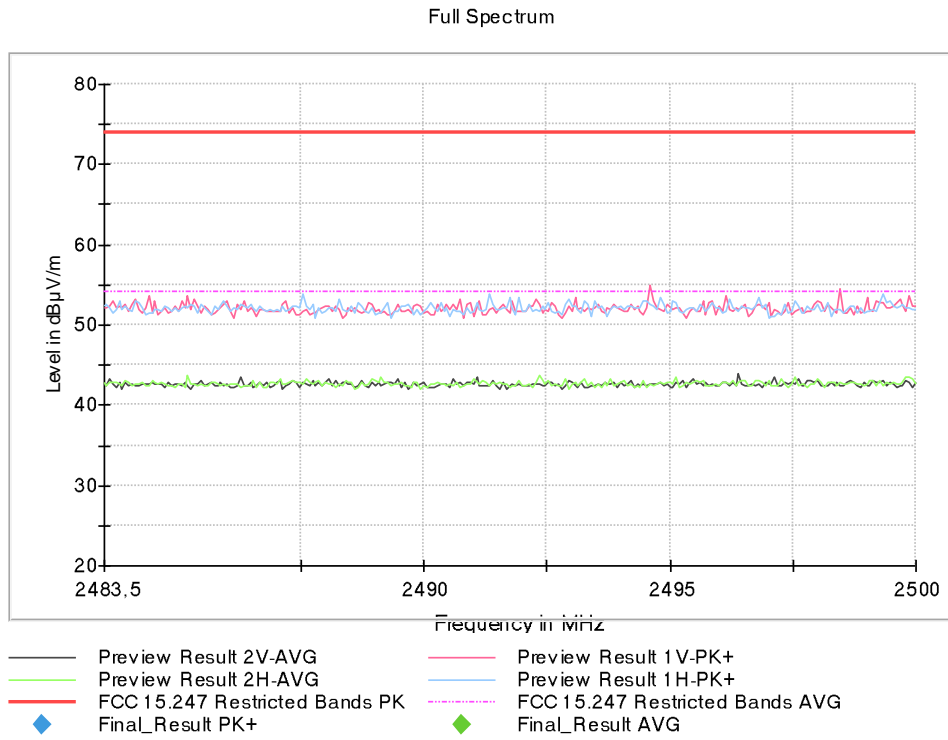


FREQUENCY RANGE 2.4835-2.5 GHz

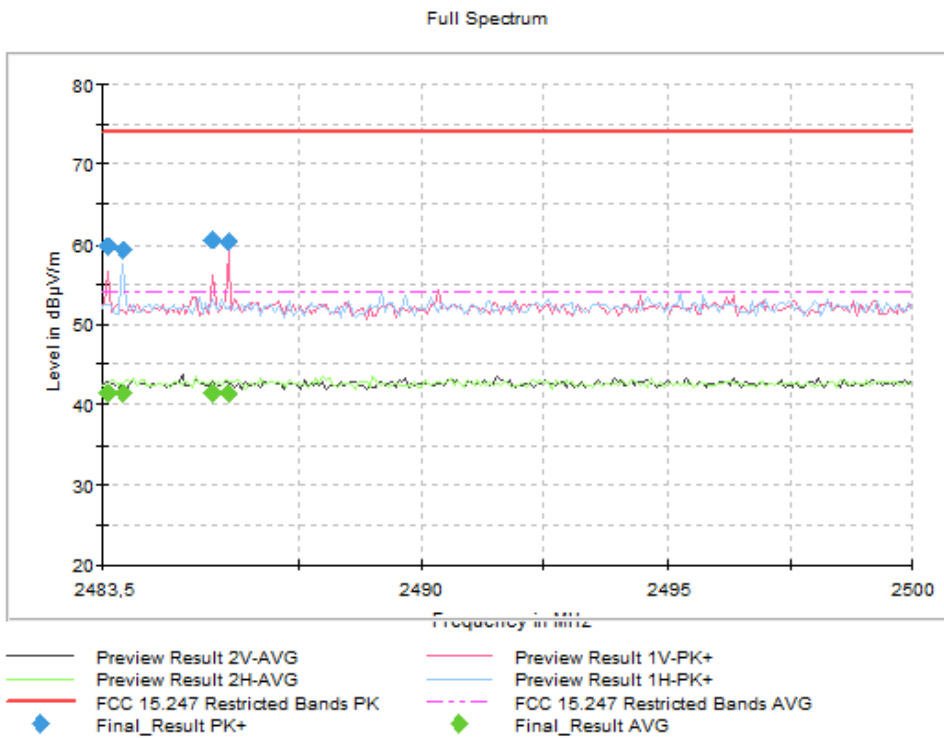
- Low Channel:



- Middle Channel:



- High Channel:



Appendix C: Test results. **Proprietary protocol DM 2.4 GHz**

INDEX_Toc54115395

TEST CONDITIONS	48
Occupied Bandwidth	51
15.249 (a) / RSS-210 B.10 (a) Field strength of fundamental and harmonics emissions	53
15.249 (d) / RSS-210 B.10 (b) Emissions radiated outside of the specific frequency bands	55

TEST CONDITIONS

POWER SUPPLY (V) and ANTENNA:

V nominal:	3.7 Vdc
Type of Power Supply:	Rechargeable battery.
Type of Antenna:	Integral.
Declared Antenna Gain:	-6 dBi

TEST FREQUENCIES:

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

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.



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 and 1 GHz-17 GHz double ridge horn antenna) is situated at a distance of 3 m and at a distance of 1 m for the frequency range 17 GHz-26 GHz (17 GHz-40 GHz horn antenna).

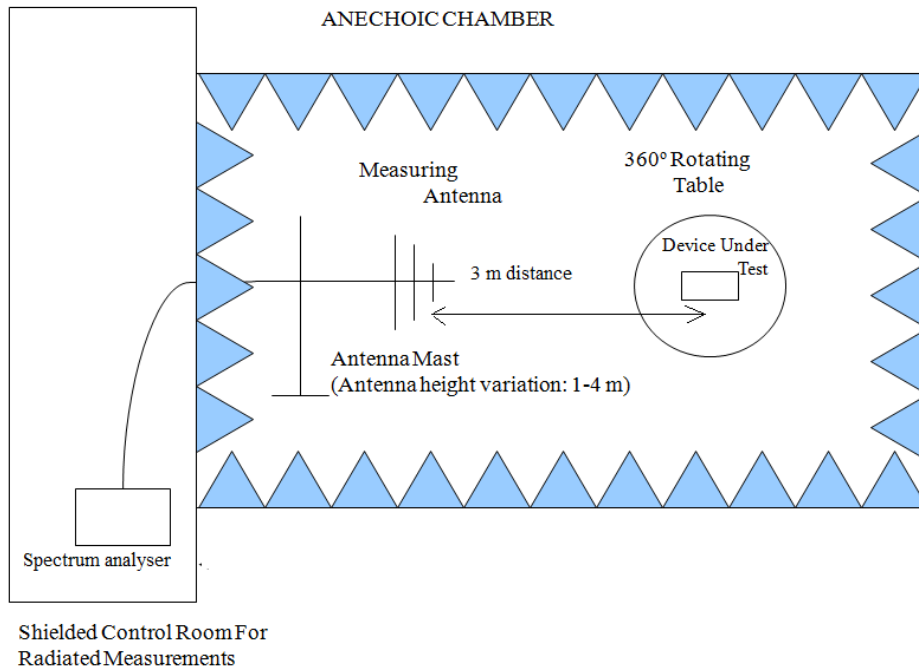
For radiated emissions in the range 17 GHz-26 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

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 was varied from 1 to 4 meters to find the maximum radiated emission.

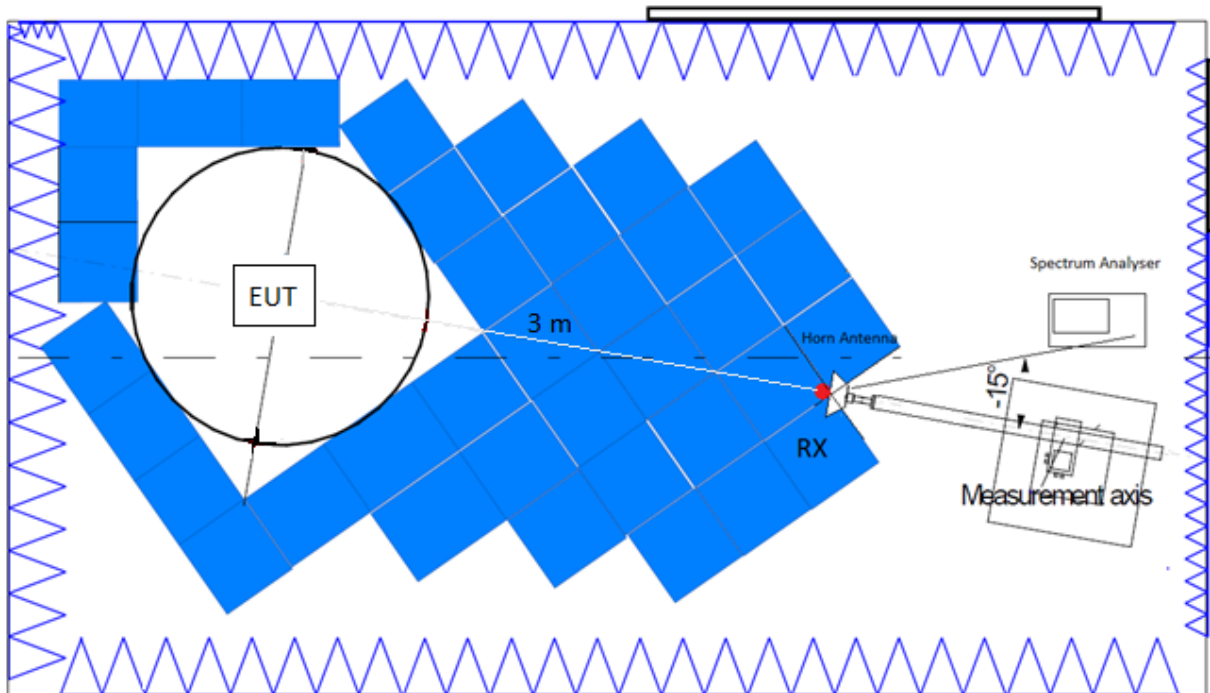
Measurements were made in both horizontal and vertical planes of polarization.

A resolution bandwidth/video bandwidth of 100 kHz/300 kHz was used for frequencies below 1 GHz and 1MHz/3MHz for frequencies above 1 GHz.

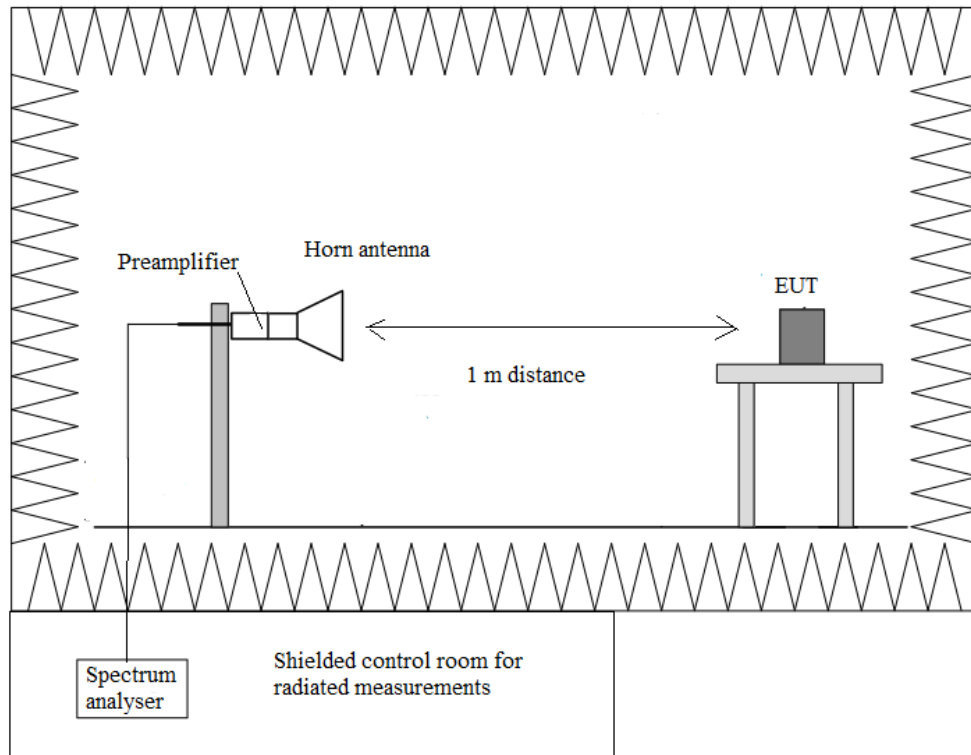
Radiated measurements setup $f < 1$ GHz:



Radiated measurements setup from 1 GHz to 17 GHz:



Radiated measurements setup $f > 17$ GHz:



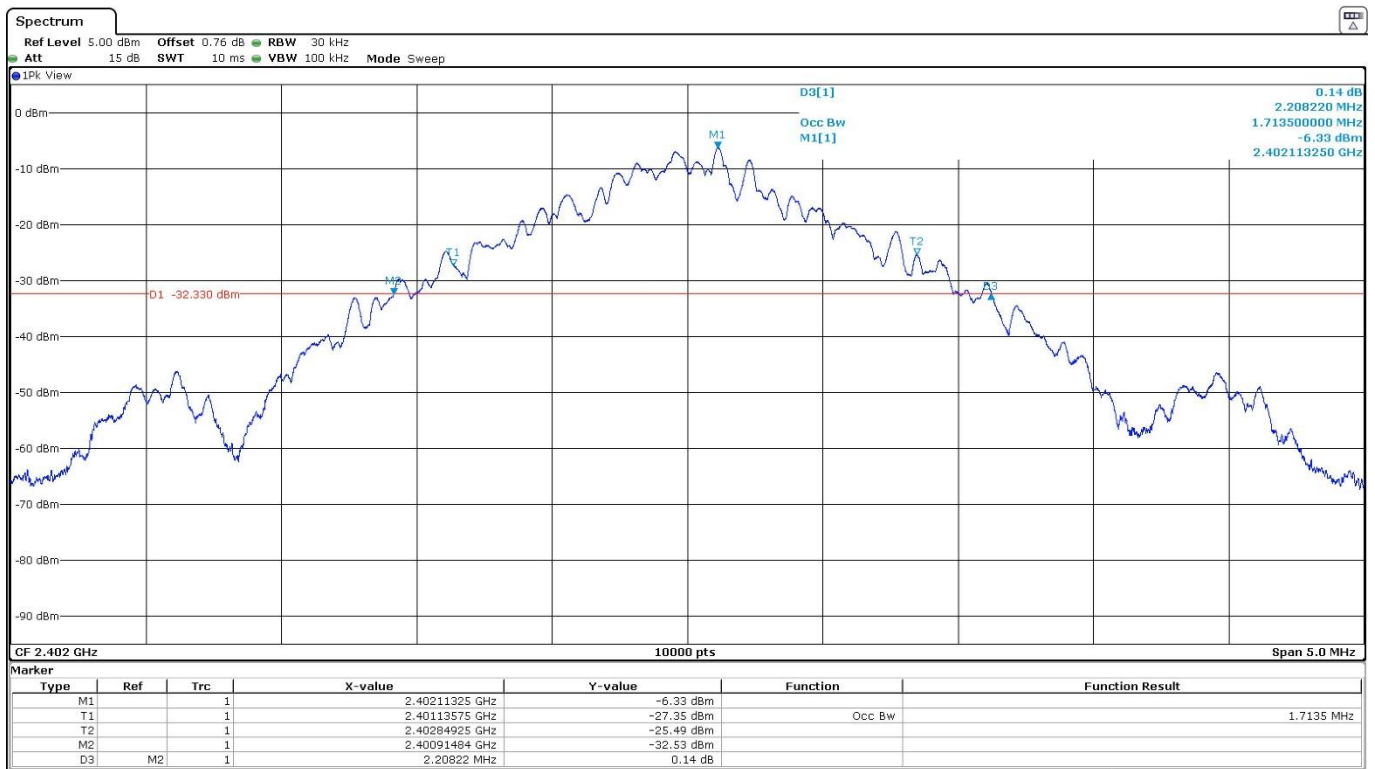
Occupied Bandwidth

RESULTS:

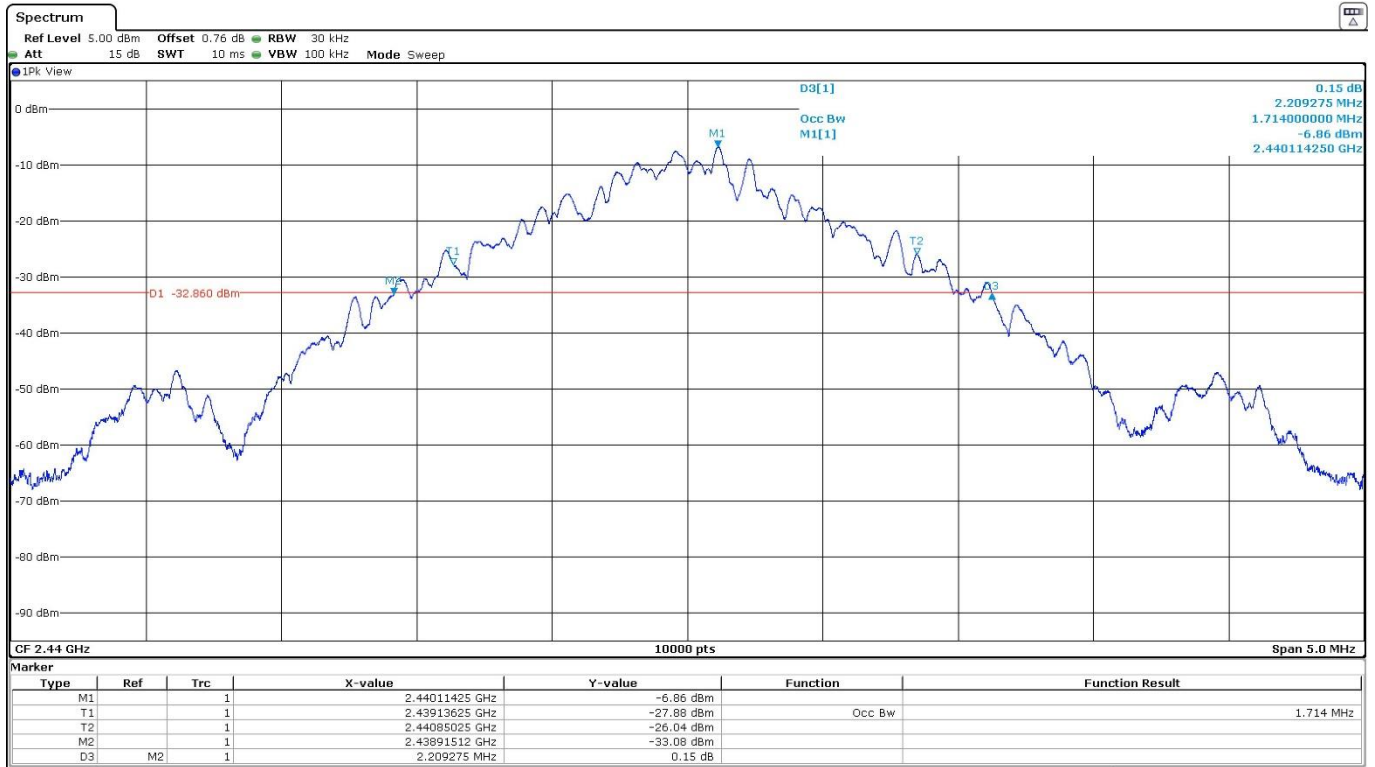
	Low Channel 2402 MHz	Middle Channel 2440 MHz	High Channel 2480 MHz
99% Bandwidth (MHz)	1.7135	1.7140	1.7160
Measurement Uncertainty (kHz)	<±1.42		

Verdict: PASS

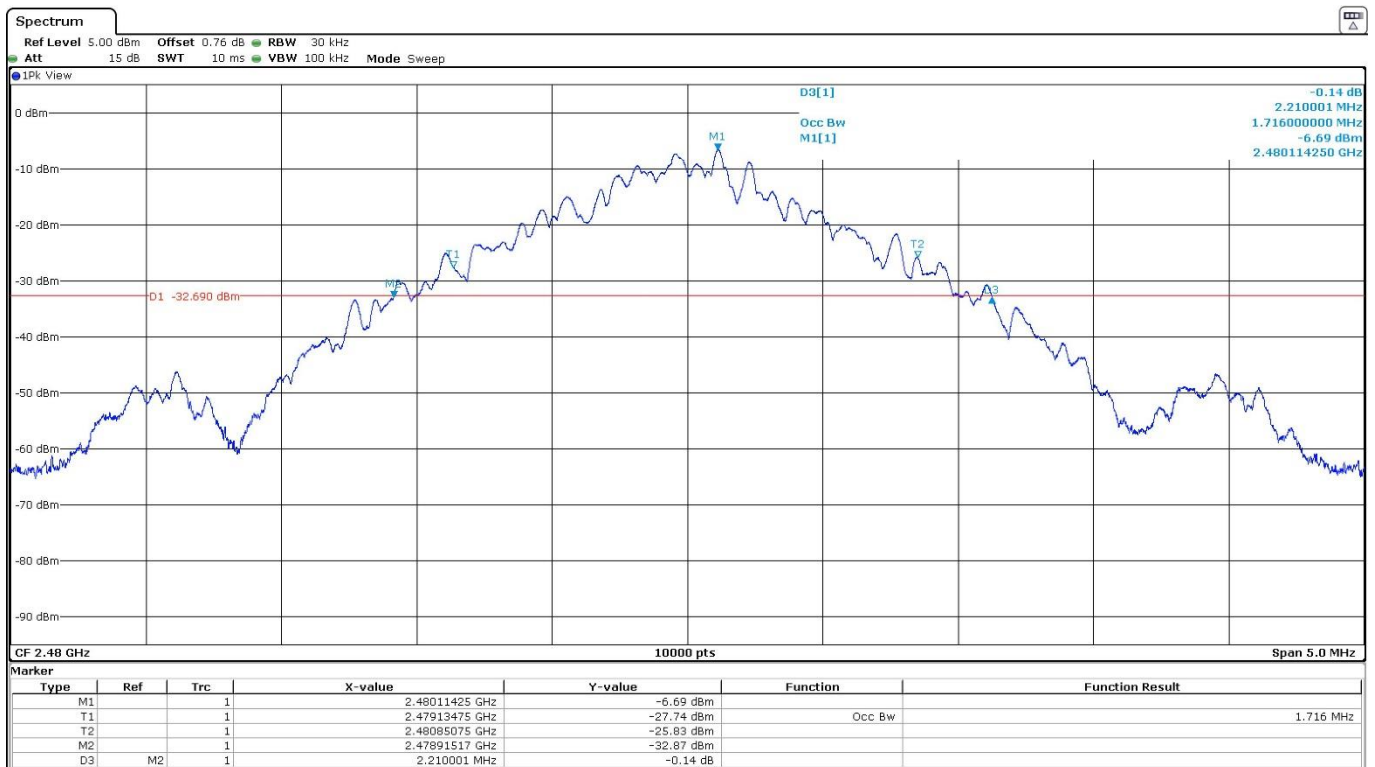
- Low Channel:



- Middle Channel:



- High Channel:



15.249 (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

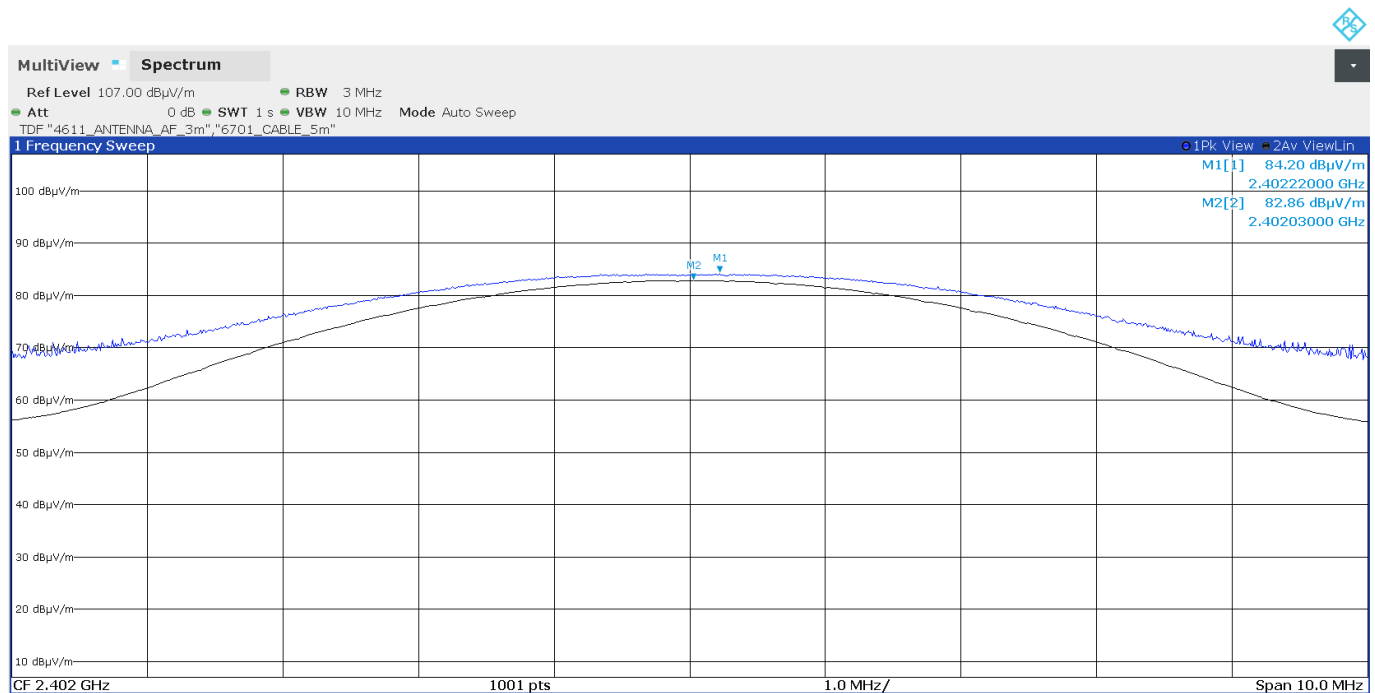
For frequencies above 1000 MHz, the above field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

RESULTS:

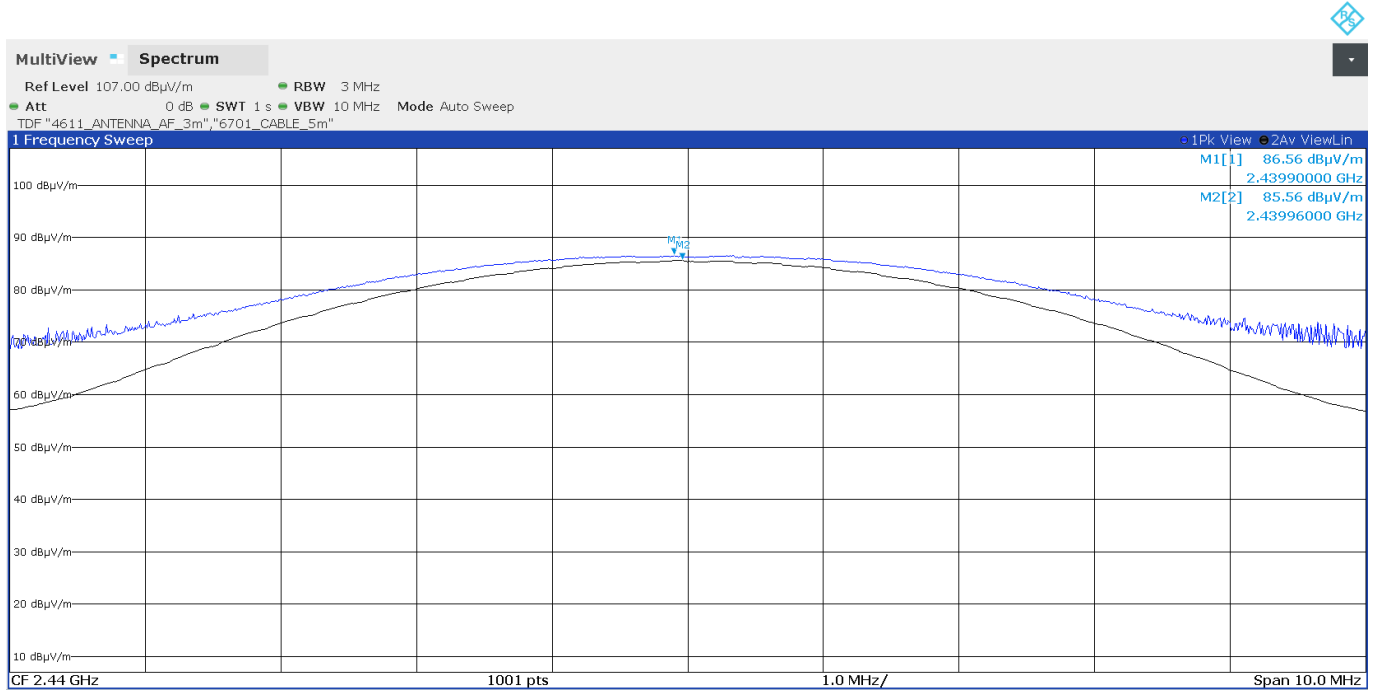
	Low Channel 2402 MHz	Middle Channel 2440 MHz	High Channel 2480 MHz
Average Field Strength (dBµV/m)	82.86	85.56	87.04
Peak Field Strength (dBµV/m)	84.20	86.56	87.96
Measurement Uncertainty (dB)	<±3.98		

Verdict: PASS

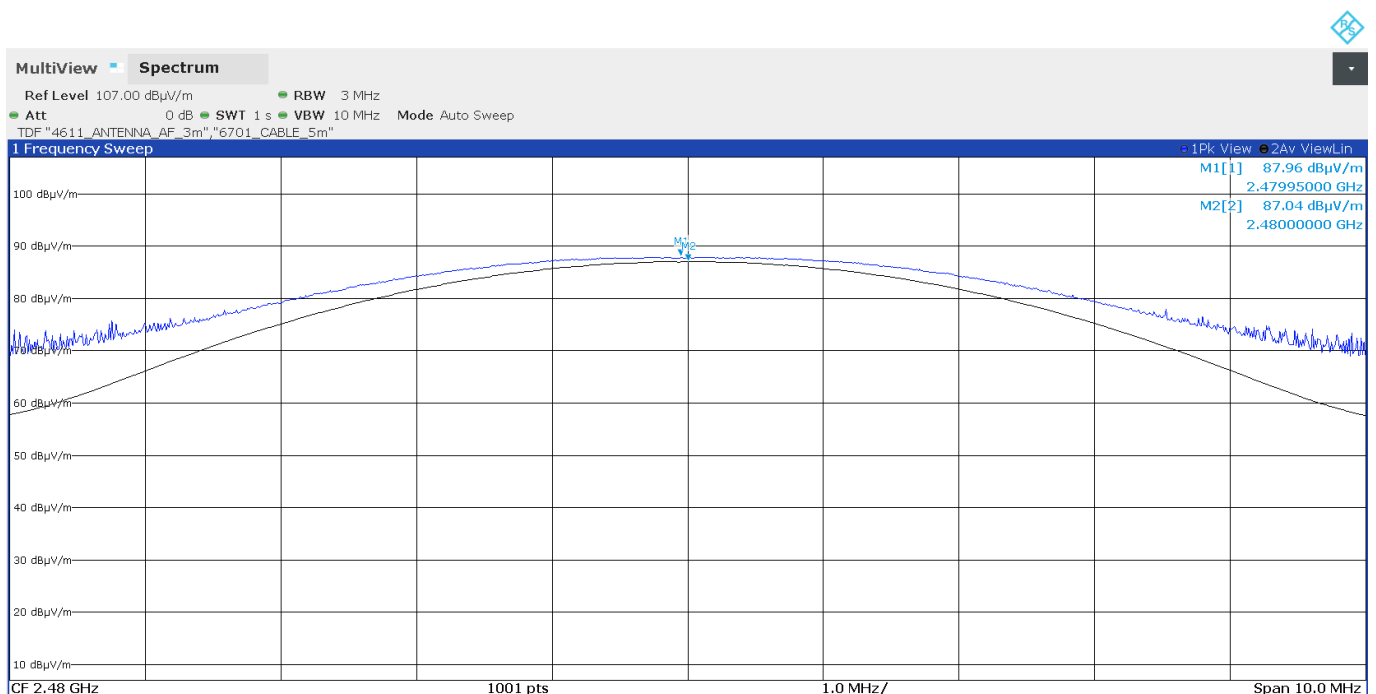
- Low Channel:



- Middle Channel:



- High Channel:



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 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-17 GHz and at distance of 1 m for the frequency range 17 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 signals detected do not depend on the operating channel.

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

Measurement Uncertainty (dB) <±4.99

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.

Duty cycle correction +3.00 dB

- Low Channel (2402 MHz):

Spurious frequency (GHz)	Emission Level (dBµV/m)	Corrected Emission Level (dBµV/m)	Polarization	Detector	Measurement Uncertainty (dB)
4.80450	48.18	48.18	V	Peak	<±4.98

- Middle Channel (2440 MHz):

Spurious frequency (GHz)	Emission Level (dBµV/m)	Corrected Emission Level (dBµV/m)	Polarization	Detector	Measurement Uncertainty (dB)
4.88050	45.60	45.60	V	Peak	<±4.98

- High Channel (2480 MHz):

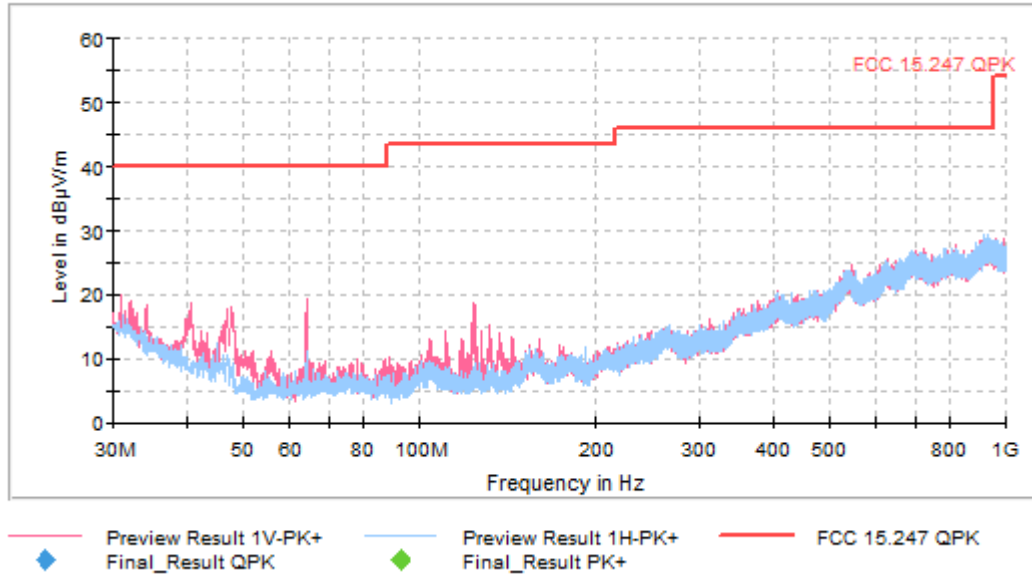
Spurious frequency (GHz)	Emission Level (dBµV/m)	Corrected Emission Level (dBµV/m)	Polarization	Detector	Measurement Uncertainty (dB)
2.48446	60.65	60.65	V	Peak	<±3.98
	41.31	44.31		Average	
4.96000	45.14	45.14	V	Peak	<±4.98

Measurement Uncertainty: 1-3 GHz <±3.98 dB
 3-17 GHz <±4.98 dB
 17-26 GHz <±5.08 dB

Verdict: PASS

FREQUENCY RANGE 30 MHz - 1 GHz

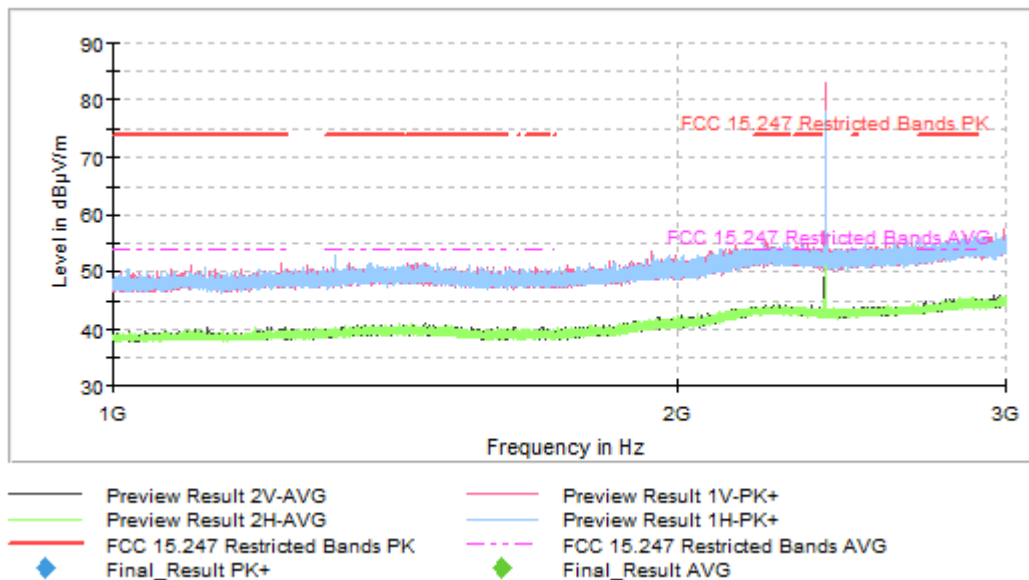
The spurious frequencies detected do not depend on the operating channel.



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

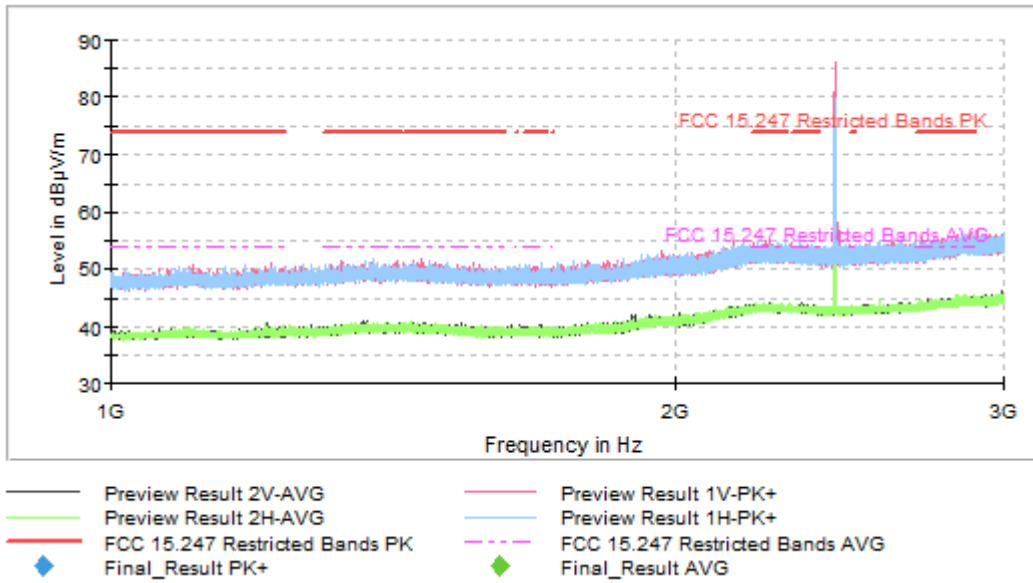
FREQUENCY RANGE 1 - 3 GHz

- Low Channel:



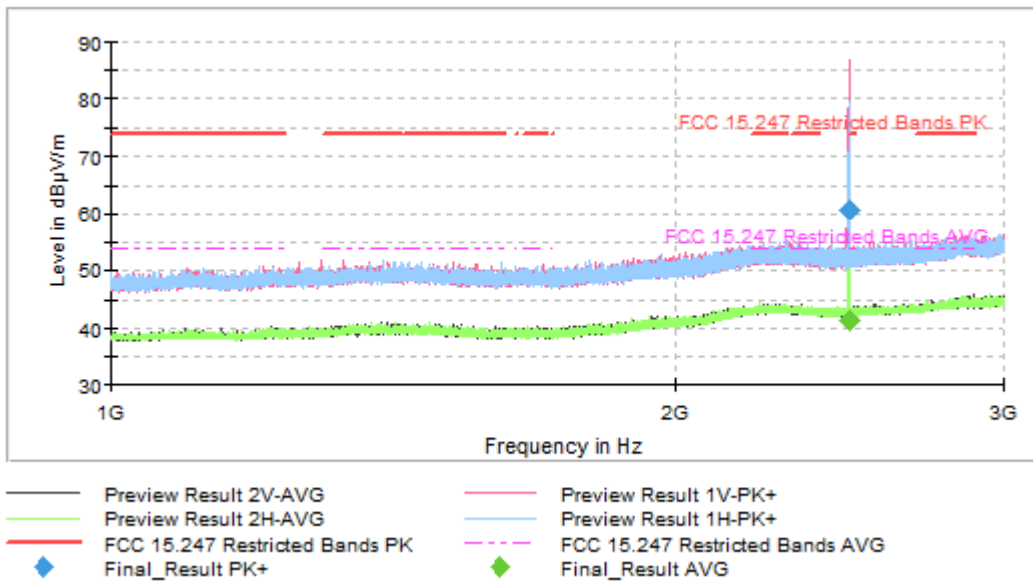
The peak above the limit is the carrier frequency.

- Middle Channel:



The peak above the limit is the carrier frequency.

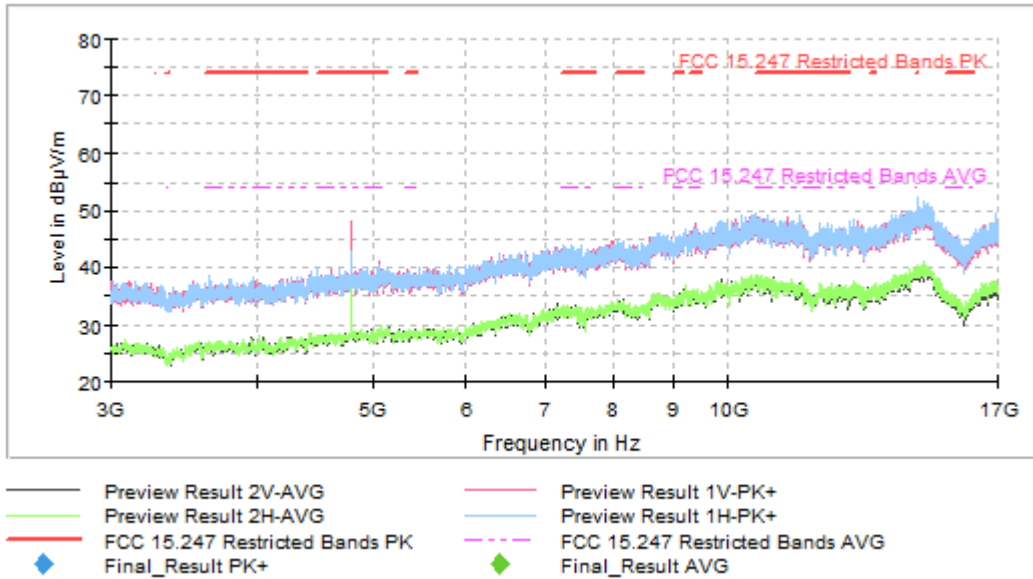
- High Channel:



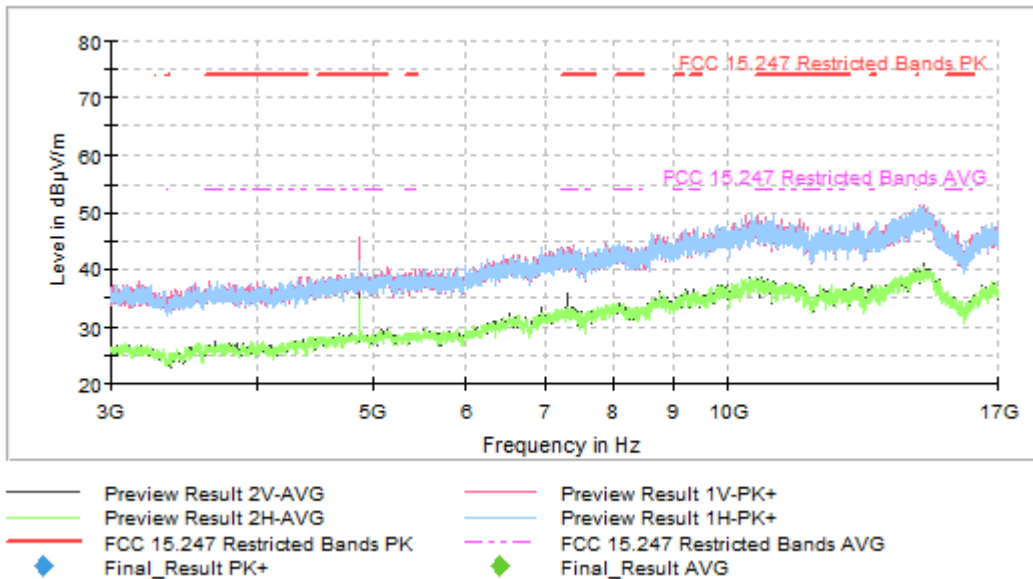
The peak above the limit is the carrier frequency.

FREQUENCY RANGE 3 - 17 GHz

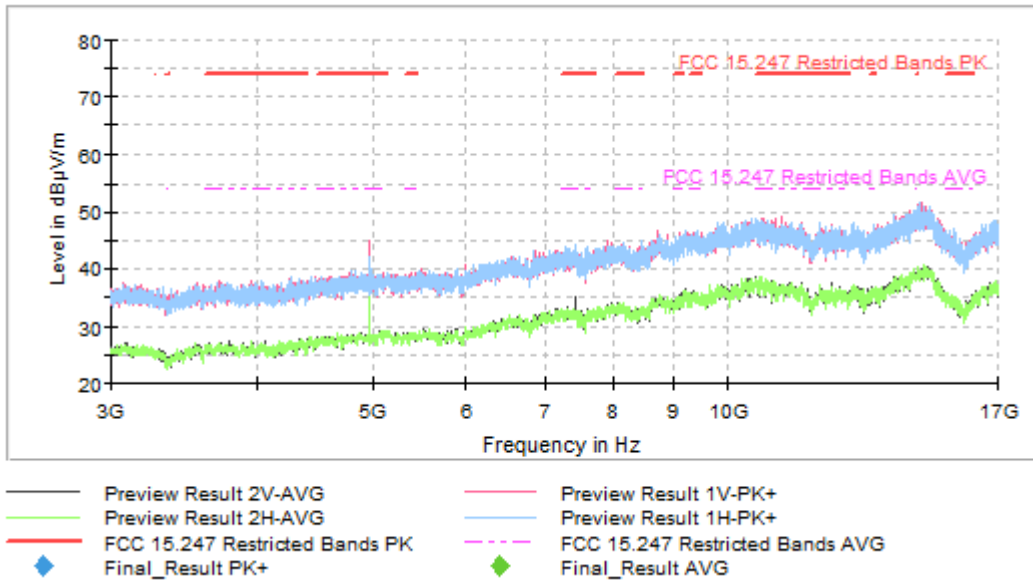
- Low Channel:



- Middle Channel:

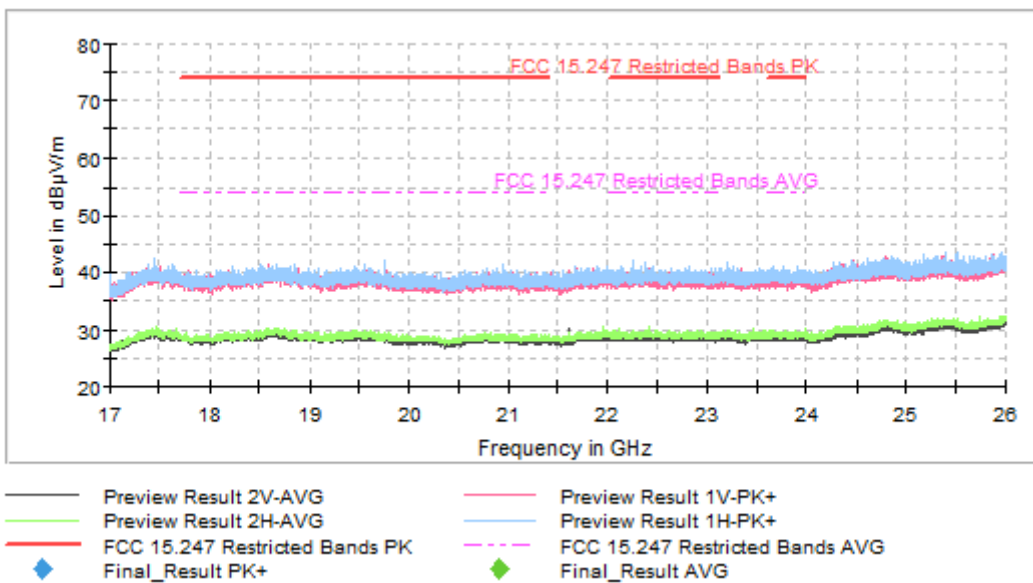


- High Channel:



FREQUENCY RANGE 17 - 26 GHz

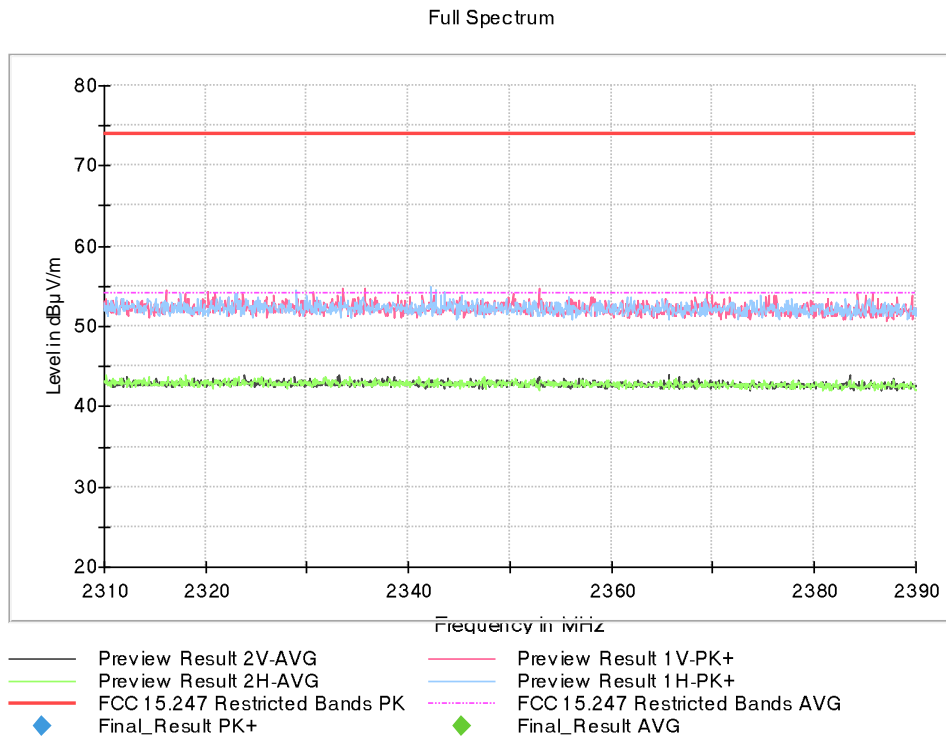
The spurious frequencies detected do not depend on the operating channel.



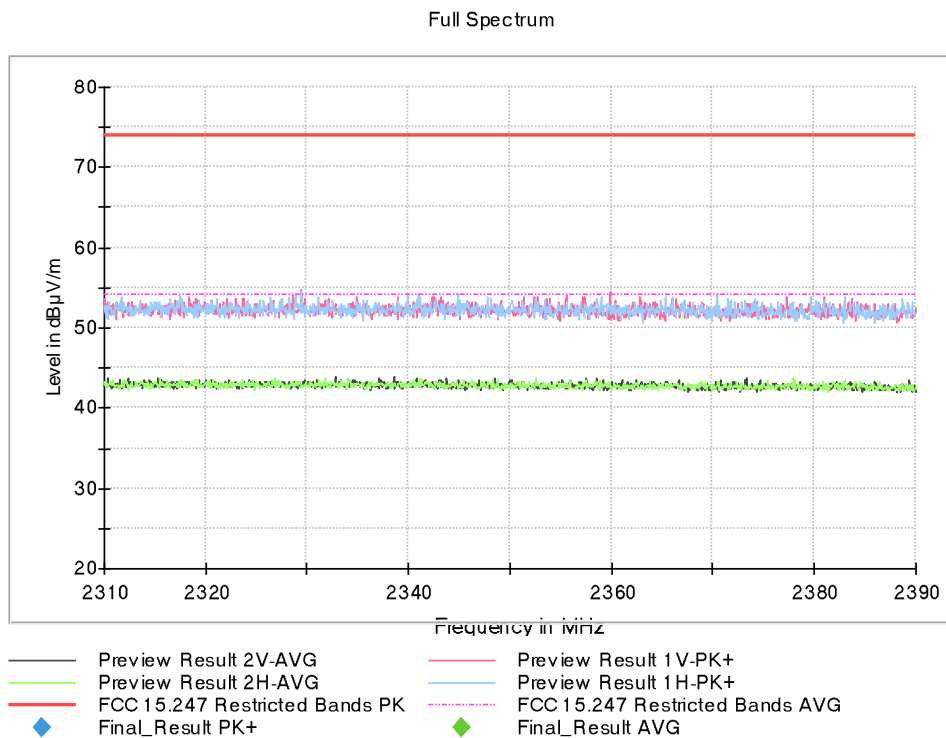
This plot is valid for the Low, Middle and High Channels.

FREQUENCY RANGE 2.31-2.39 GHZ

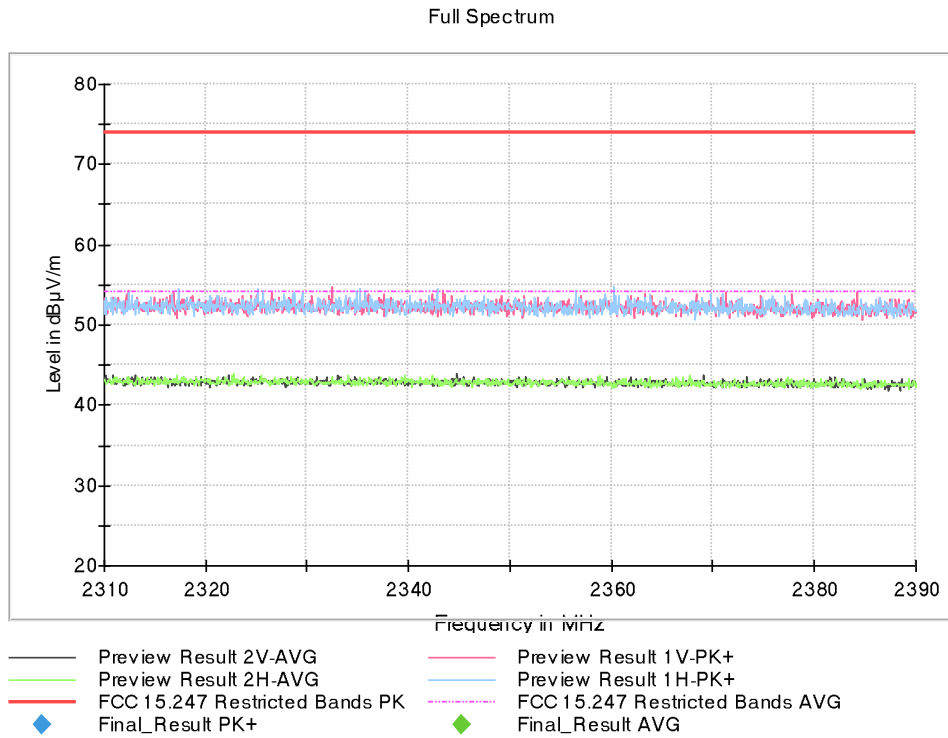
- Low Channel:



- Middle Channel:

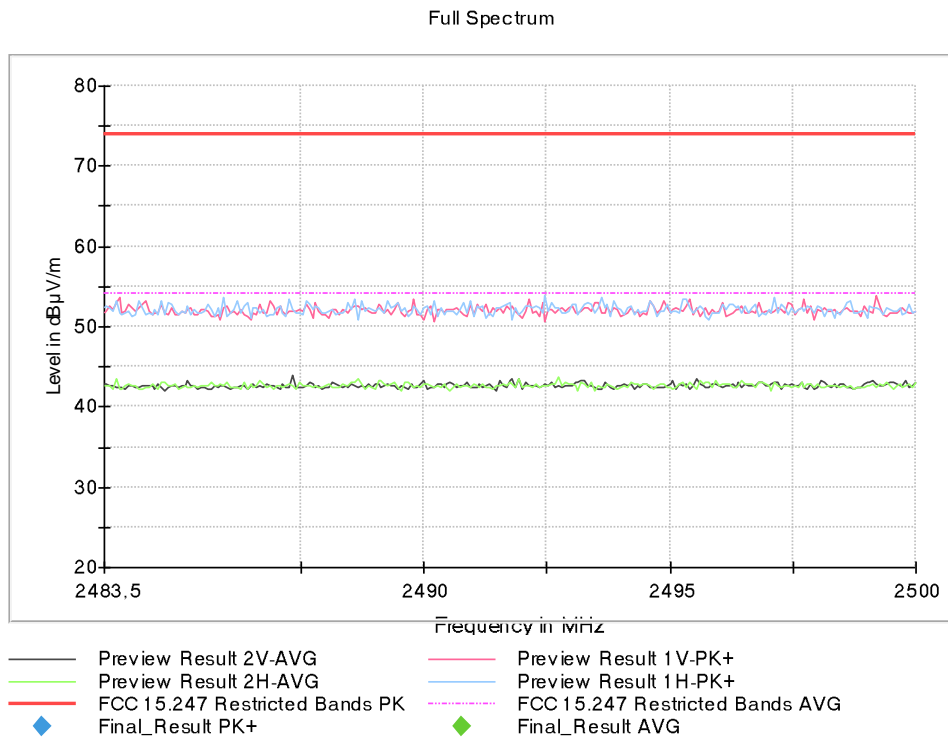


- High Channel:

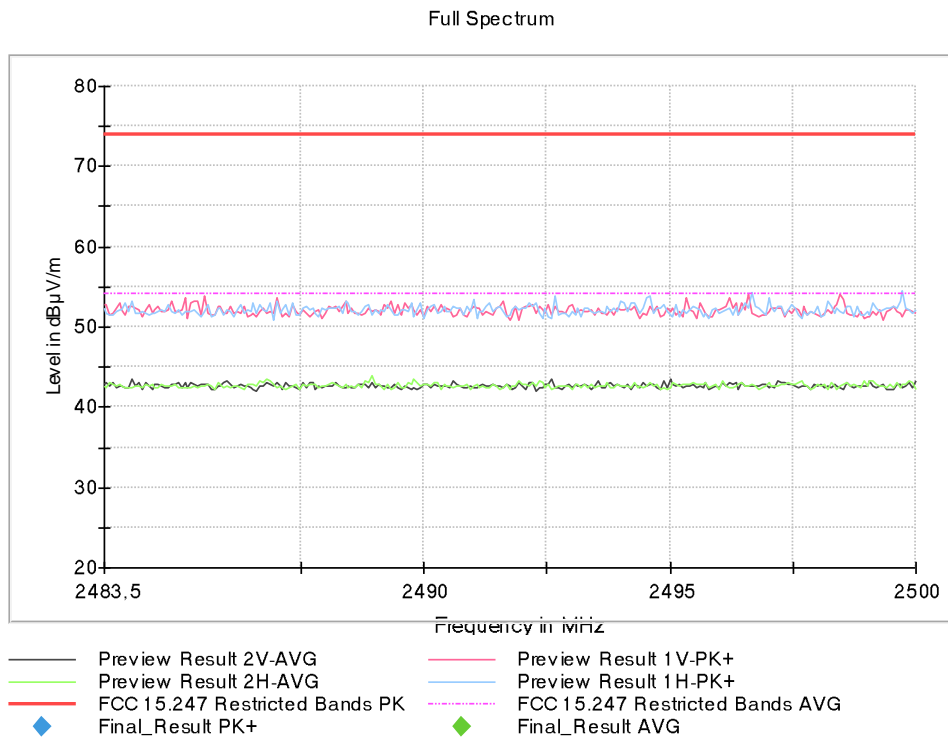


FREQUENCY RANGE 2.4835-2.5 GHz

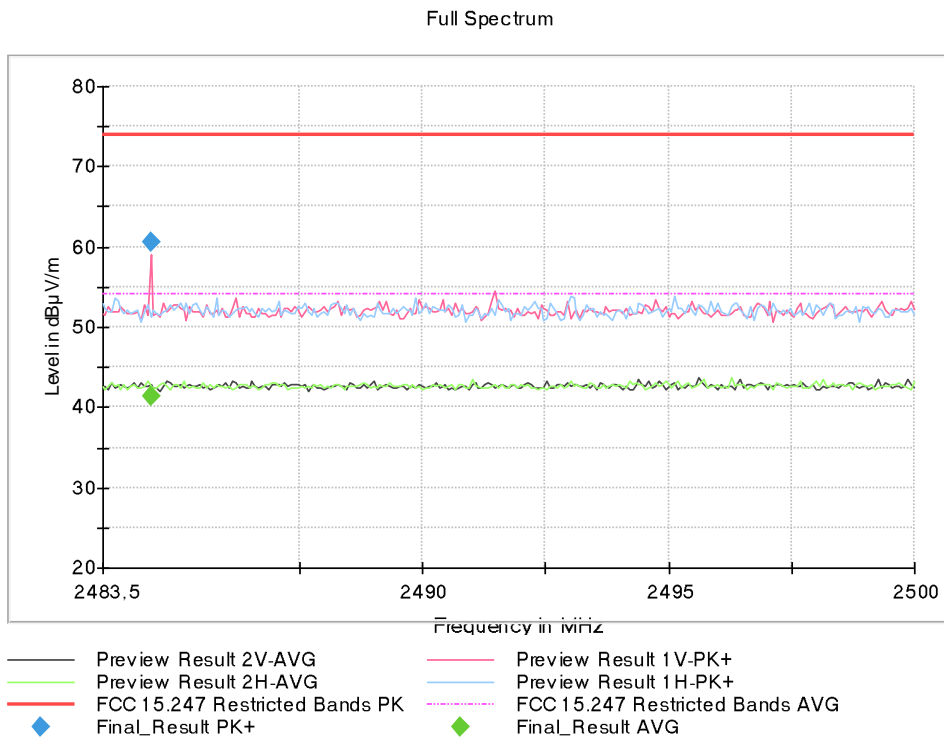
- Low Channel:



- Middle Channel:



- High Channel:



Appendix D: Test results. **Proprietary protocol Flora 2.4 GHz**

INDEX

TEST CONDITIONS	66
Occupied Bandwidth	69
15.249 (a) / RSS-210 B.10 (a) Field strength of fundamental and harmonics emissions	71
15.249 (d) / RSS-210 B.10 (b) Emissions radiated outside of the specific frequency bands	73

TEST CONDITIONS

POWER SUPPLY (V) and ANTENNA:

V nominal:	3.7 Vdc
Type of Power Supply:	Rechargeable battery.
Type of Antenna:	Integral.
Declared Antenna Gain:	-6 dBi

TEST FREQUENCIES:

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

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.



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 and 1 GHz-17 GHz double ridge horn antenna) is situated at a distance of 3 m and at a distance of 1 m for the frequency range 17 GHz-26 GHz (17 GHz-40 GHz horn antenna).

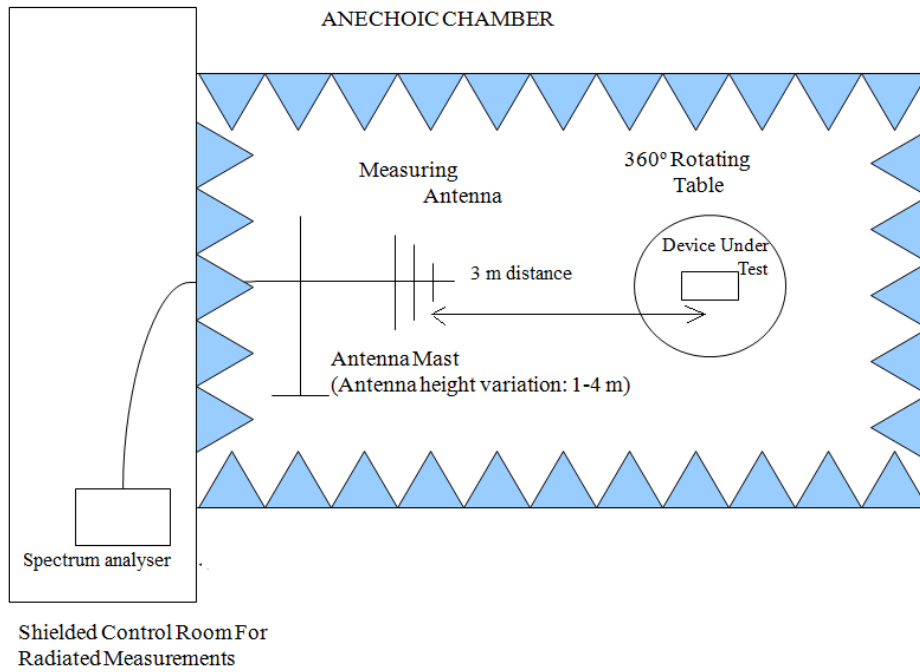
For radiated emissions in the range 17 GHz-26 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

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 was varied from 1 to 4 meters to find the maximum radiated emission.

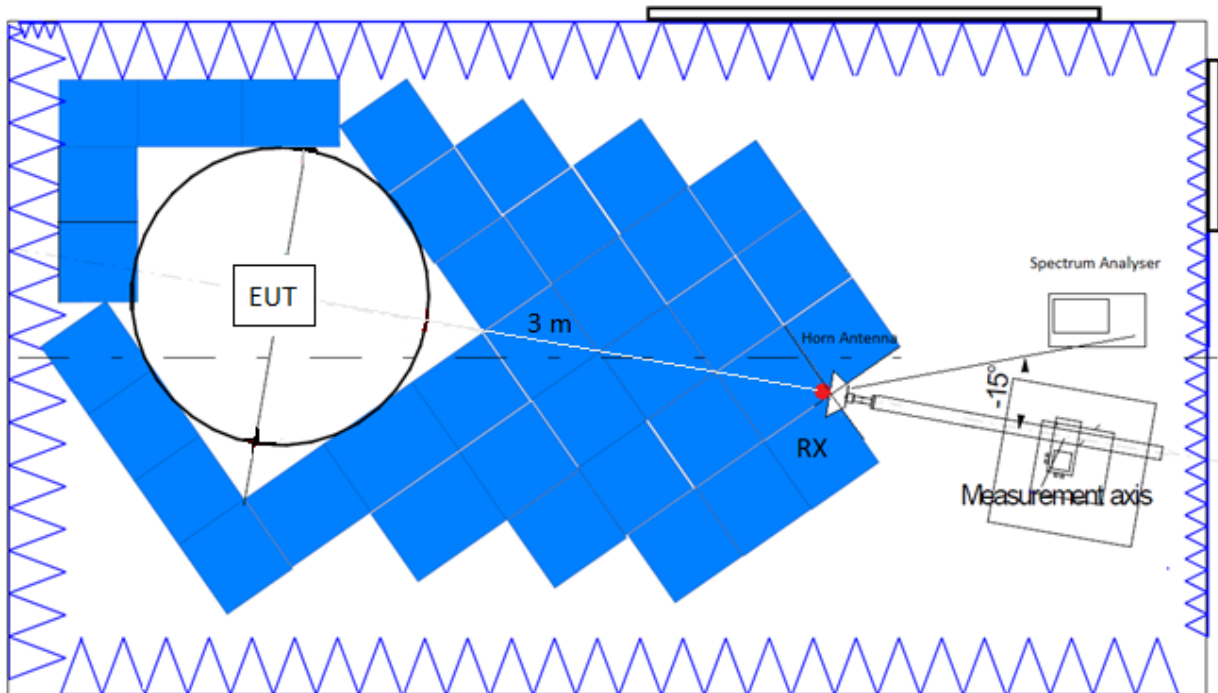
Measurements were made in both horizontal and vertical planes of polarization.

A resolution bandwidth/video bandwidth of 100 kHz/300 kHz was used for frequencies below 1 GHz and 1MHz/3MHz for frequencies above 1 GHz.

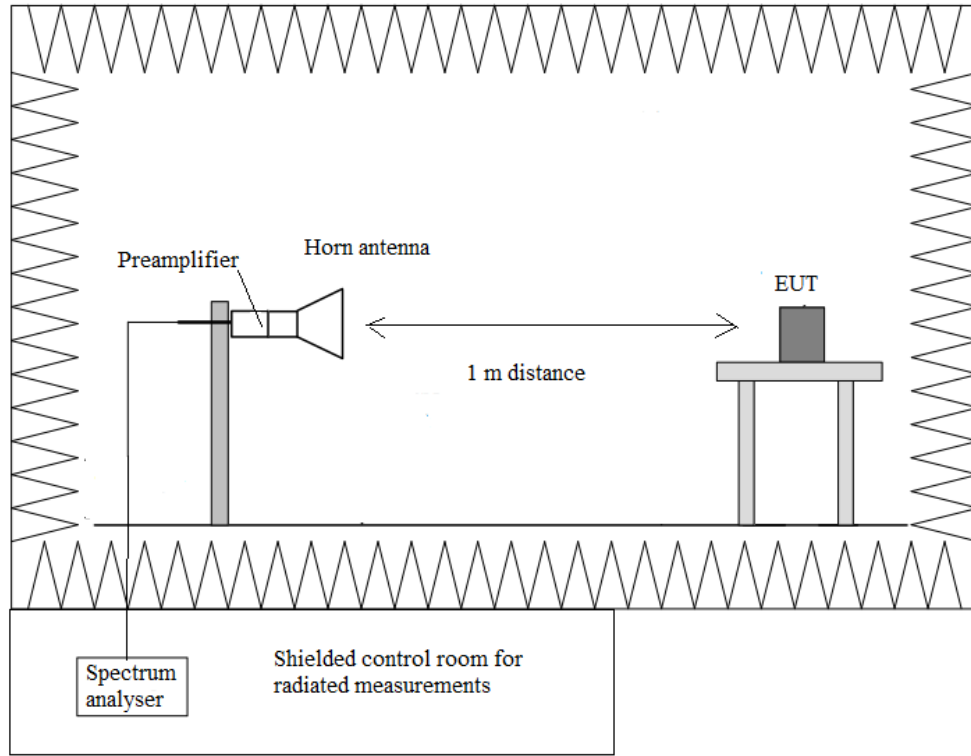
Radiated measurements setup $f < 1$ GHz:



Radiated measurements setup from 1 GHz to 17 GHz:



Radiated measurements setup $f > 17$ GHz:



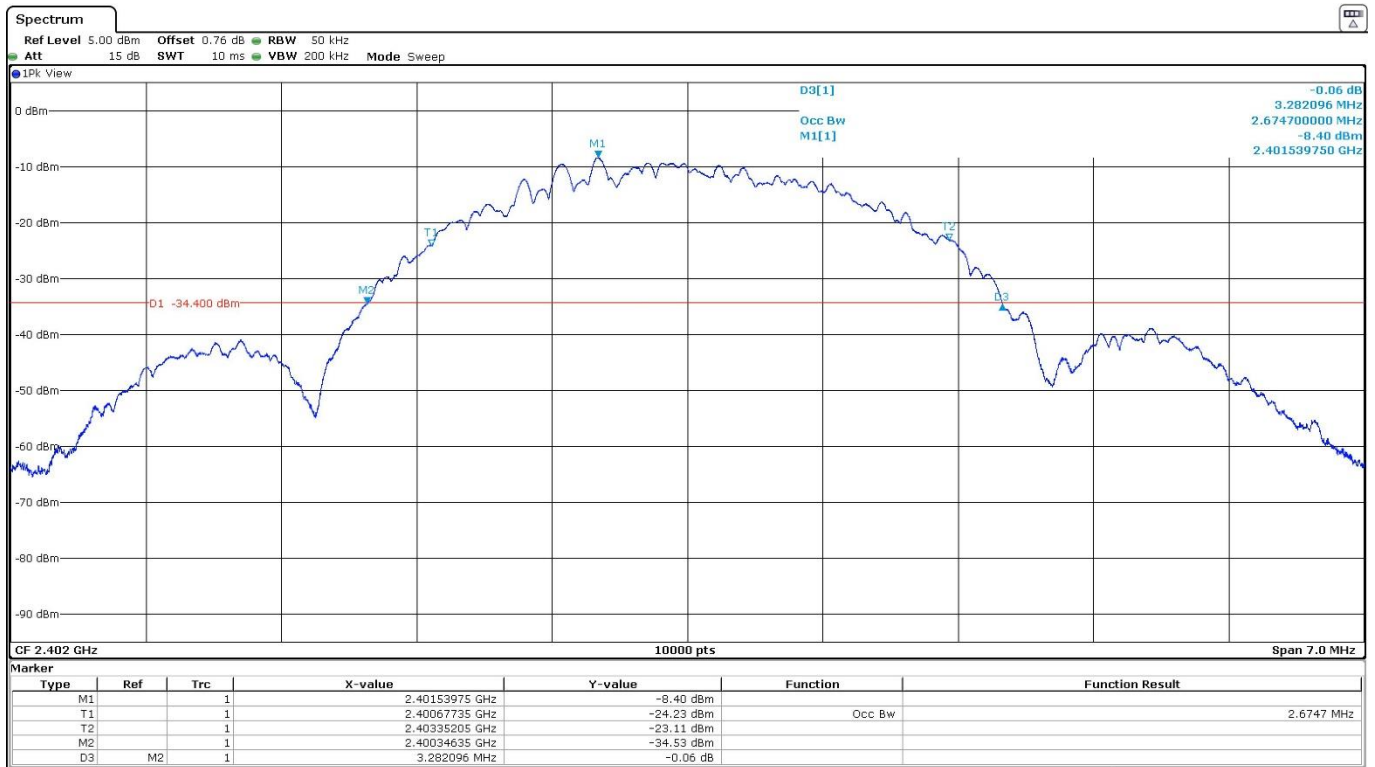
Occupied Bandwidth

RESULTS:

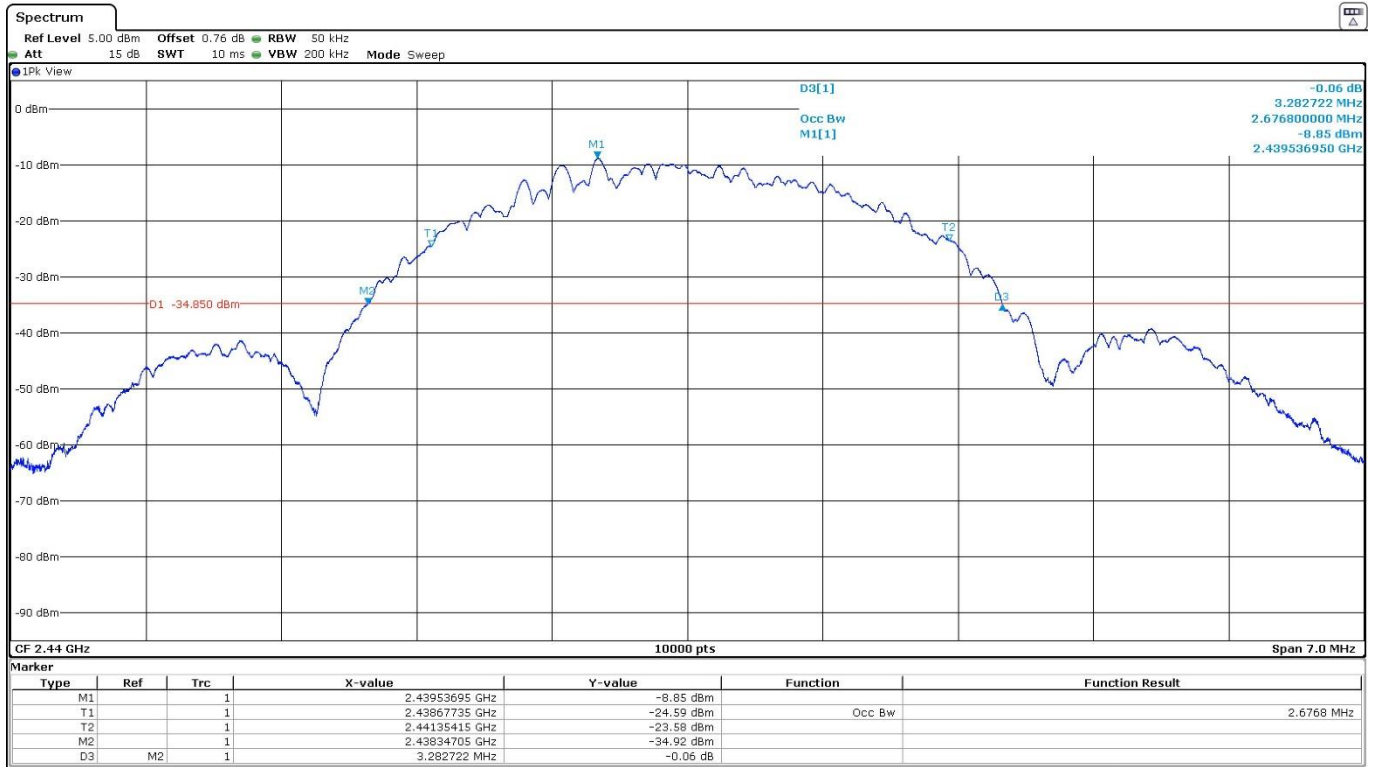
	Low Channel 2402 MHz	Middle Channel 2440 MHz	High Channel 2480 MHz
99% Bandwidth (MHz)	2.6747	2.6768	2.6768
Measurement Uncertainty (kHz)	<±1.42		

Verdict: PASS

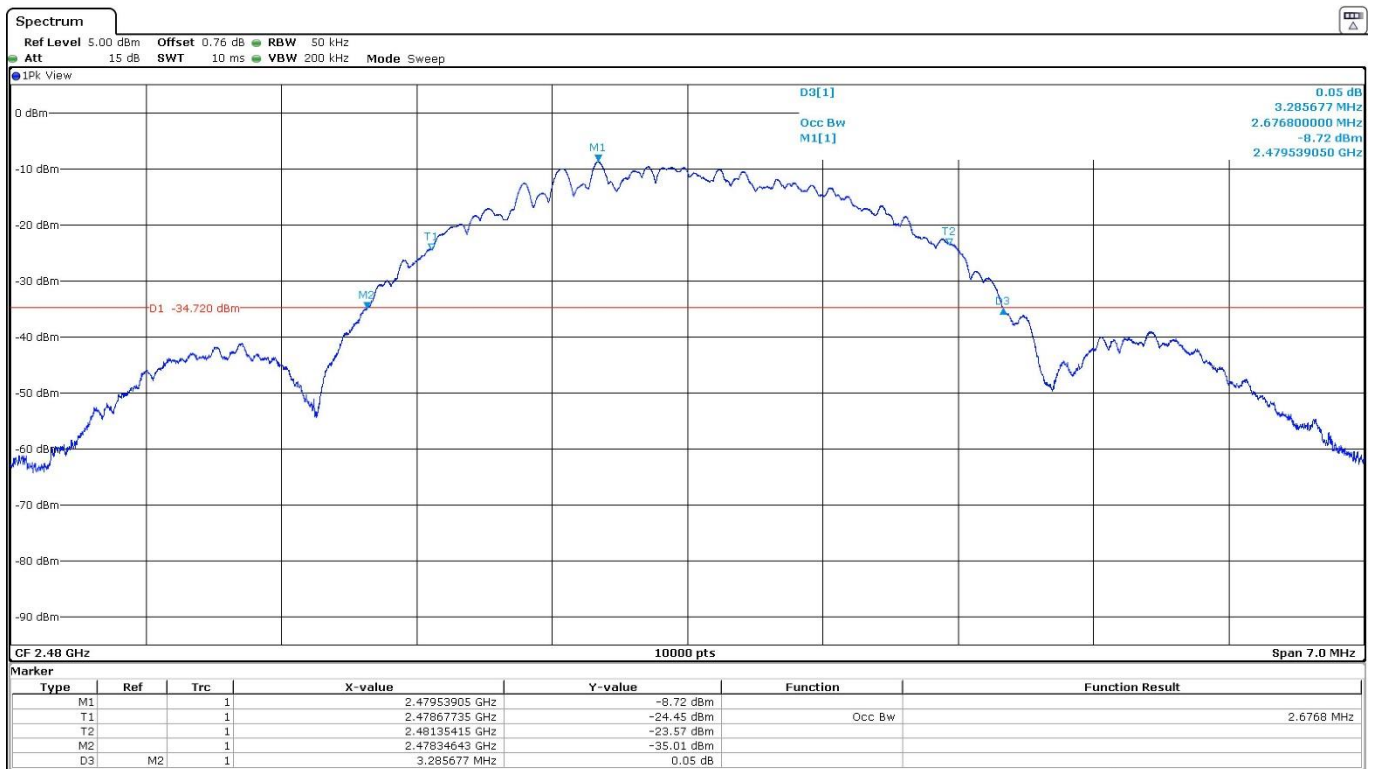
- Low Channel:



- Middle Channel:



- High Channel:



15.249 (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

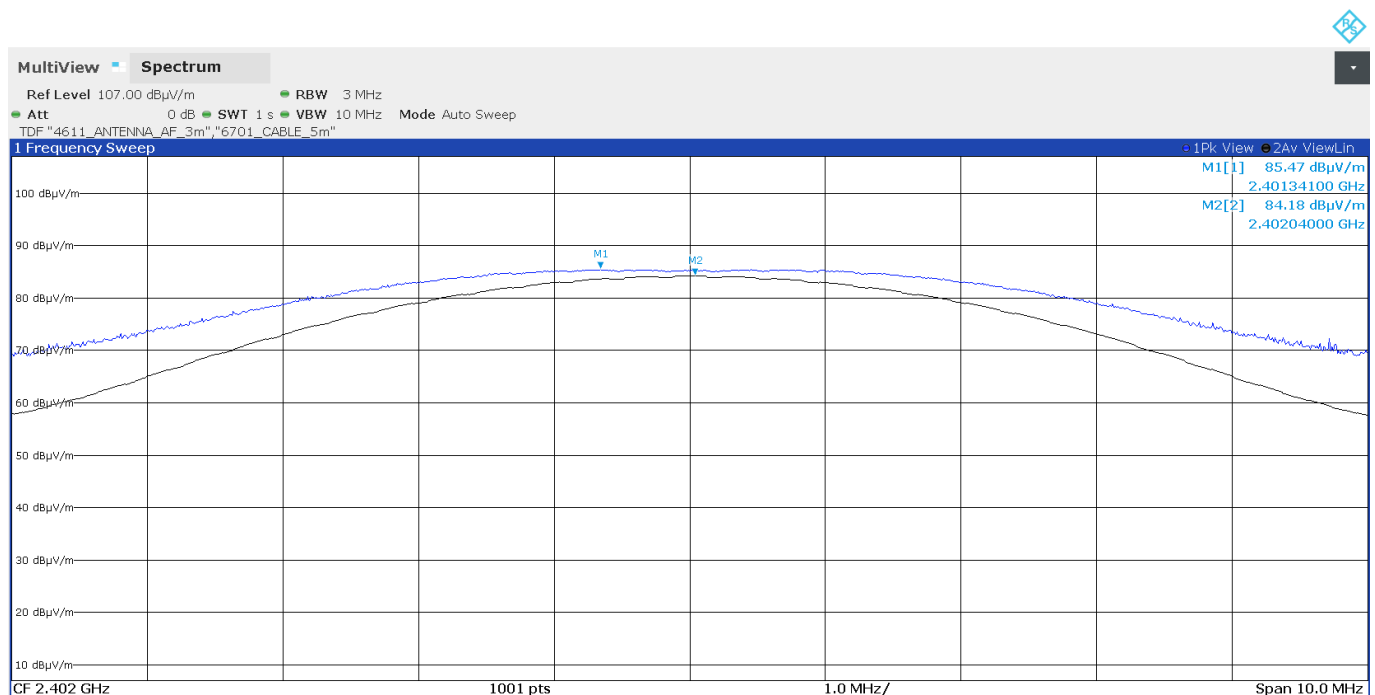
For frequencies above 1000 MHz, the above field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

RESULTS:

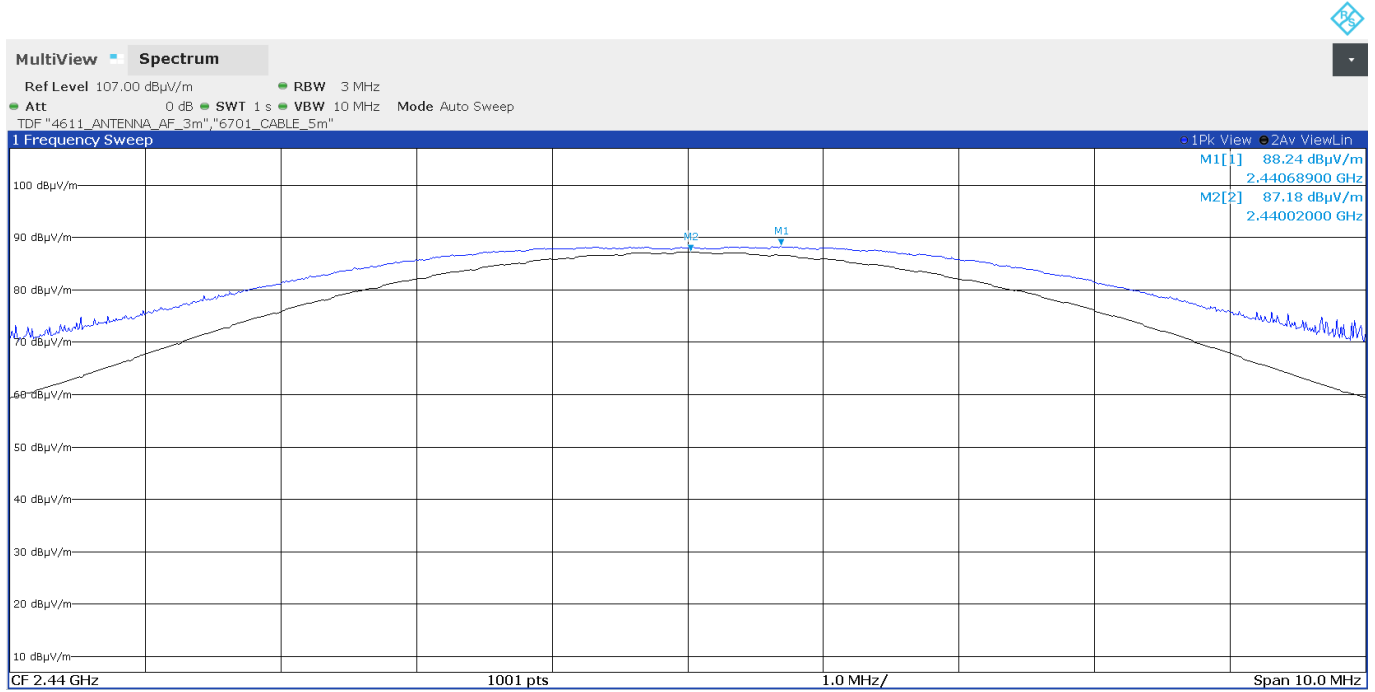
	Low Channel 2402 MHz	Middle Channel 2440 MHz	High Channel 2480 MHz
Average Field Strength (dBµV/m)	84.18	87.18	86.16
Peak Field Strength (dBµV/m)	85.47	88.24	87.26
Measurement Uncertainty (dB)	<±3.98		

Verdict: PASS

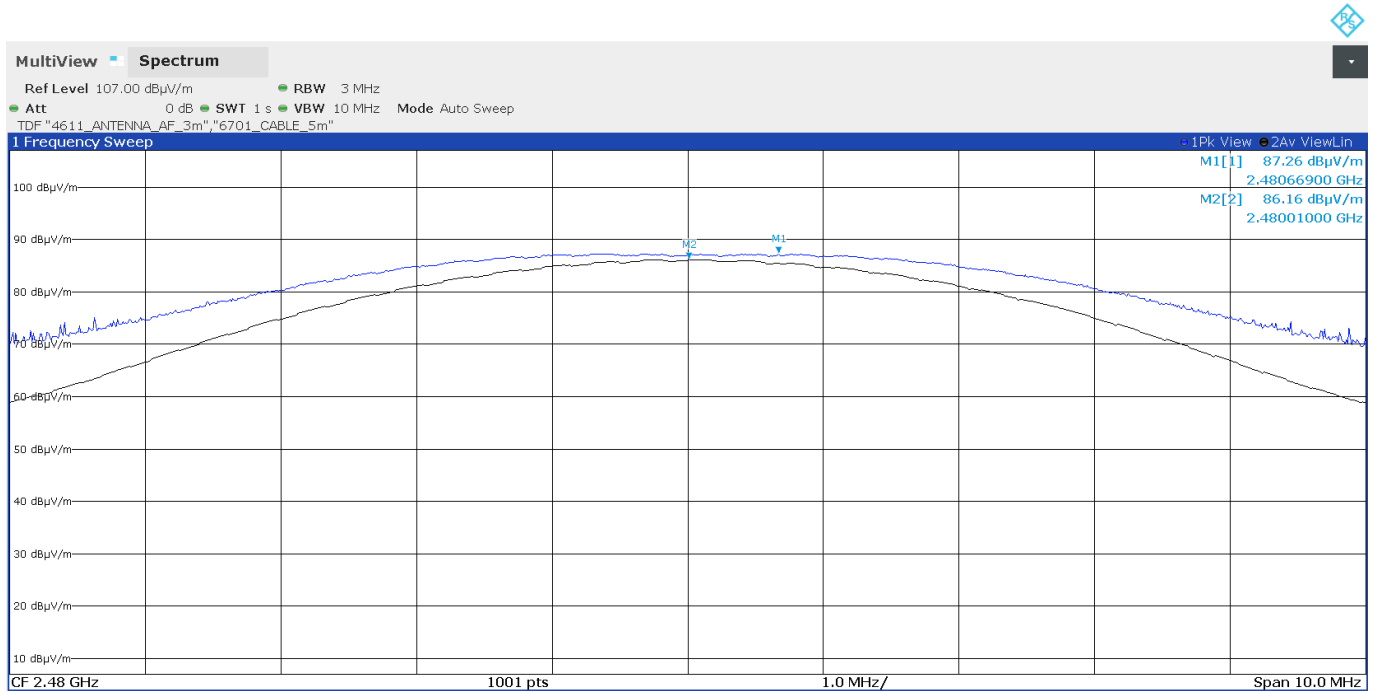
- Low Channel:



- Middle Channel:



- High Channel:



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 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-17 GHz and at distance of 1 m for the frequency range 17 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 signals detected do not depend on the operating channel.

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

Measurement Uncertainty (dB) <±4.99

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.

- Low Channel (2402 MHz):

Spurious frequency (GHz)	Emission Level (dBµV/m)	Polarization	Detector	Measurement Uncertainty (dB)
4.8045	45.97	V	Peak	<±4.98

- Middle Channel (2440 MHz):

Spurious frequency (GHz)	Emission Level (dBµV/m)	Polarization	Detector	Measurement Uncertainty (dB)
4.8790	43.94	V	Peak	<±4.98

- High Channel (2480 MHz):

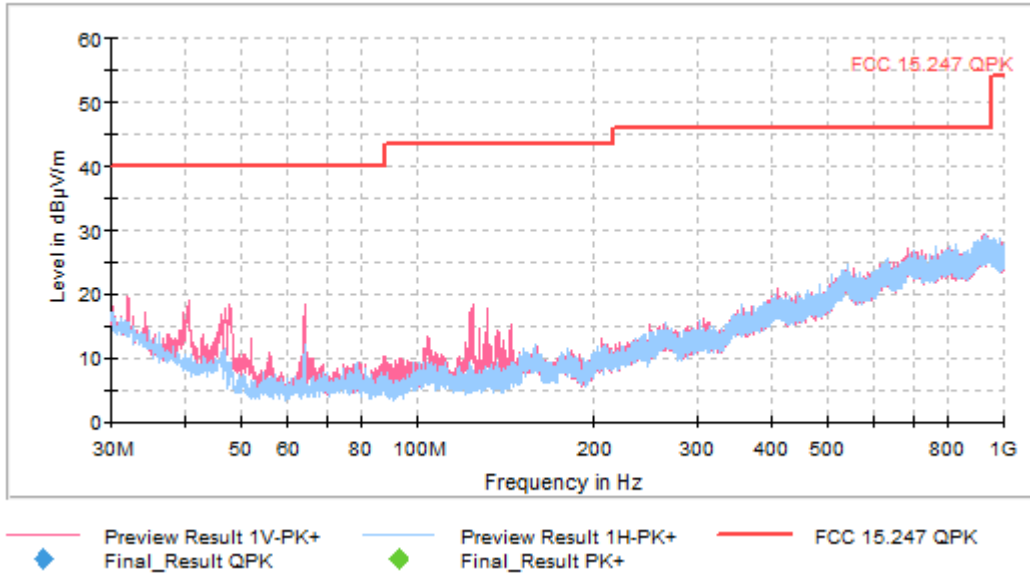
Spurious frequency (GHz)	Emission Level (dBµV/m)	Polarization	Detector	Measurement Uncertainty (dB)
4.9585	44.77	V	Peak	<±4.98

Measurement Uncertainty: 1-3 GHz <±3.98 dB
 3-17 GHz <±4.98 dB
 17-26 GHz <±5.08 dB

Verdict: PASS

FREQUENCY RANGE 30 MHz - 1 GHz

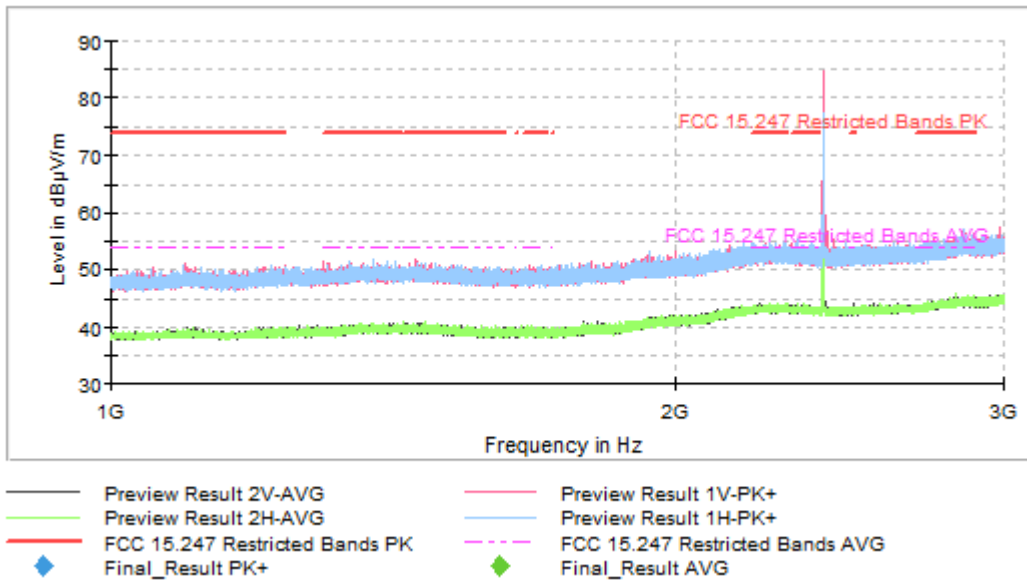
The spurious frequencies detected do not depend on the operating channel.



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

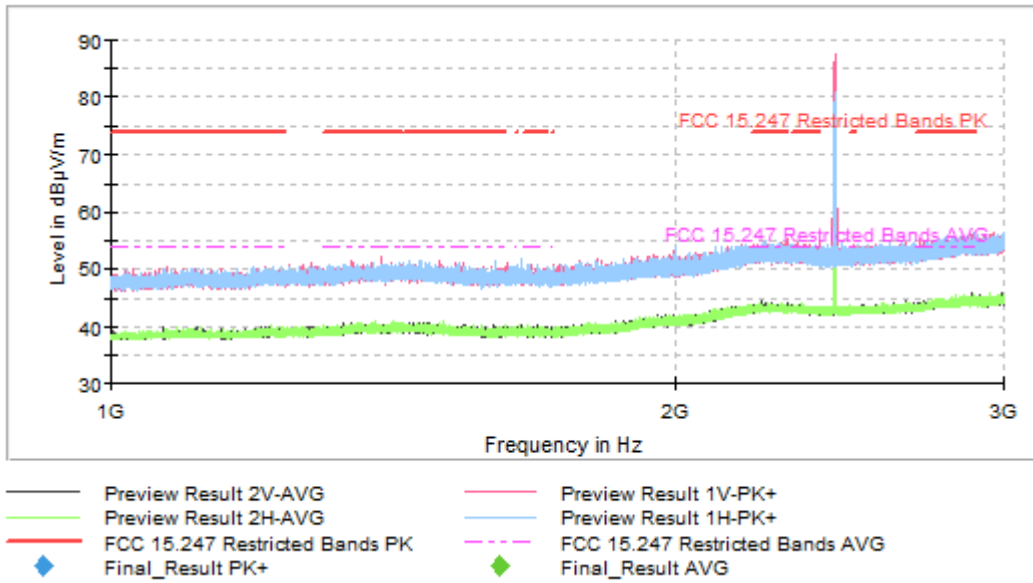
FREQUENCY RANGE 1 - 3 GHz

- Low Channel:



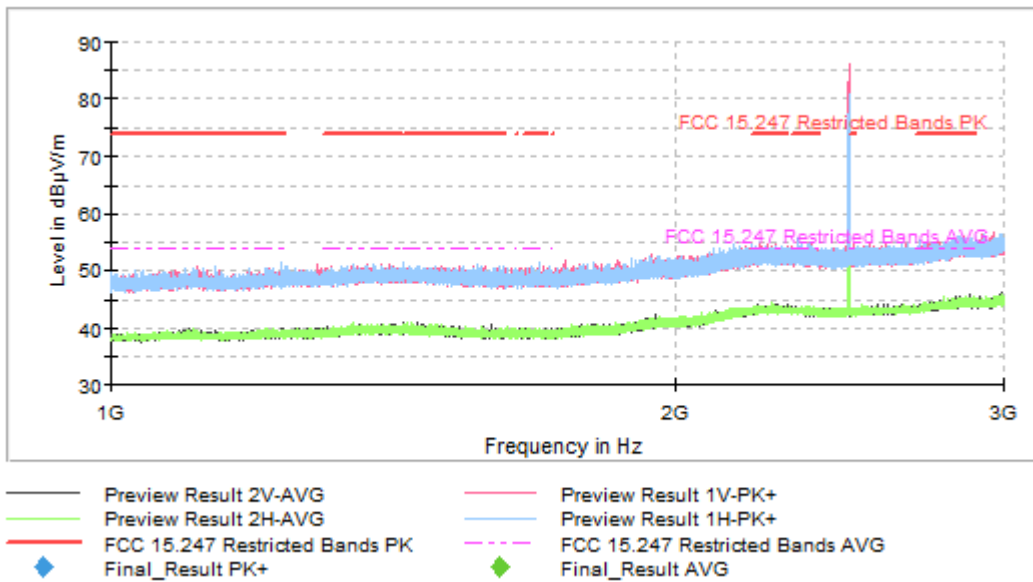
The peak above the limit is the carrier frequency.

- Middle Channel:



The peak above the limit is the carrier frequency.

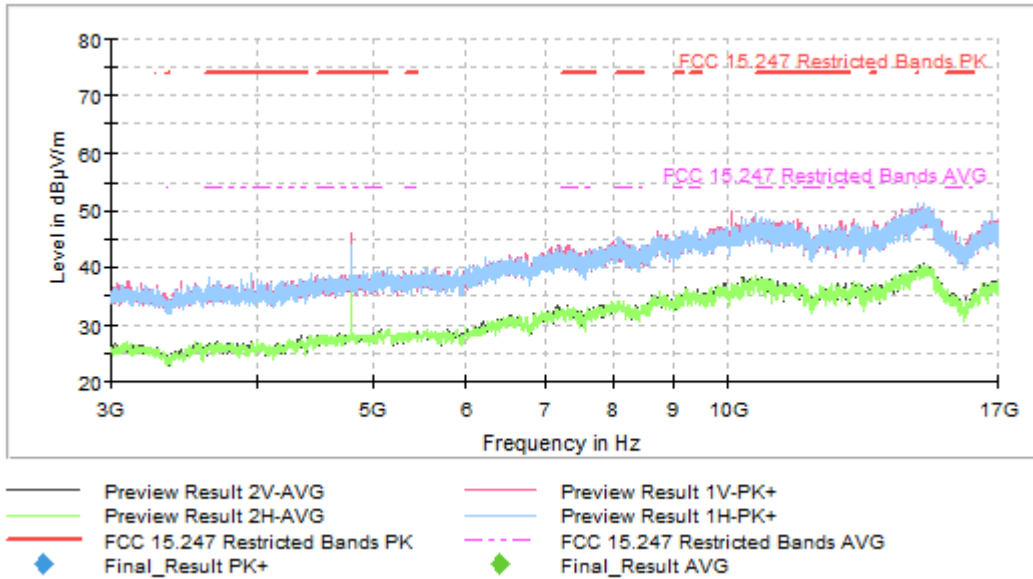
- High Channel:



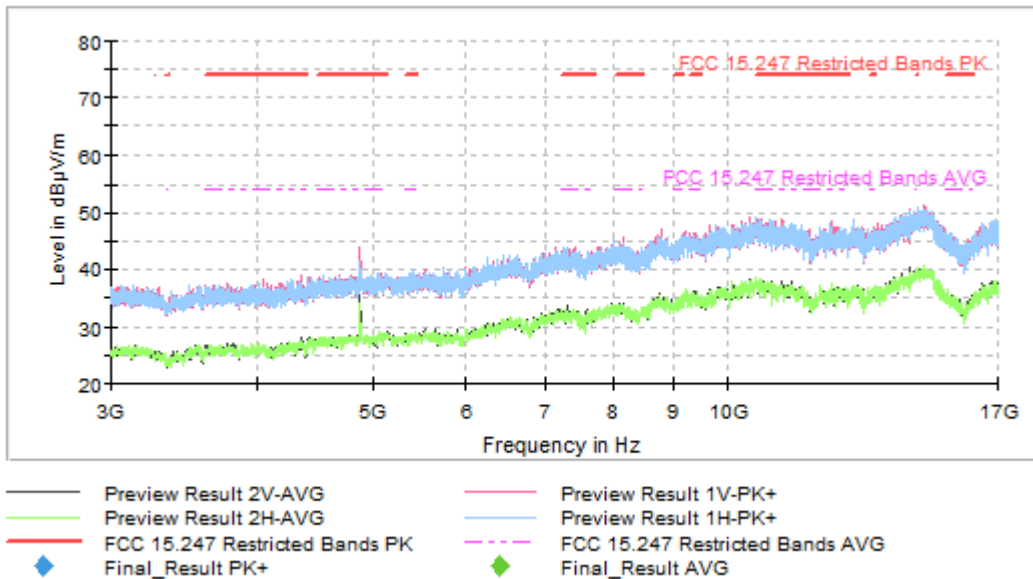
The peak above the limit is the carrier frequency.

FREQUENCY RANGE 3 - 17 GHz

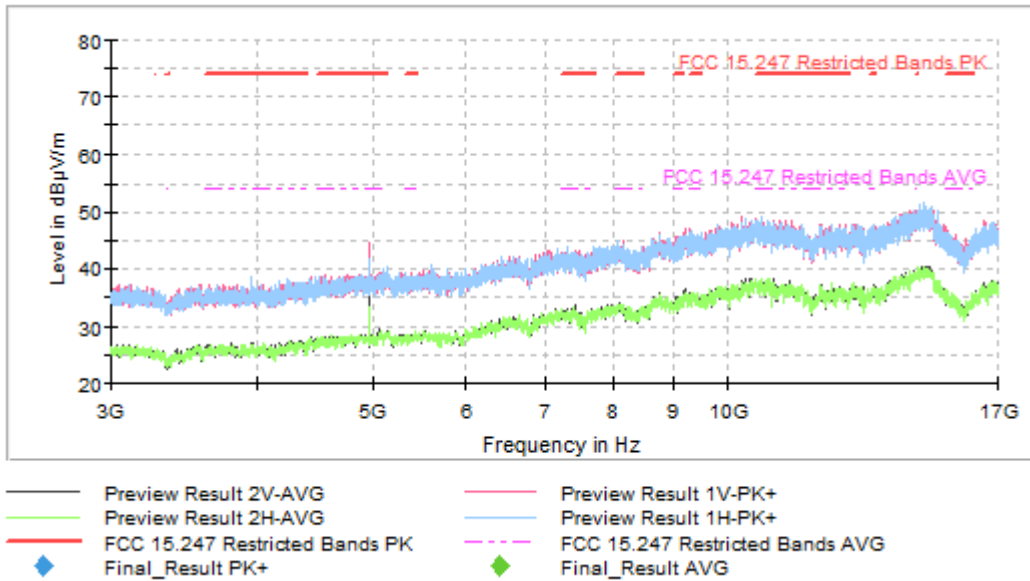
- Low Channel:



- Middle Channel:

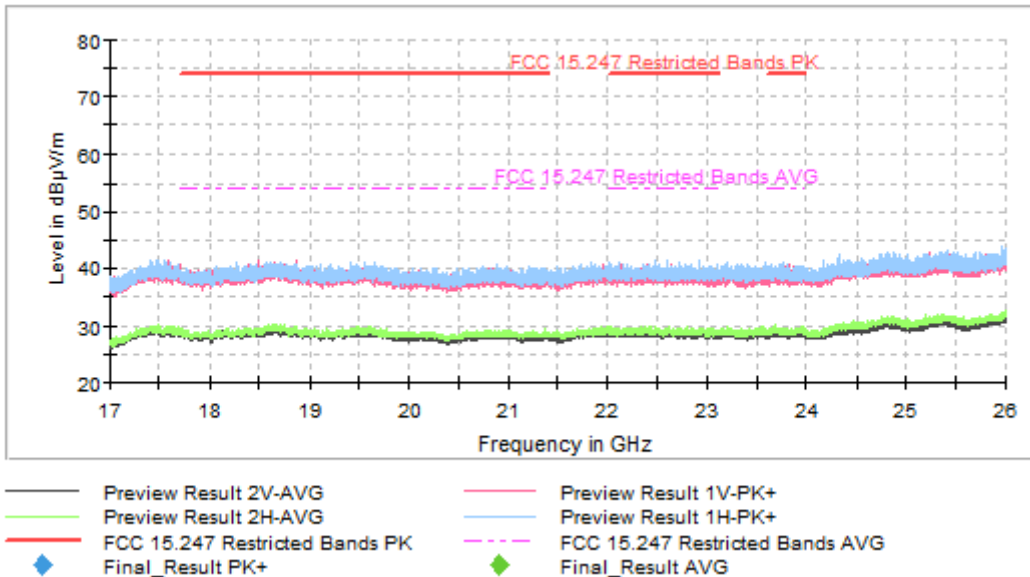


- High Channel:



FREQUENCY RANGE 17 - 26 GHz

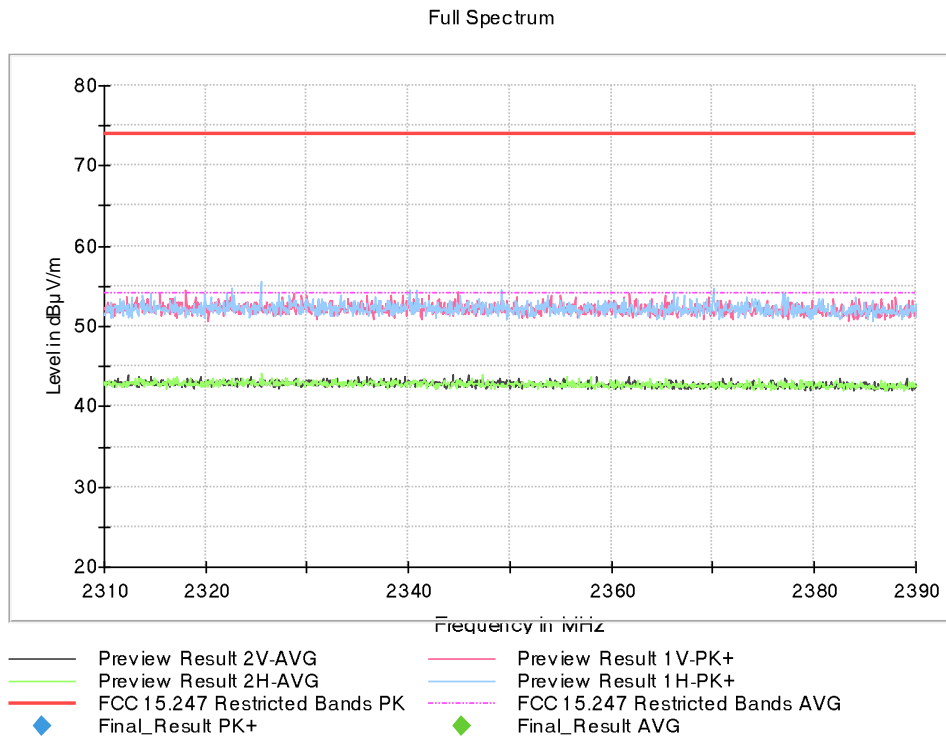
The spurious frequencies detected do not depend on the operating channel.



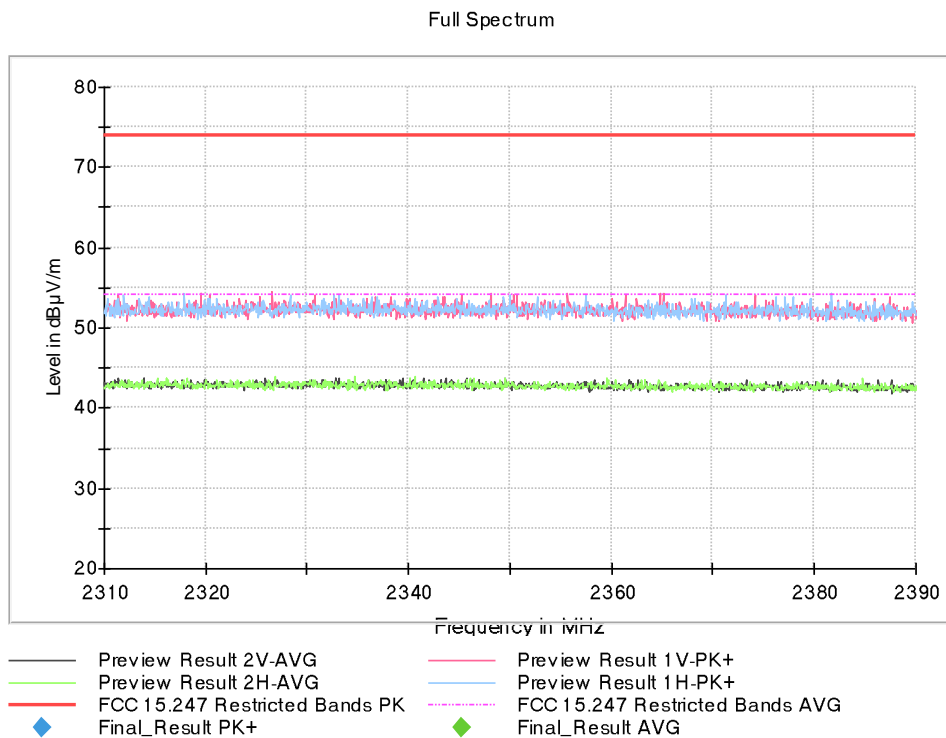
This plot is valid for the Low, Middle and High Channels.

FREQUENCY RANGE 2.31-2.39 GHz

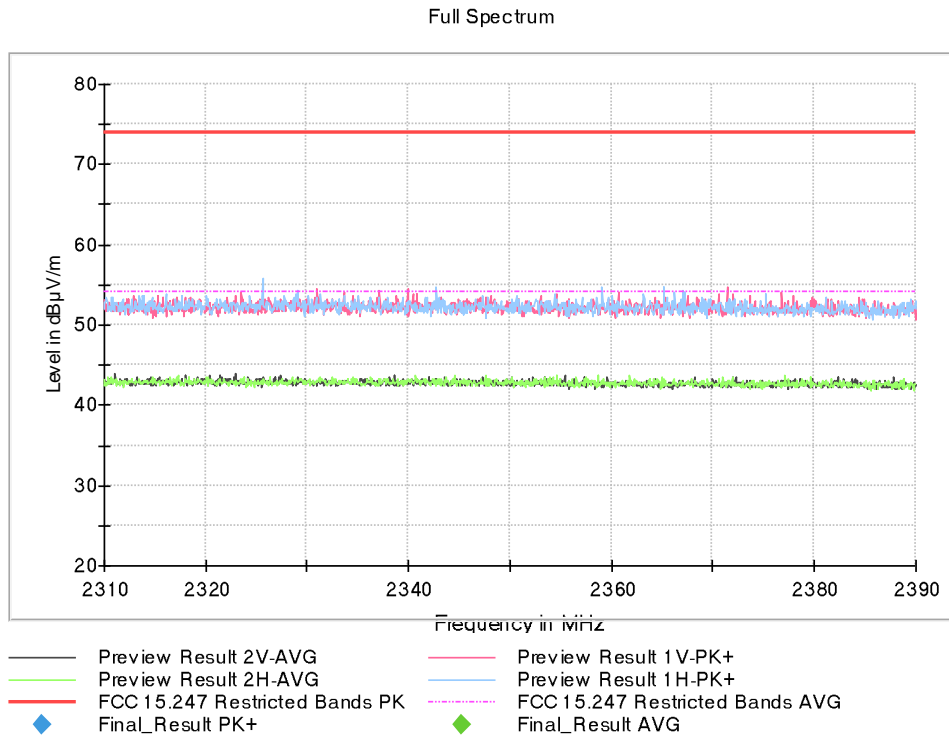
- Low Channel:



- Middle Channel:

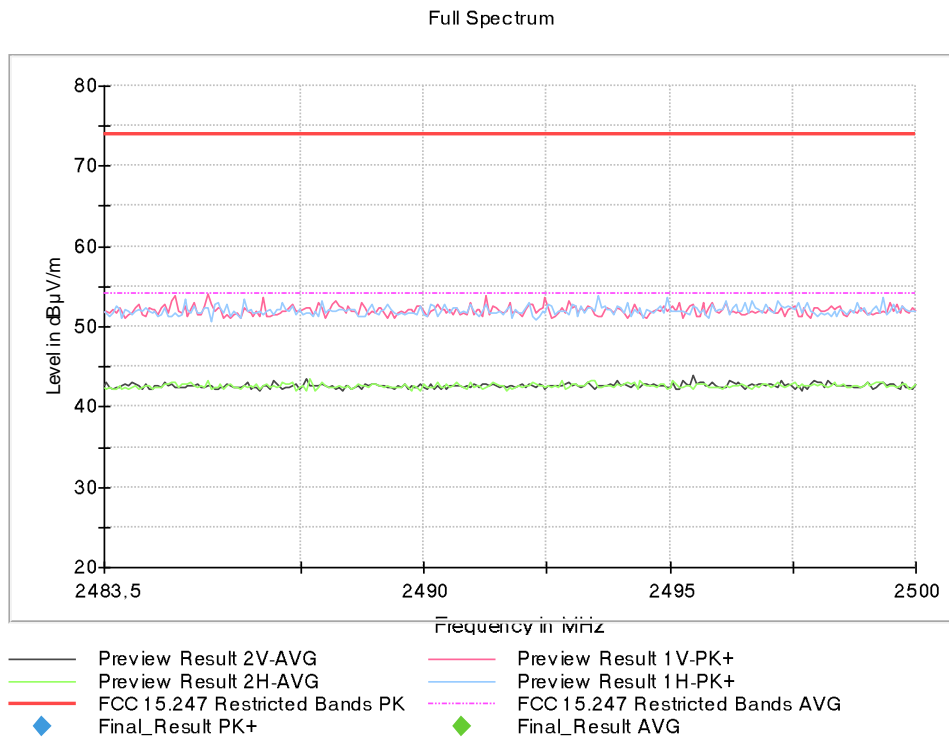


- High Channel:

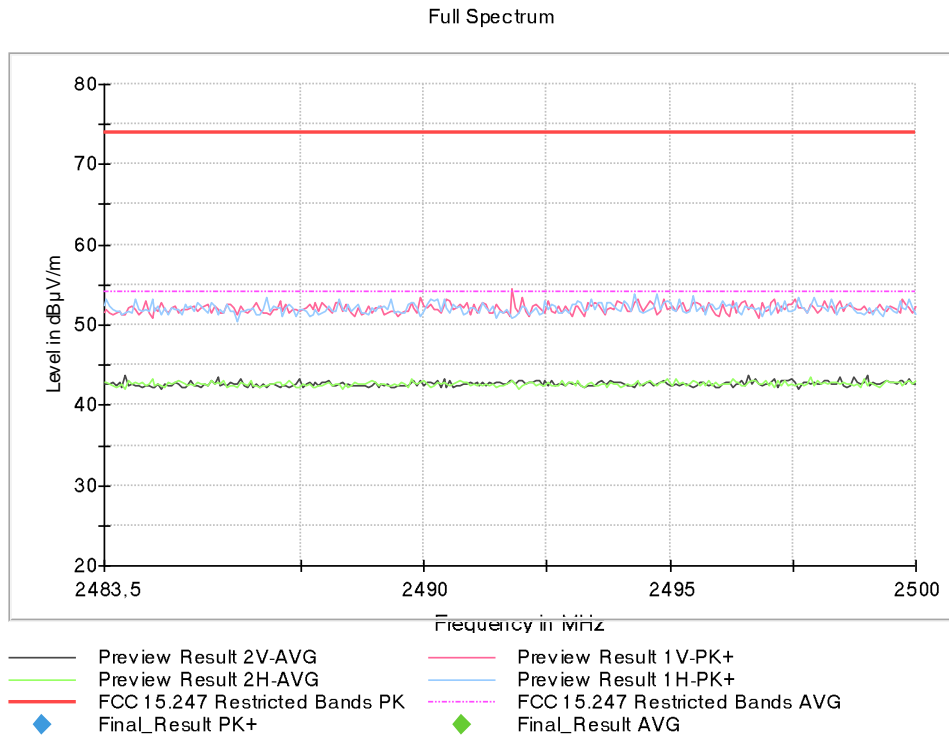


FREQUENCY RANGE 2.4835-2.5 GHz

- Low Channel:



- Middle Channel:



- High Channel:

