

Appendix C: Test results. Flora (Proprietary)

Approved by (name / position & signature)

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Date of issue

2024-01-26

INDEX

TEST CONDITIONS	54
TEST CASES DETAILS	57
<i>Occupied Channel Bandwidth 99%</i>	57
<i>FCC 15.249 (b) / RSS-210 B.10 (a) Field strength of fundamental and harmonics emissions</i>	61
<i>FCC 15.249 (d) (e) / RSS-210 B.10 (b) Emissions radiated outside of the specific frequency bands</i>	65

TEST CONDITIONS

(*): Data provided by the client.

POWER SUPPLY (*):

Vnominal:	1.25 Vdc
Type of Power Supply:	Internal battery

ANTENNA (*):

Type of Antenna:	Integral
Maximum Declared Antenna Gain:	-7.0 dBi

TEST FREQUENCIES (*):

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

During transmitter test the EUT was controlled by a SW tool provided by the client to operate in a continuous transmit mode on the modulation schemes and test channels as required.

CONDUCTED MEASUREMENTS:

The equipment under test was set up in a shielded room and it is connected to the spectrum analyzer 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 1.5 m for the frequency range 17 GHz-26 GHz (17 GHz-40 GHz horn antenna).

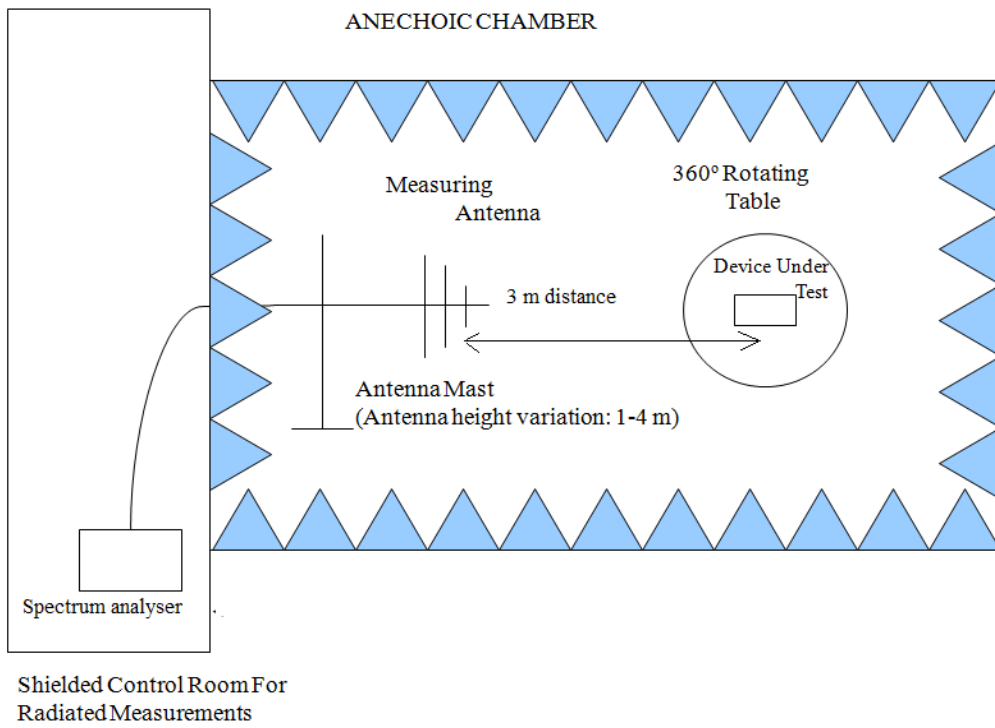
For radiated emissions in the range 17 GHz-26 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

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 (Bilog antenna and Double ridge horn antenna) was varied from 1 to 4 meters to find the maximum radiated emission.

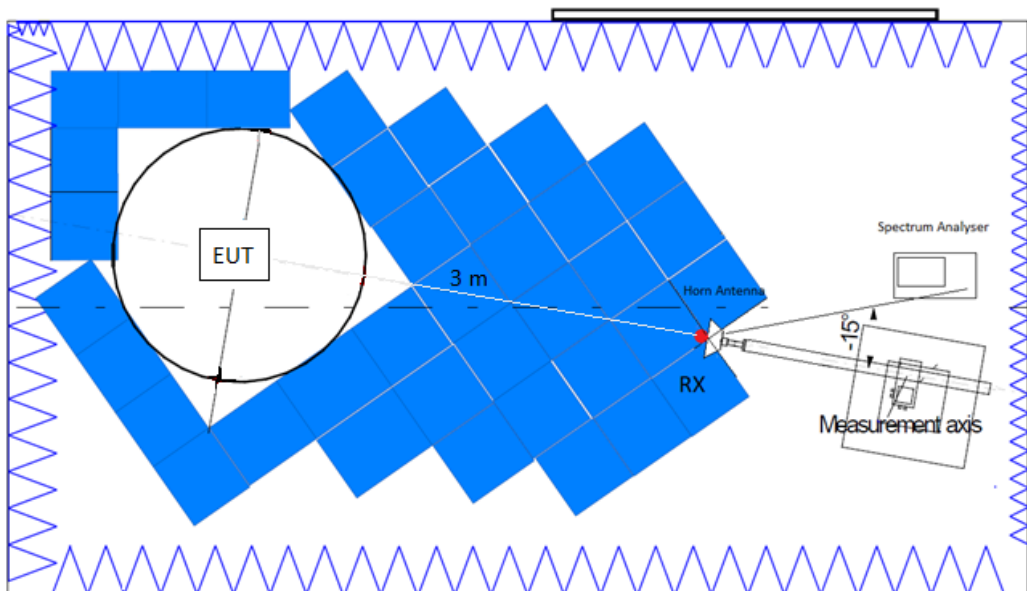
Measurements were made in both horizontal and vertical planes of polarization.

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

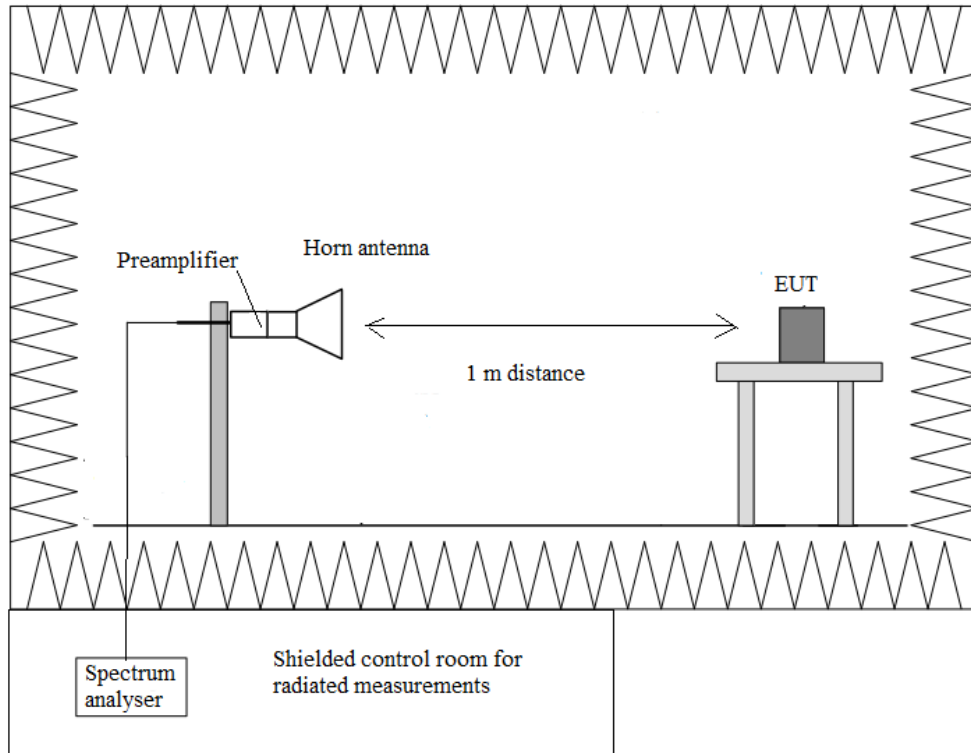
Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup from 1 GHz to 17 GHz:



Radiated measurements setup $f > 17$ GHz:



TEST CASES DETAILS

Occupied Channel Bandwidth 99%

Specification

* RSS-Gen Issue 5, Clause 6.7 Occupied bandwidth (or 99% emission bandwidth) and x dB bandwidth:

The occupied bandwidth or the “99% emission bandwidth” is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

Modulation: FLORA

Results

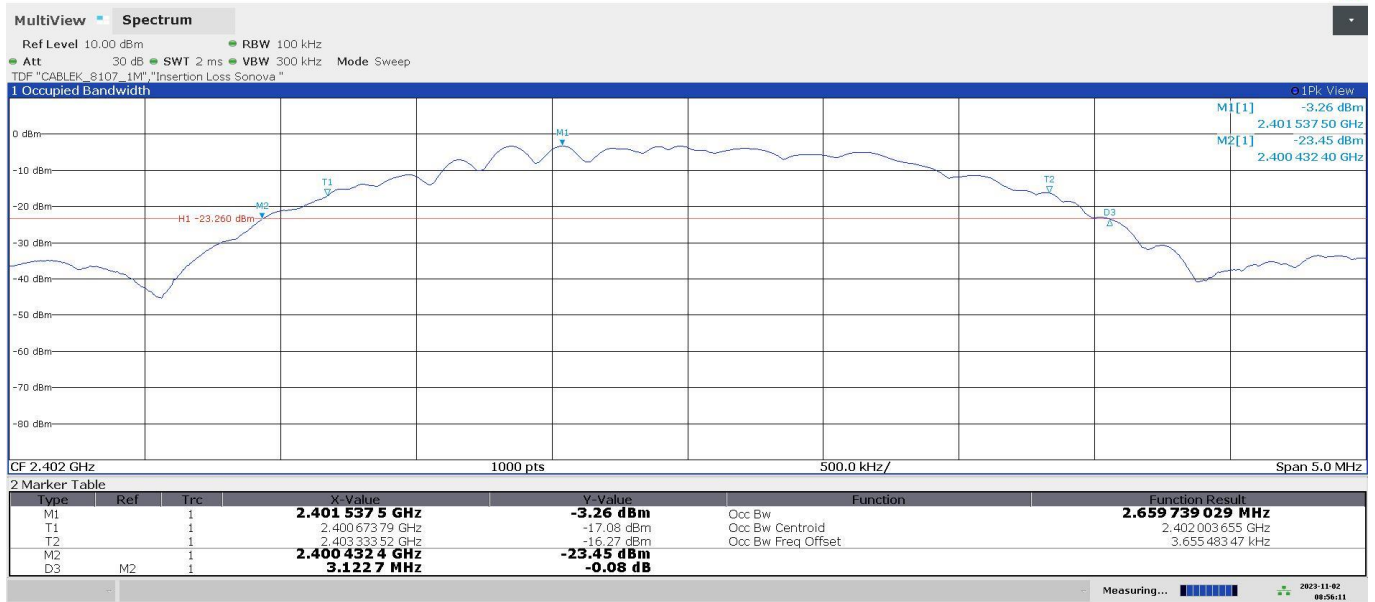
Operation Band (MHz)	Freq (MHz)	99OBW (kHz)
[2400, 2483.5]	2402	2659.74
	2440	2661.36
	2480	2661.55

Attachments

Operation Band MHz = [2400, 2483.5] Modulation = FLORA

Frequency MHz = 2402.00000

Images:

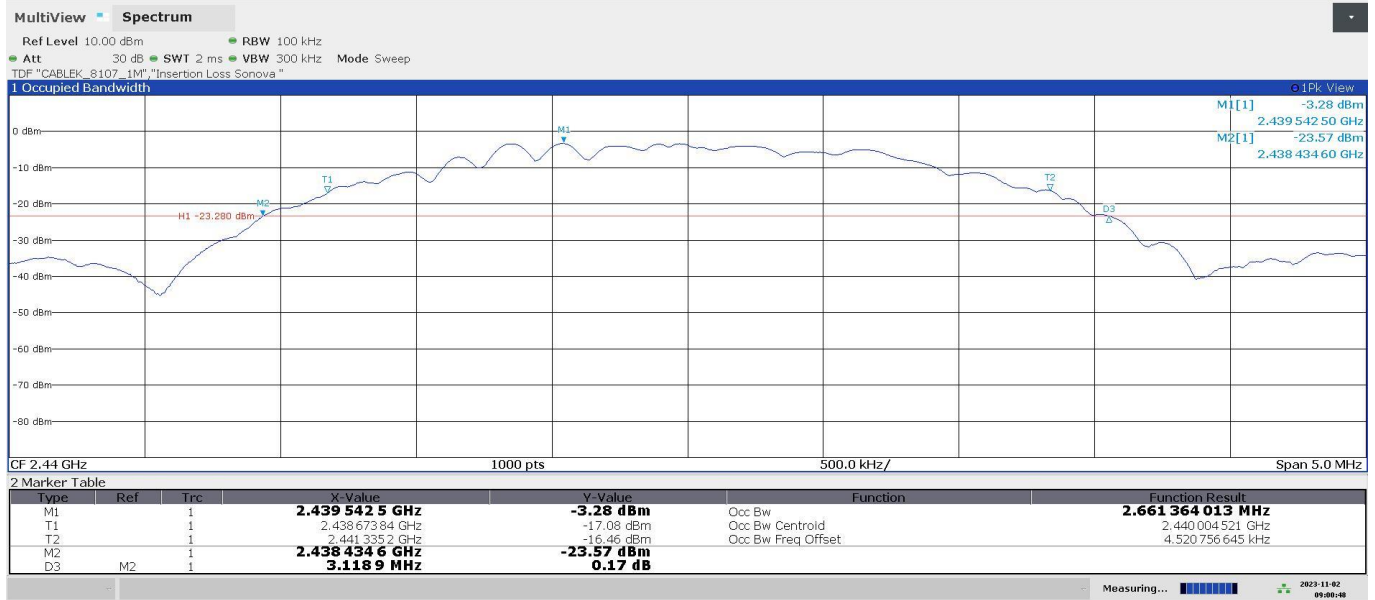


08:56:11 AM 11/02/2023

Operation Band MHz = [2400, 2483.5] Modulation = FLORA

Frequency MHz = 2440.00000

Images:

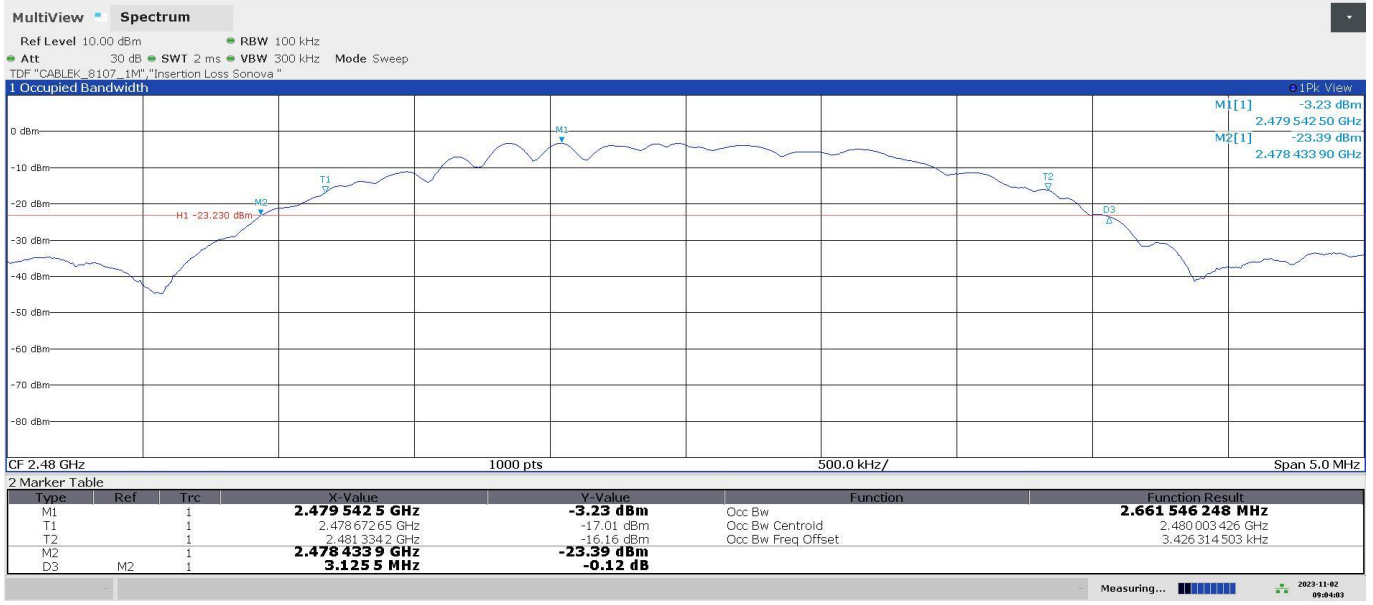


09:00:49 AM 11/02/2023

Operation Band MHz = [2400, 2483.5] Modulation = FLORA

Frequency MHz = 2480.00000

Images:



FCC 15.249 (b) / RSS-210 B.10 (a) Field strength of fundamental and harmonics emissions

Limits

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.

Modulation: FLORA

Results

Operation Band (MHz)	Freq (MHz)	Pk Field (dBµV/m)	Avg Field (dBµV/m)
[2400, 2483.5]	2402.00	77.23	74.27
	2440.00	82.36	80.86
	2480.00	83.36	81.88

Verdict

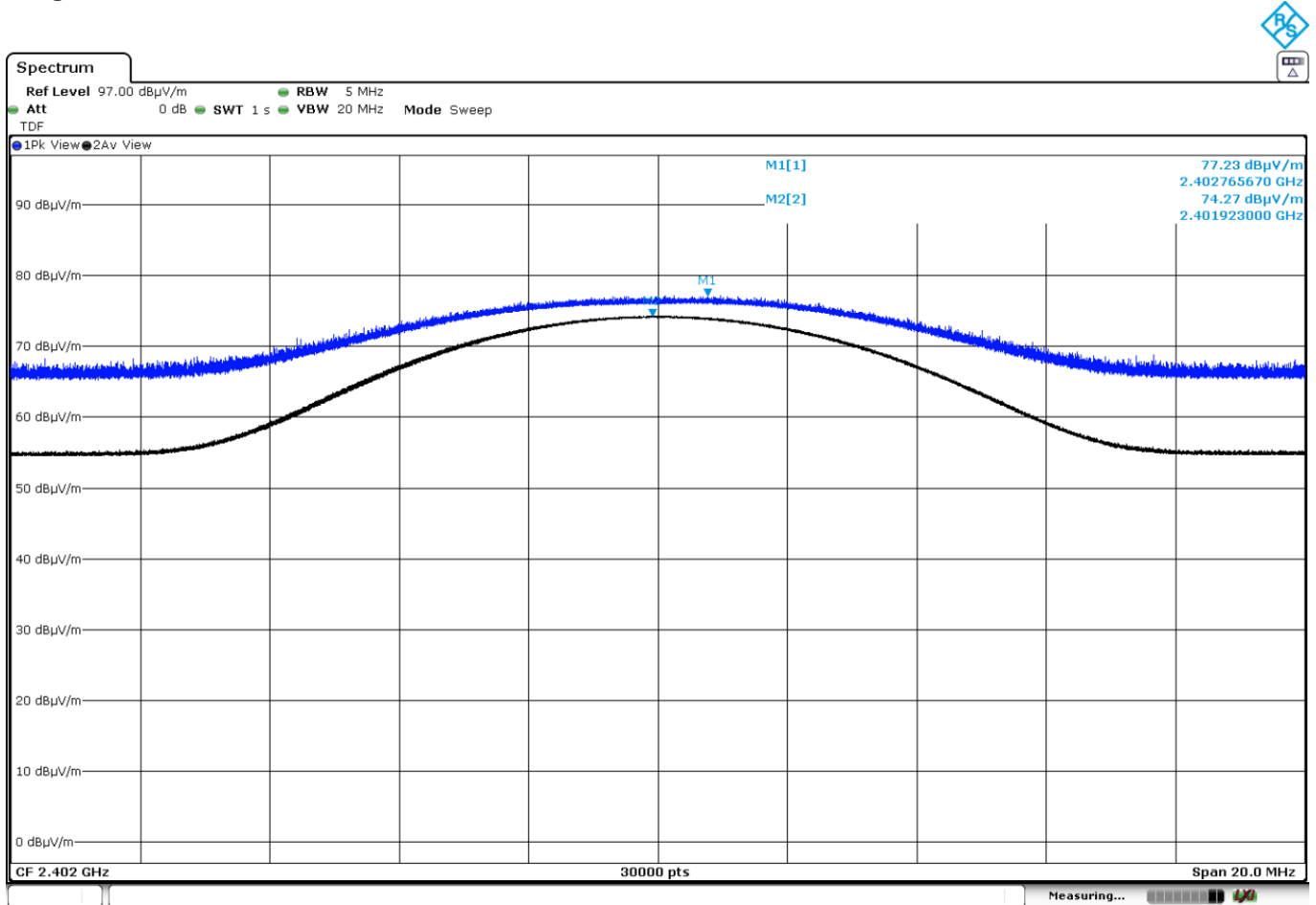
Pass

Attachments

Operation Band MHz = [2400, 2483.5] Modulation = FLORA

Frequency MHz = 2402.00000

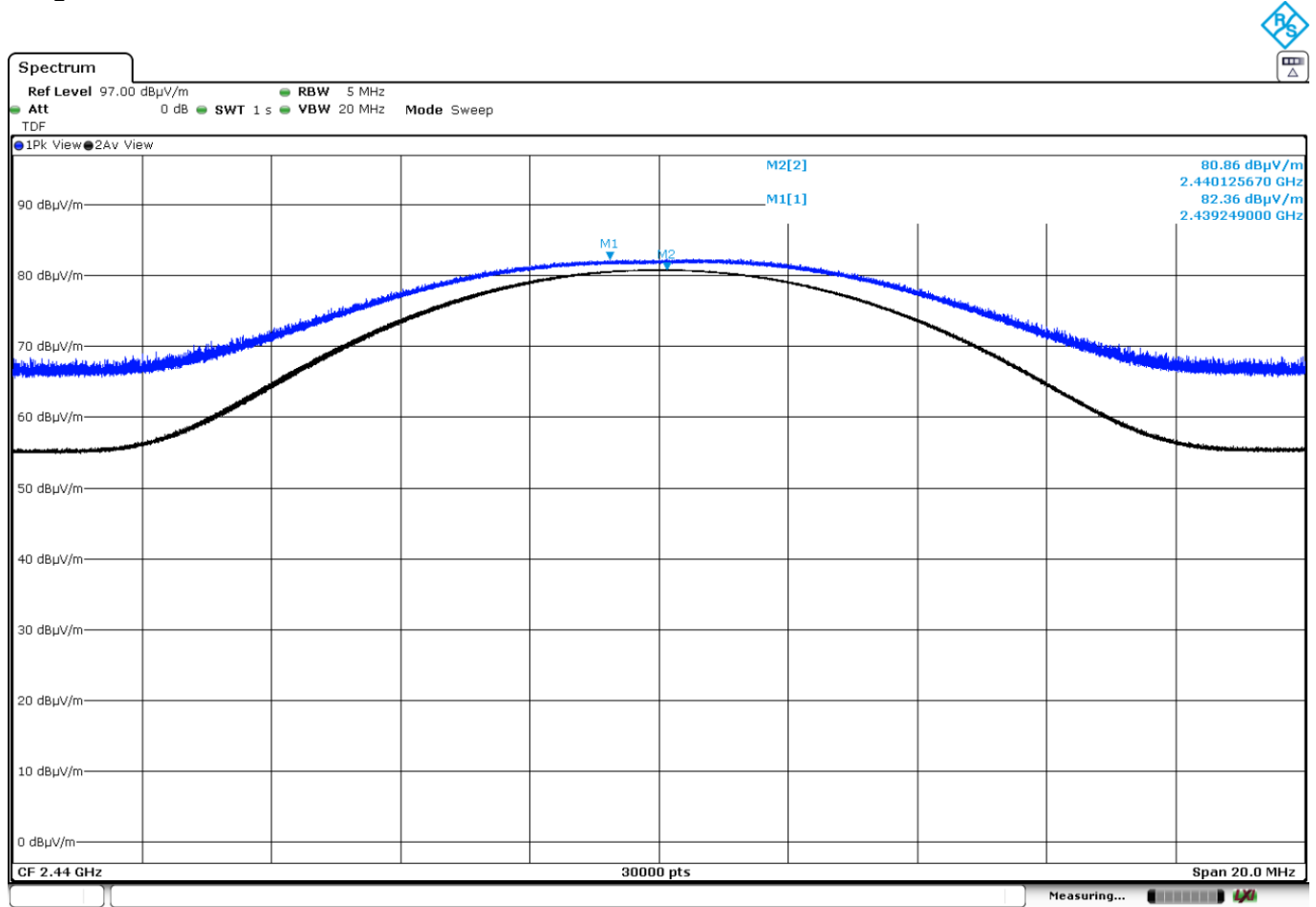
Images:



Operation Band MHz = [2400, 2483.5] Modulation = FLORA

Frequency MHz = 2440.00000

Images:

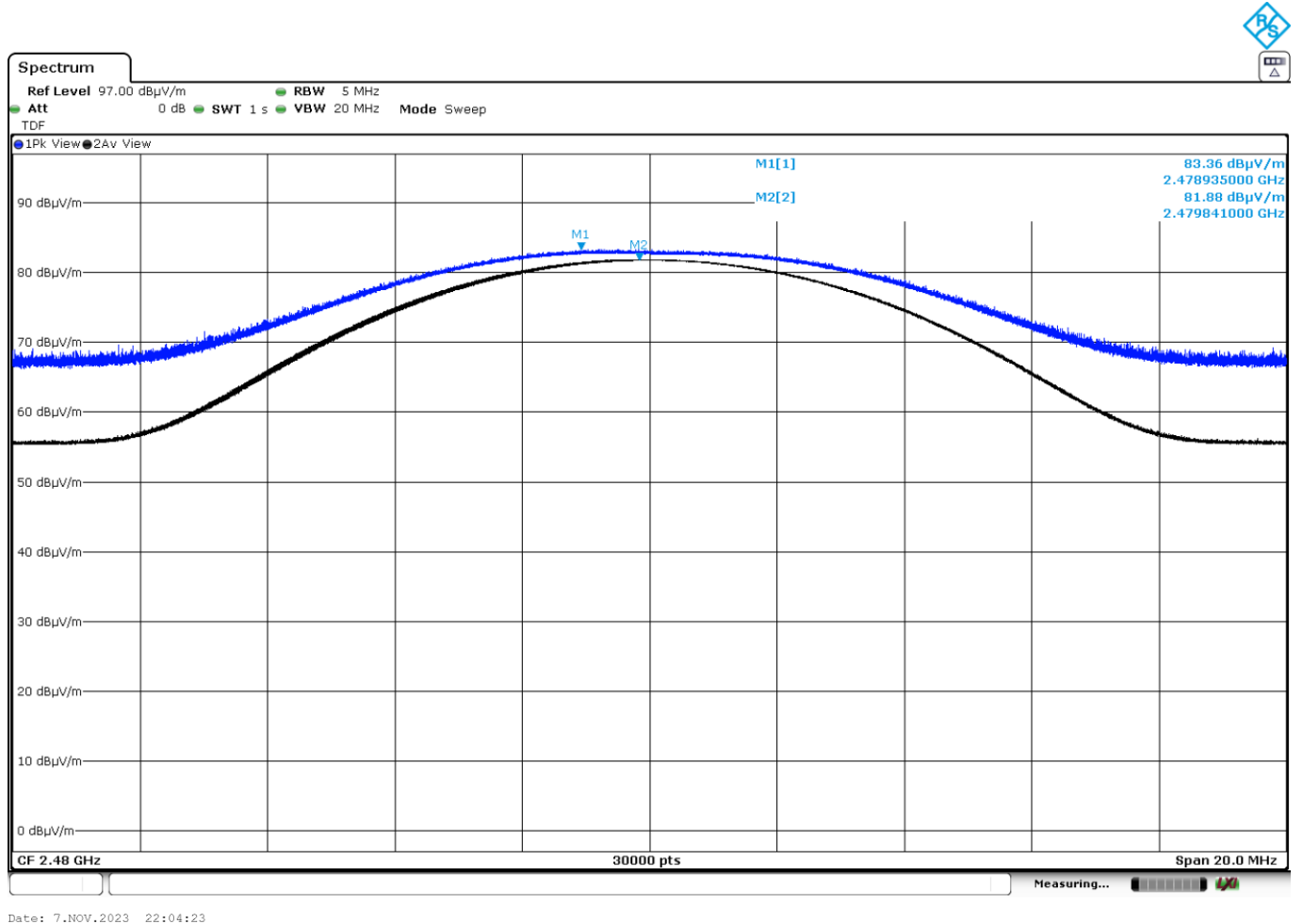


Date: 7.NOV.2023 21:29:06

Operation Band MHz = [2400, 2483.5] Modulation = FLORA

Frequency MHz = 2480.00000

Images:



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

Limits

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

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

Whichever is the lesser attenuation.

Modulation: FLORA

Results

Frequency range 30 MHz – 1 GHz:

The spurious frequencies do not depend on the operating channel.
 No spurious frequencies detected at less than 20 dB below the limit.

Frequency range 1 GHz – 17 GHz:

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

Frequency range 17 GHz – 16 GHz:

The spurious frequencies do not depend on the operating channel.
 No spurious frequencies detected at less than 20 dB below the limit.

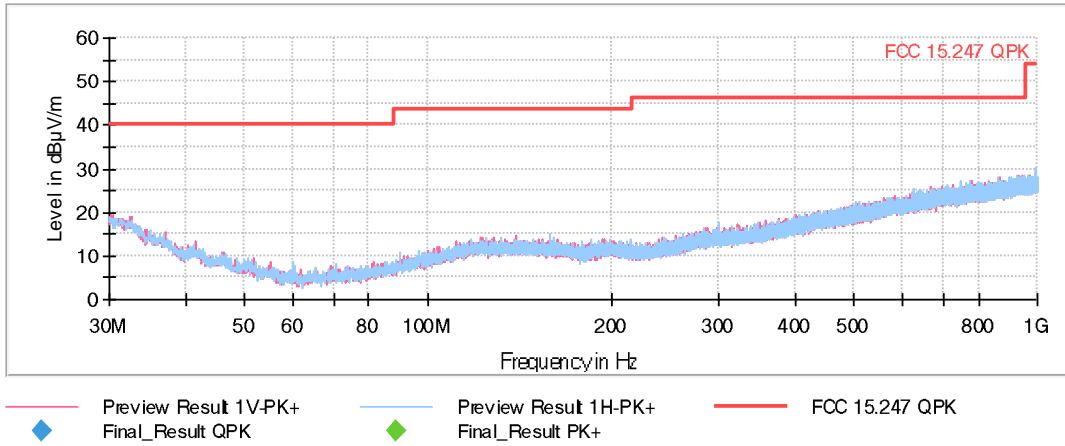
Verdict

Pass

Attachments

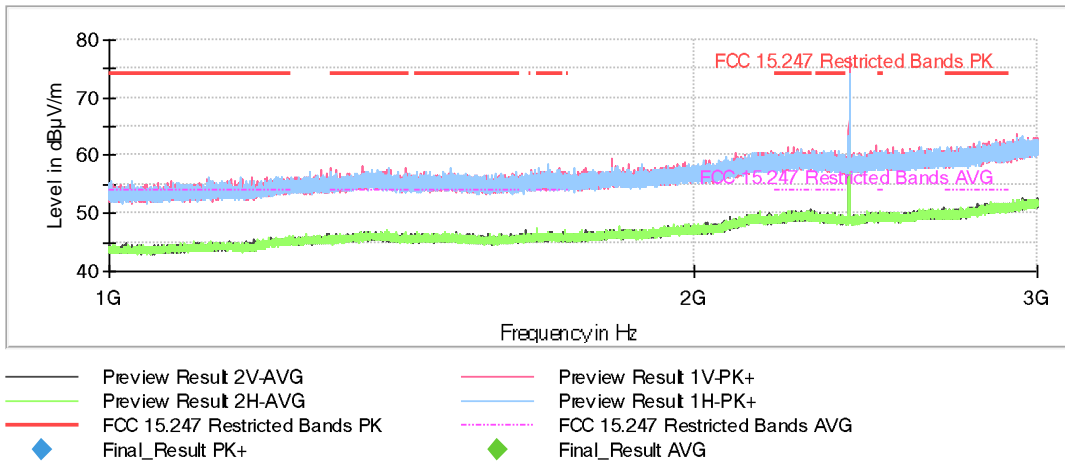
Operation Band MHz = [2400, 2483.5] Modulation = FLORA
 Frequency MHz = 2402.00000
 Frequency Range GHz = [0.03, 1] Measurement Point = 1

Images:



Operation Band MHz = [2400, 2483.5] Modulation = FLORA
 Frequency MHz = 2402.00000
 Frequency Range GHz = [1, 3] Measurement Point = 1

Images:

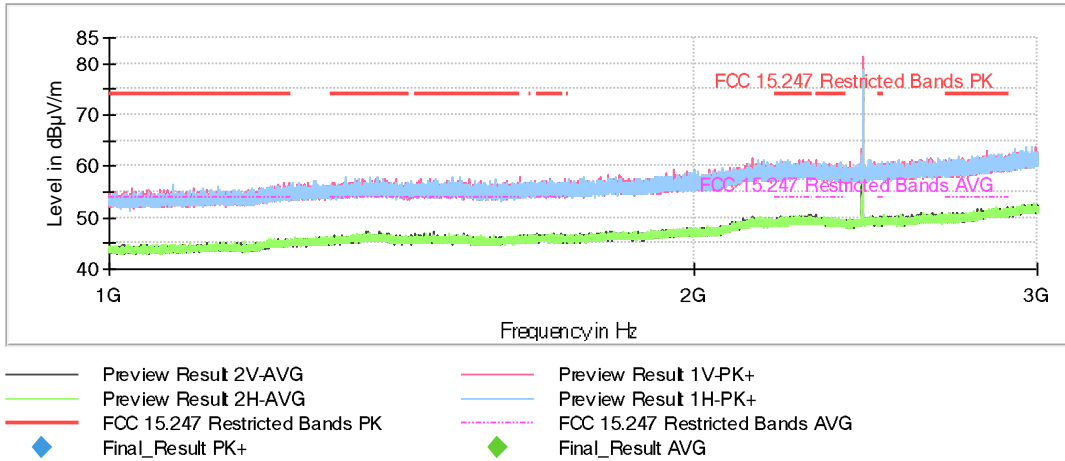


Operation Band MHz = [2400, 2483.5] Modulation = FLORA

Frequency MHz = 2440.00000

Frequency Range GHz = [1, 3] Measurement Point = 1

Images:

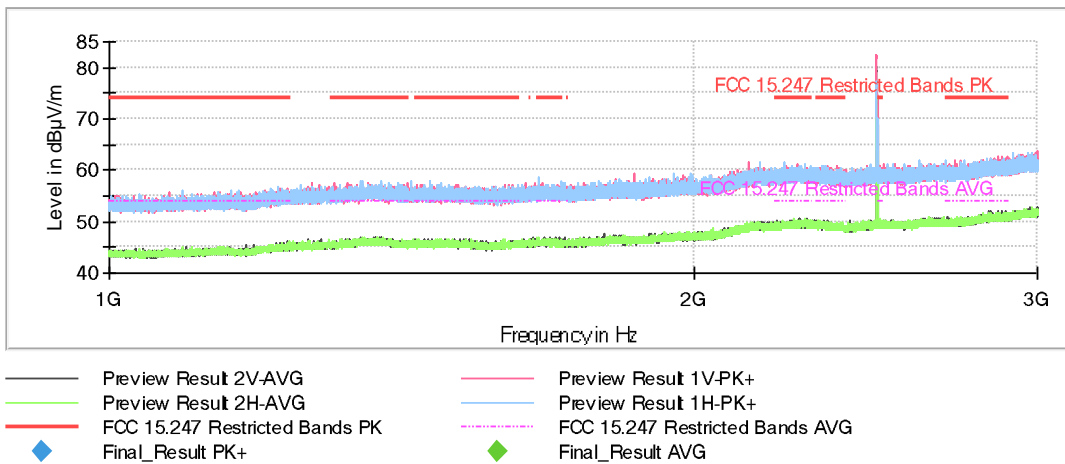


Operation Band MHz = [2400, 2483.5] Modulation = FLORA

Frequency MHz = 2480.00000

Frequency Range GHz = [1, 3] Measurement Point = 1

Images:

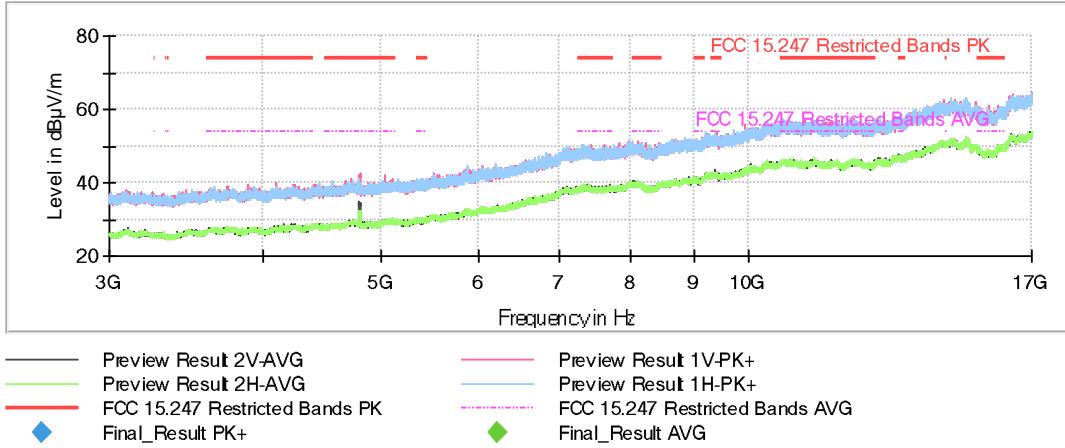


Operation Band MHz = [2400, 2483.5] Modulation = FLORA

Frequency MHz = 2402.00000

Frequency Range GHz = [3, 17] Measurement Point = 1

Images:

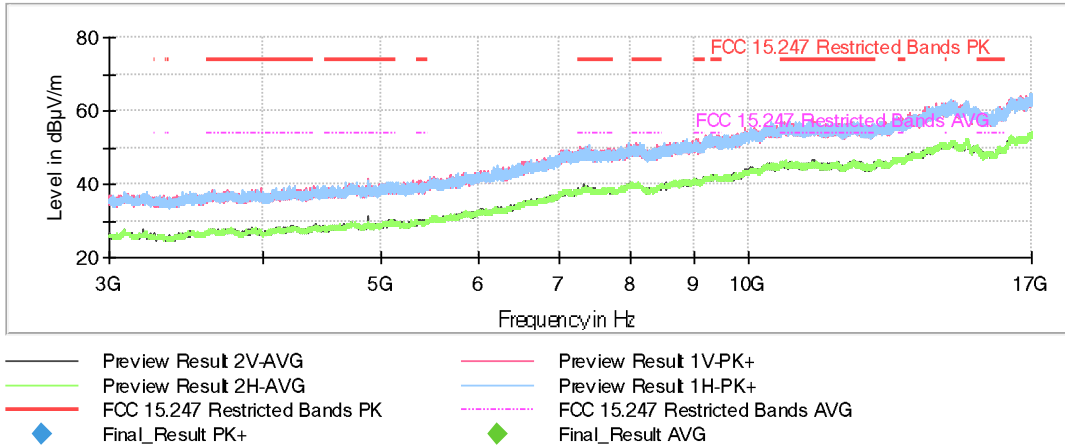


Operation Band MHz = [2400, 2483.5] Modulation = FLORA

Frequency MHz = 2440.00000

Frequency Range GHz = [3, 17] Measurement Point = 1

Images:

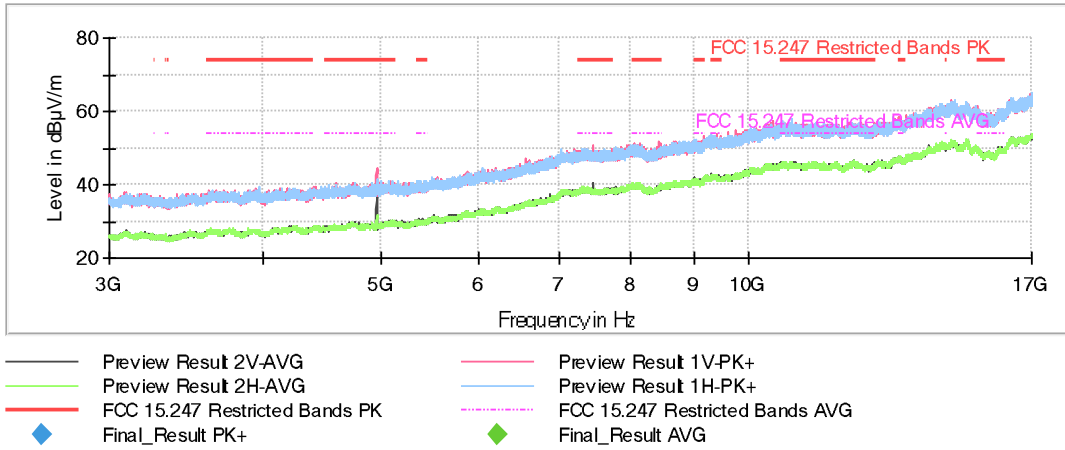


Operation Band MHz = [2400, 2483.5] Modulation = FLORA

Frequency MHz = 2480.00000

Frequency Range GHz = [3, 17] Measurement Point = 1

Images:

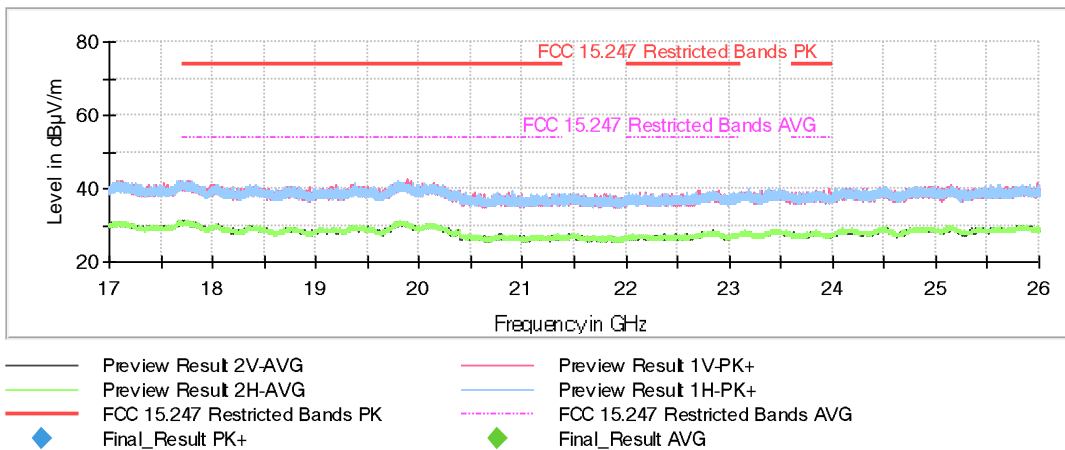


Operation Band MHz = [2400, 2483.5] Modulation = FLORA

Frequency MHz = 2402.00000

Frequency Range GHz = [17, 26] Measurement Point = 1

Images:



Appendix D: Test results. DM (Proprietary)

INDEX

TEST CONDITIONS	72
TEST CASES DETAILS	75
<i>Occupied Channel Bandwidth 99%</i>	75
<i>FCC 15.249 (b) / RSS-210 B.10 (a) Field strength of fundamental and harmonics emissions</i>	79
<i>FCC 15.249 (d) (e) / RSS-210 B.10 (b) Emissions radiated outside of the specific frequency bands</i>	83

TEST CONDITIONS

(*): Data provided by the client.

POWER SUPPLY (*):

Vnominal:	1.25 Vdc
Type of Power Supply:	Internal battery

ANTENNA (*):

Type of Antenna:	Integral
Maximum Declared Antenna Gain:	-7.0 dBi

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

During transmitter test the EUT was controlled by a SW tool provided by the client to operate in a continuous transmit mode on the modulation schemes and test channels as required.

CONDUCTED MEASUREMENTS:

The equipment under test was set up in a shielded room and it is connected to the spectrum analyzer 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 1.5 m for the frequency range 17 GHz-26 GHz (17 GHz-40 GHz horn antenna).

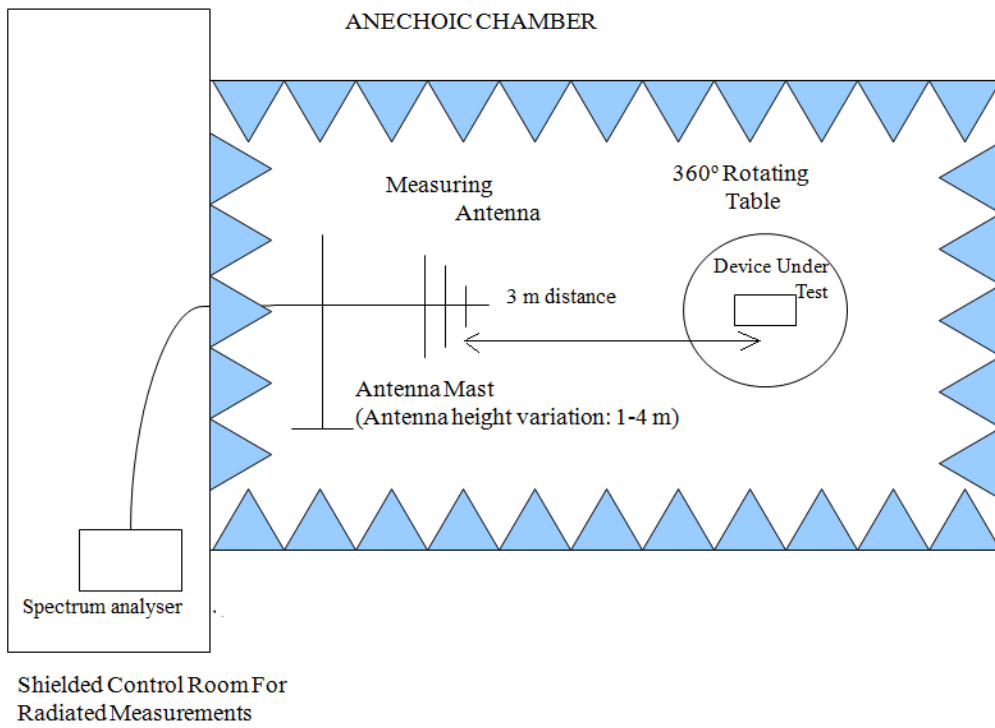
For radiated emissions in the range 17 GHz-26 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

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 (Bilog antenna and Double ridge horn antenna) was varied from 1 to 4 meters to find the maximum radiated emission.

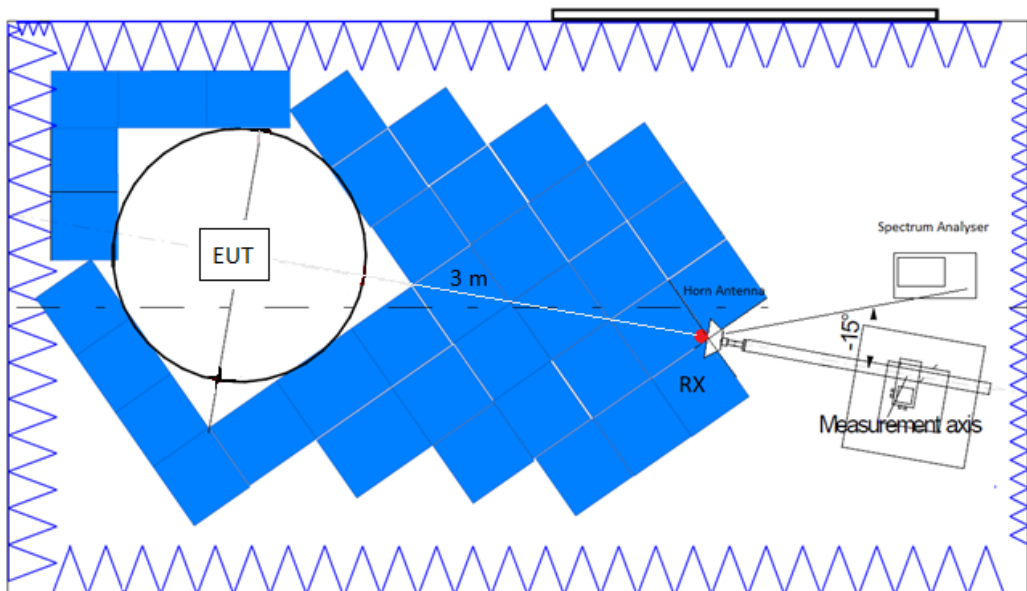
Measurements were made in both horizontal and vertical planes of polarization.

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

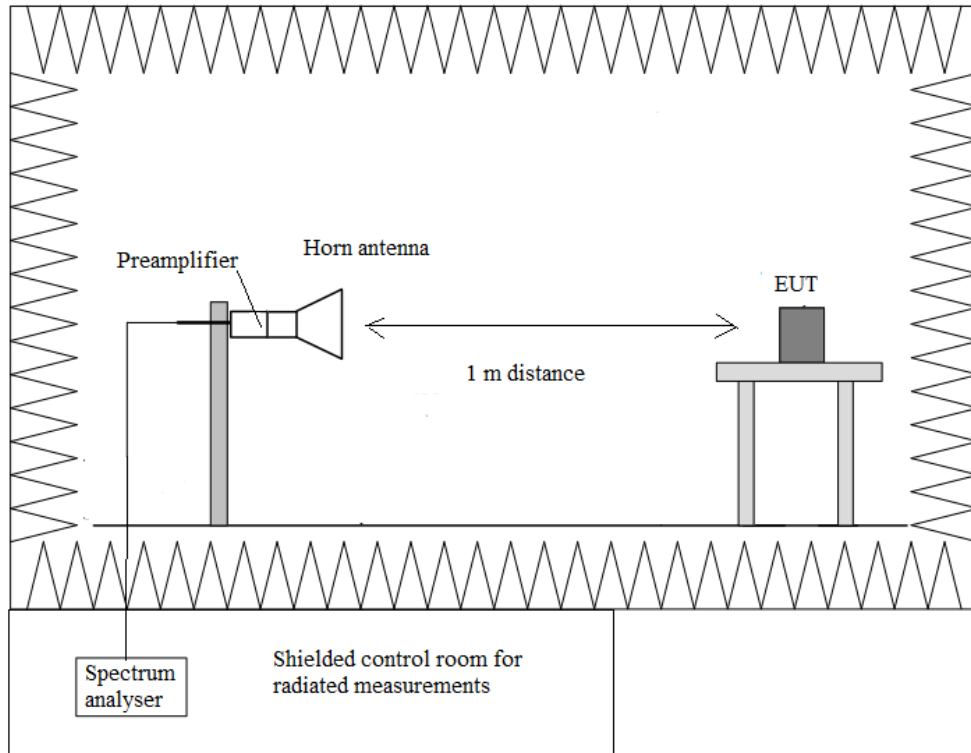
Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup from 1 GHz to 17 GHz:



Radiated measurements setup $f > 17$ GHz:



TEST CASES DETAILS

Occupied Channel Bandwidth 99%

Specification

* RSS-Gen Issue 5, Clause 6.7 Occupied bandwidth (or 99% emission bandwidth) and x dB bandwidth:

The occupied bandwidth or the “99% emission bandwidth” is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

Modulation: DM

Results

Operation Band (MHz)	Freq (MHz)	99OBW (kHz)
[2400, 2483.5]	2402	1723.90
	2440	1726.99
	2480	1727.39

Attachments

Operation Band MHz = [2400, 2483.5] Modulation = DM

Frequency MHz = 2402.00000

Images:



Operation Band MHz = [2400, 2483.5] Modulation = DM
 Frequency MHz = 2440.00000

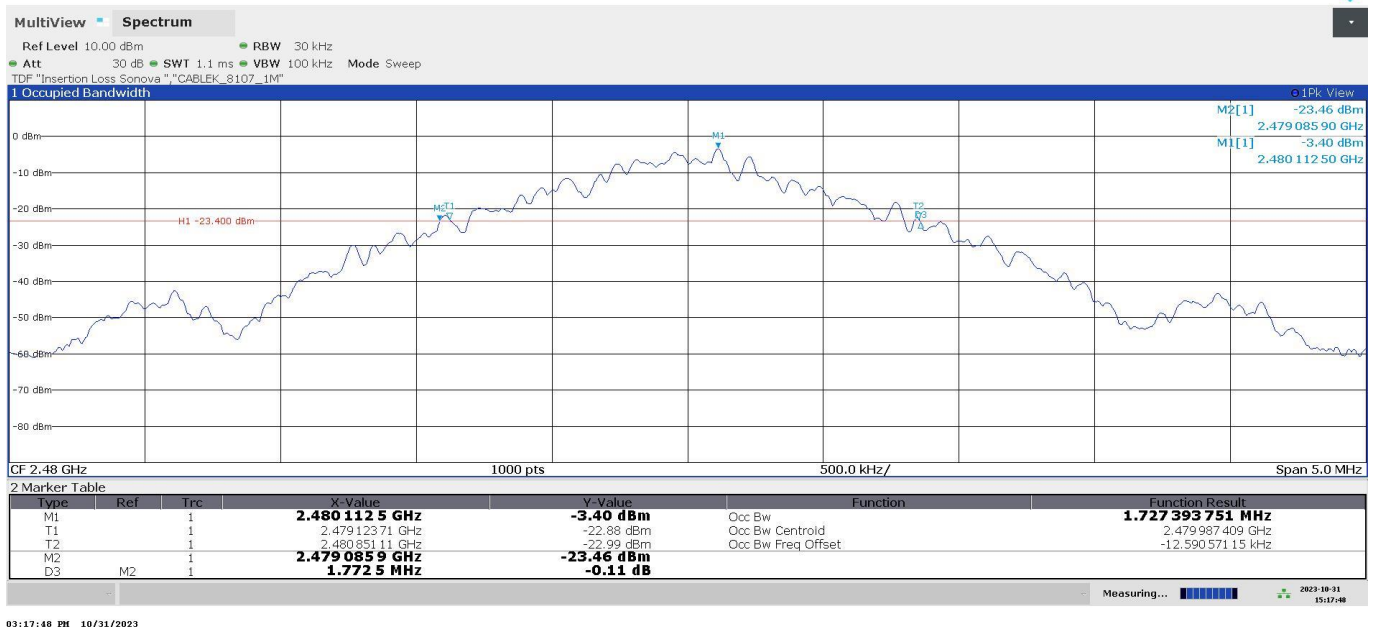
Images:



03:15:51 PM 10/31/2023

Operation Band MHz = [2400, 2483.5] Modulation = DM
 Frequency MHz = 2480.00000

Images:



03:17:48 PM 10/31/2023

FCC 15.249 (b) / RSS-210 B.10 (a) Field strength of fundamental and harmonics emissions

Limits

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.

Modulation: DM

Results

Operation Band (MHz)	Freq (MHz)	Pk Field (dBµV/m)	Avg Field (dBµV/m)
[2400, 2483.5]	2402.00	78.26	75.86
	2440.00	84.53	83.33
	2480.00	82.70	81.27

Verdict

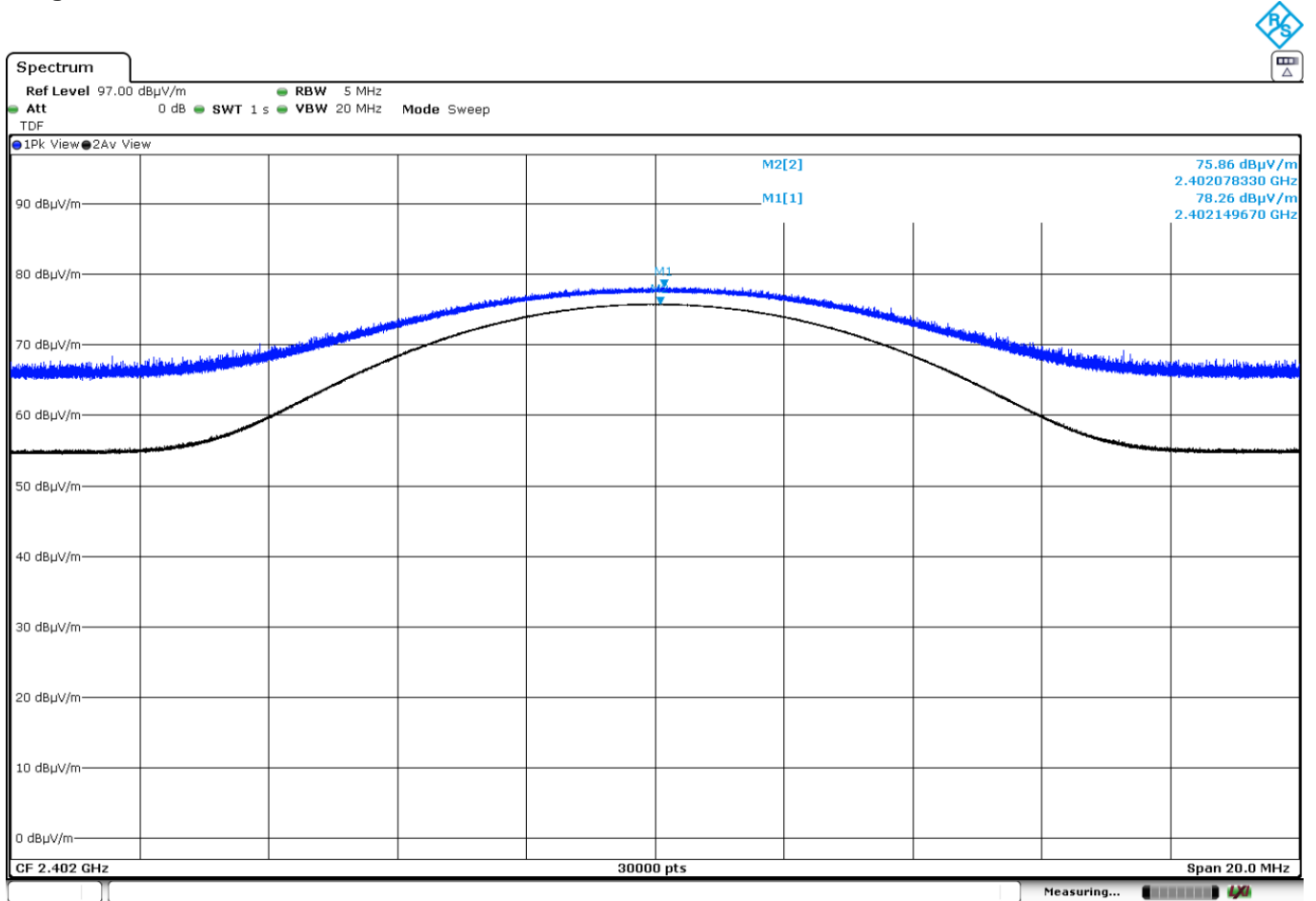
Pass

Attachments

Operation Band MHz = [2400, 2483.5] Modulation = DM

Frequency MHz = 2402.00000

Images:

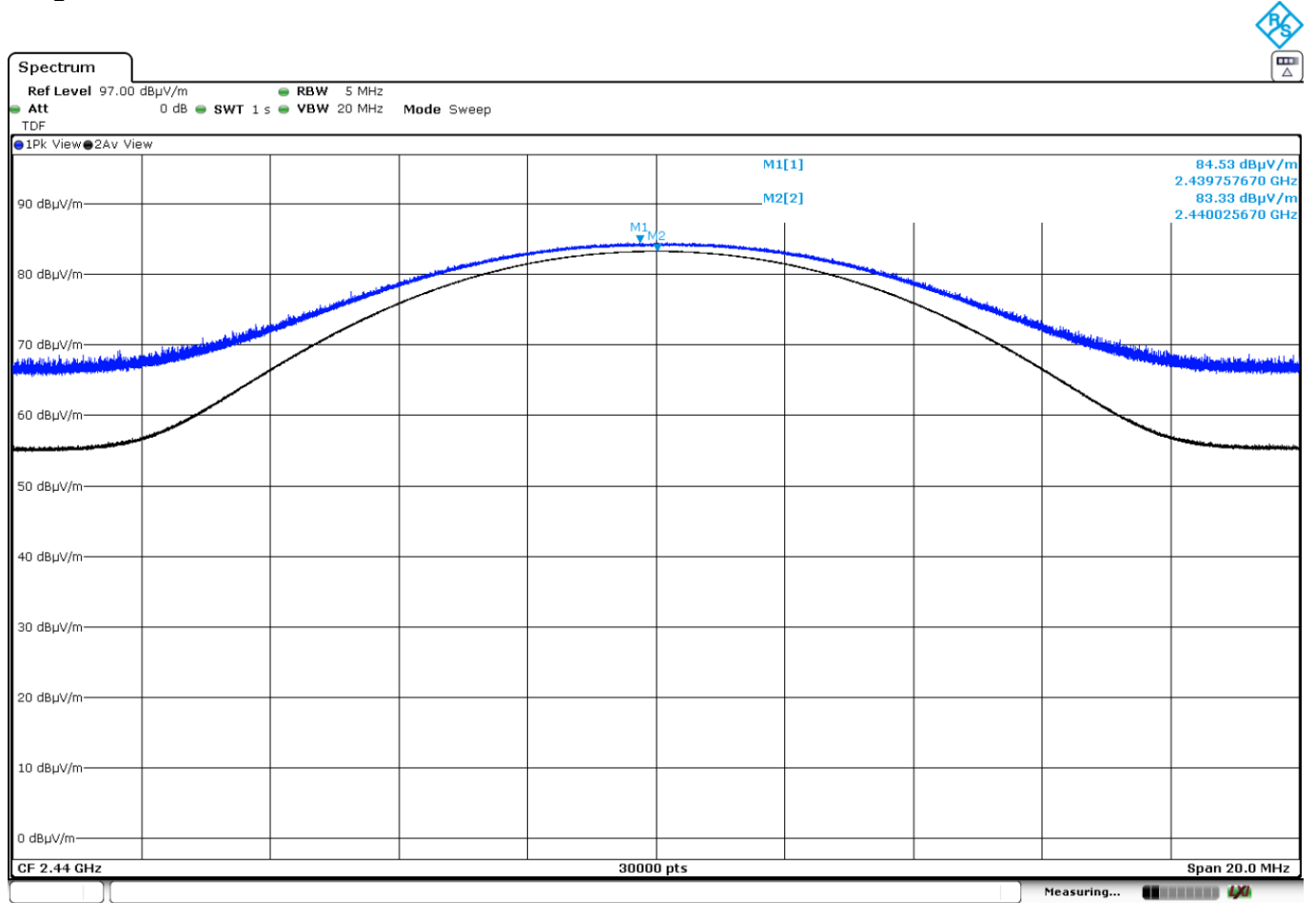


Date: 7.NOV.2023 18:36:53

Operation Band MHz = [2400, 2483.5] Modulation = DM

Frequency MHz = 2440.00000

Images:

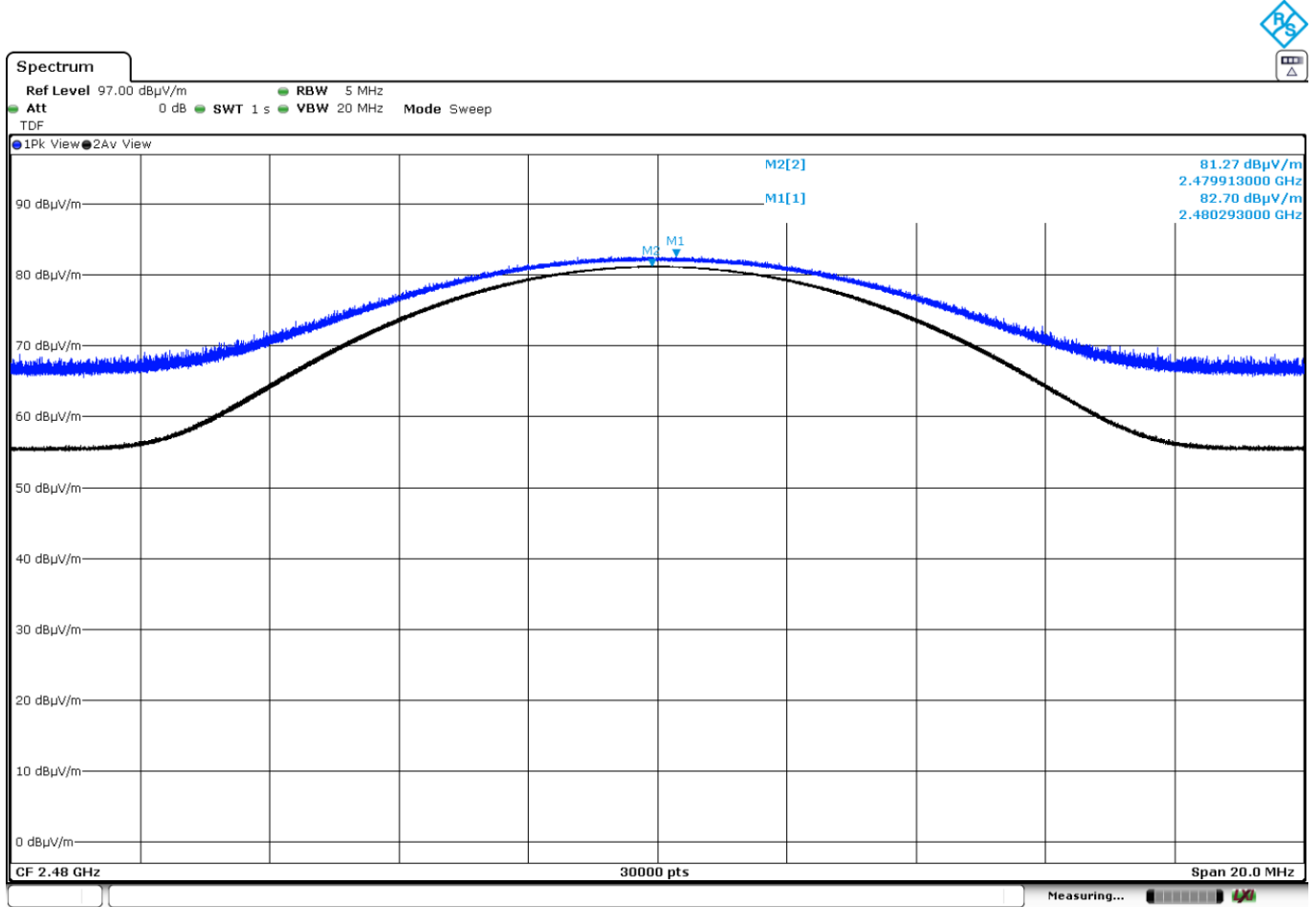


Date: 7.NOV.2023 18:44:46

Operation Band MHz = [2400, 2483.5] Modulation = DM

Frequency MHz = 2480.00000

Images:



Date: 7.NOV.2023 20:14:54

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

Limits

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

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

Whichever is the lesser attenuation.

Modulation: DM

Results

Frequency range 30 MHz – 1 GHz:

The spurious frequencies do not depend on the operating channel.
 No spurious frequencies detected at less than 20 dB below the limit.

Frequency range 1 GHz – 17 GHz:

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

Frequency range 17 GHz – 16 GHz:

The spurious frequencies do not depend on the operating channel.
 No spurious frequencies detected at less than 20 dB below the limit.

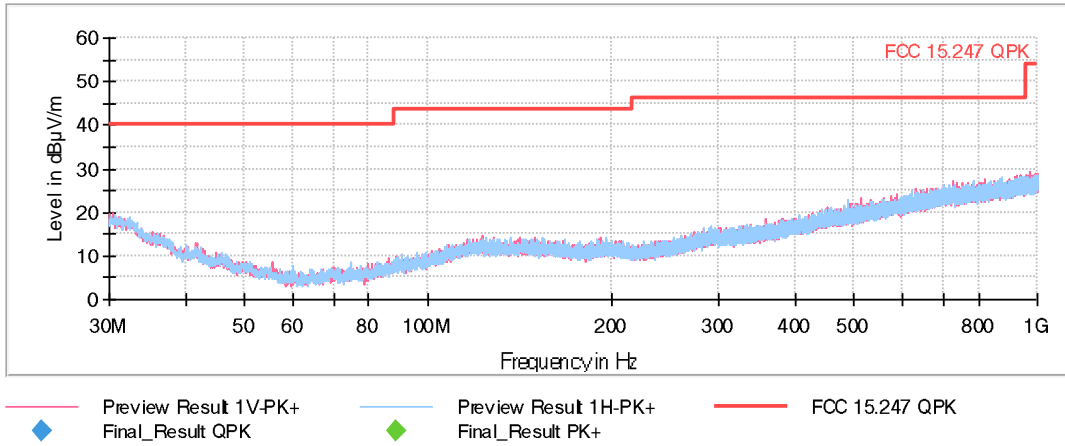
Verdict

Pass

Attachments

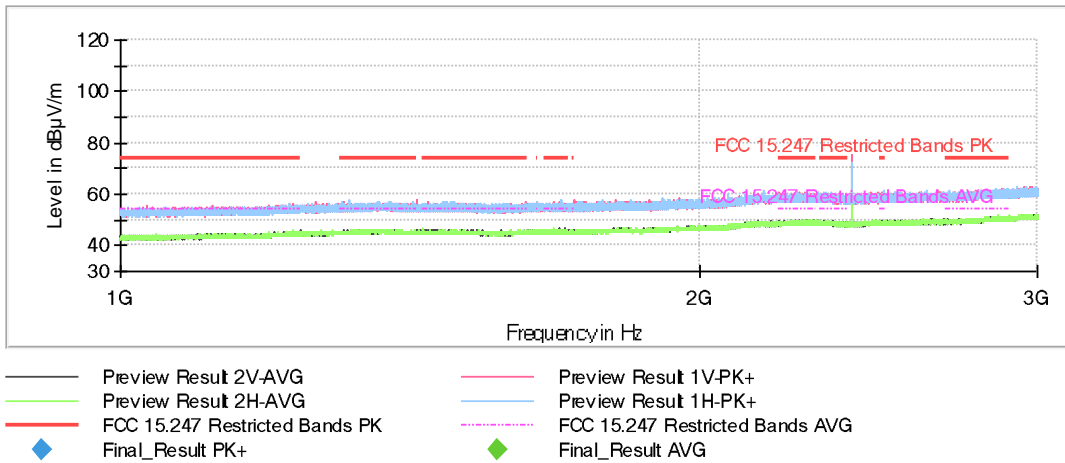
Operation Band MHz = [2400, 2483.5] Modulation = DM
 Frequency MHz = 2402.00000
 Frequency Range GHz = [0.03, 1] Measurement Point = 1

Images:



Operation Band MHz = [2400, 2483.5] Modulation = DM
 Frequency MHz = 2402.00000
 Frequency Range GHz = [1, 3] Measurement Point = 1

Images:

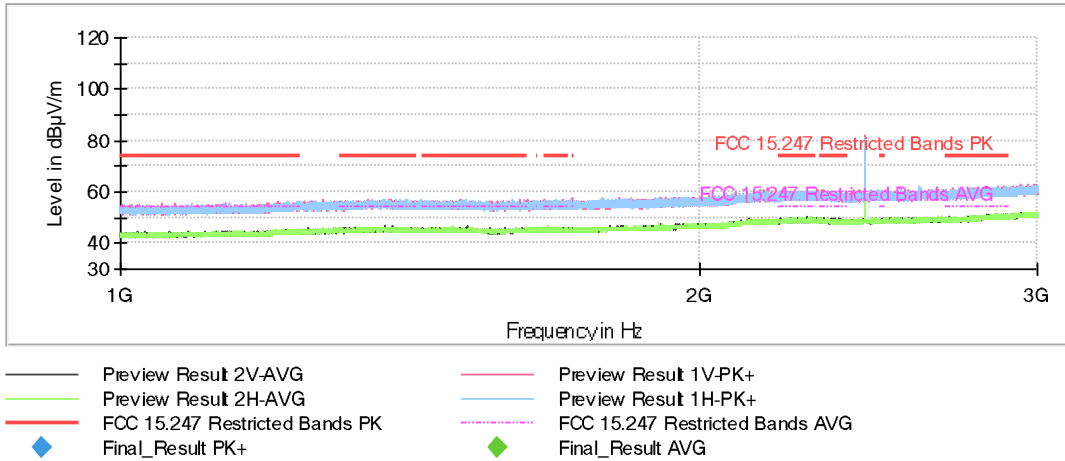


Operation Band MHz = [2400, 2483.5] Modulation = DM

Frequency MHz = 2440.00000

Frequency Range GHz = [1, 3] Measurement Point = 1

Images:

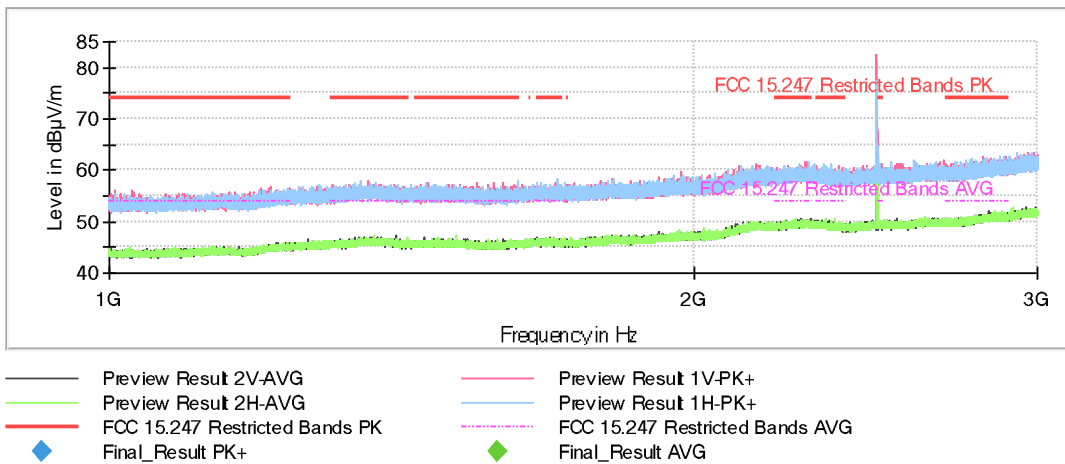


Operation Band MHz = [2400, 2483.5] Modulation = DM

Frequency MHz = 2480.00000

Frequency Range GHz = [1, 3] Measurement Point = 1

Images:

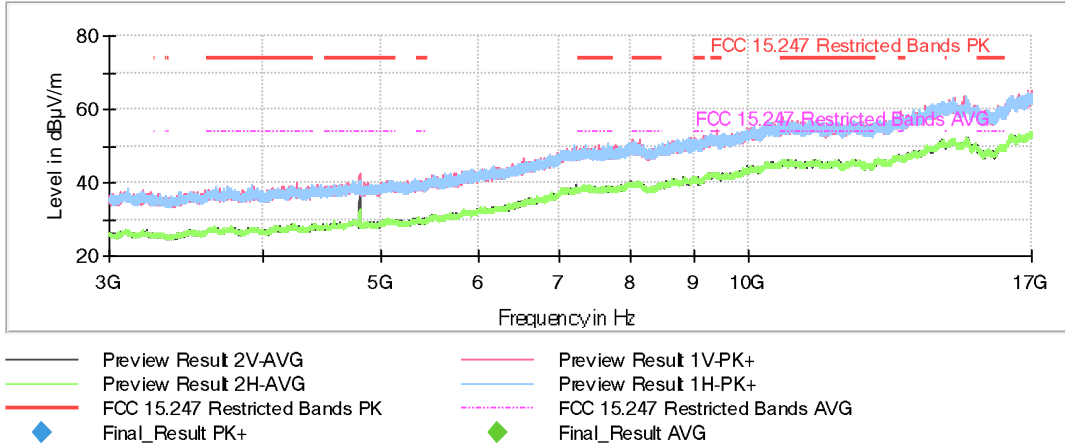


Operation Band MHz = [2400, 2483.5] Modulation = DM

Frequency MHz = 2402.00000

Frequency Range GHz = [3, 17] Measurement Point = 1

Images:

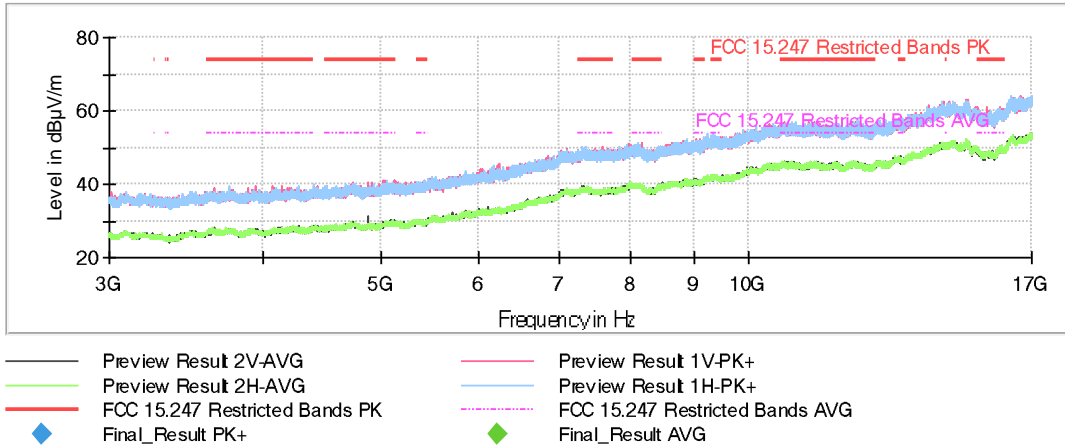


Operation Band MHz = [2400, 2483.5] Modulation = DM

Frequency MHz = 2440.00000

Frequency Range GHz = [3, 17] Measurement Point = 1

Images:

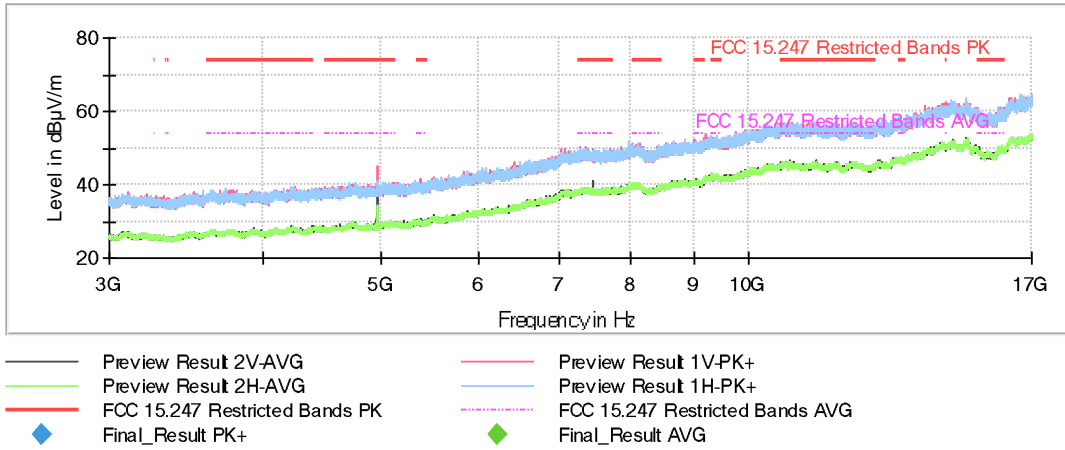


Operation Band MHz = [2400, 2483.5] Modulation = DM

Frequency MHz = 2480.00000

Frequency Range GHz = [3, 17] Measurement Point = 1

Images:



Operation Band MHz = [2400, 2483.5] Modulation = DM

Frequency MHz = 2480.00000

Frequency Range GHz = [17, 26] Measurement Point = 1

Images:

