



Test report No:  
NIE: 64587RRF.001

## 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         | Treon Gateway inside IP protected enclosure                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| (*) Trademark                             | TREON                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| (*) Model and /or type reference          | Treon Gateway in protective enclosure, Model 1131                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Other identification of the product       | HW version: 0001<br>SW version: 5.8.0<br>FCC ID: 2AR86GW11<br>IC: 24716-GW11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| (*) Features                              | GSM/NB-IOT/Cat M1, WLAN 2.4GHz b/g/n, Wirepas Mesh (BLE)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Applicant                                 | TREON OY<br>Visiokatu 3, 33720 Tampere, Finland                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Test method requested, standard           | USA FCC Part 15.247 (10-1-19) Edition: Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz.<br>USA FCC Part 15.209 (10-1-19) Edition: Radiated emission limits; general requirements.<br>CANADA RSS-247 Issue 2 (February 2017).<br>CANADA RSS-Gen Issue 5 Amendment 1 (March 2019).<br>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.<br>ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices. |
| Approved by (name / position & signature) | José Carlos Luque<br>RF Lab. Supervisor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Date of issue                             | 2020-08-12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Report template No                        | FDT08_22<br>(*) "Data provided by the client"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

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## Competences and guarantees

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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

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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.
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## Uncertainty

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Uncertainty (factor  $k=2$ ) was calculated according to the DEKRA Testing and Certification S.A.U. internal document PODT000.

## Data provided by the client

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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 Treon Gateway in protective enclosure, Model 1131 includes a Treon Gateway (Model 1111) which is placed inside a plastic IP67 enclosure to protect the gateway in challenging installation environments. Treon Gateway is a certified wireless gateway for Wirepas Mesh sensor networks. Through the Treon Gateway sensor data can be routed to backend systems via ethernet, WiFi or cellular data connection.

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 result.

## 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 |
|------------|---------------------------------------------|---------------------------------------------------|-----------|-------------------|
| 64587/001  | Treon Gateway inside IP protected enclosure | Treon Gateway in protective enclosure, Model 1131 | a87cc3ea  | 2020/05/19        |

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

## Test sample description

|                                    |                                     |                                |                          |                          |                                   |                          |
|------------------------------------|-------------------------------------|--------------------------------|--------------------------|--------------------------|-----------------------------------|--------------------------|
| Ports..... :                       | Port name and description           | Cable                          |                          |                          |                                   |                          |
|                                    |                                     | Specified max length [m]       | Attached during test     | Shielded                 | Coupled to patient <sup>(3)</sup> |                          |
|                                    | RJ45                                | <100                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>          |                          |
|                                    |                                     |                                | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>          |                          |
| Supplementary information to the   | --                                  |                                |                          |                          |                                   |                          |
| Rated power supply .....           | Voltage and Frequency               |                                | Reference poles          |                          |                                   |                          |
|                                    |                                     |                                | L1                       | L2                       | L3                                | N PE                     |
|                                    | <input checked="" type="checkbox"/> | AC: 100-240V 50/60Hz           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>          | <input type="checkbox"/> |
|                                    | <input type="checkbox"/>            | DC:                            |                          |                          |                                   |                          |
| Rated Power .....                  | --                                  |                                |                          |                          |                                   |                          |
| Clock frequencies..... :           | 1000MHz                             |                                |                          |                          |                                   |                          |
| Other parameters .....             | --                                  |                                |                          |                          |                                   |                          |
| Software version .....             | 5.8.0                               |                                |                          |                          |                                   |                          |
| Hardware version .....             | 0001                                |                                |                          |                          |                                   |                          |
| Dimensions in cm (W x H x D) ..... | 18 x 13 x 8,1                       |                                |                          |                          |                                   |                          |
| Mounting position .....            | <input type="checkbox"/>            | Table top equipment            |                          |                          |                                   |                          |
|                                    | <input checked="" 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 |
|                                               | IRM-30-5ST                | AC-DC Single output<br>Encapsulated power supply | Mean Well    |
|                                               |                           |                                                  |              |
| Accessories (not part of the test item) ..... | Description               | Type                                             | Manufacturer |
|                                               | --                        |                                                  |              |
|                                               |                           |                                                  |              |
| Documents as provided by the applicant.....:  | Description               | File name                                        | Issue date   |
|                                               | --                        |                                                  |              |
|                                               |                           |                                                  |              |

<sup>(3)</sup> Only for Medical Equipment

## Identification of the client

TREON OY  
Visiokatu 3, 33720 Tampere, Finland

## Testing period and place

|               |                                        |
|---------------|----------------------------------------|
| Test Location | DEKRA Testing and Certification S.A.U. |
| Date (start)  | 2020-06-08                             |
| Date (finish) | 2020-07-17                             |

## Document history

| Report number | Date       | Description   |
|---------------|------------|---------------|
| 64587RRF.001  | 2020-08-12 | First release |

## Environmental conditions

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

|                   |                                     |
|-------------------|-------------------------------------|
| Temperature       | Min. = 15 °C<br>Max. = 35 °C        |
| Relative humidity | Min. = 20 %<br>Max. = 75 %          |
| Air pressure      | Min. = 860 mbar<br>Max. = 1060 mbar |

In the semianechoic chamber, the following limits were not exceeded during the test.

|                   |                                     |
|-------------------|-------------------------------------|
| Temperature       | Min. = 15 °C<br>Max. = 35 °C        |
| Relative humidity | Min. = 20 %<br>Max. = 75 %          |
| Air pressure      | Min. = 860 mbar<br>Max. = 1060 mbar |

## Remarks and comments

The tests have been performed by the technical personnel: Cristina Calle, Nicolás Salguero, Pablo Redondo and José Gabriel Pendón.

Used instrumentation:

### Radiated Measurements:

|                                                                            | Last Calibration | Due Calibration |
|----------------------------------------------------------------------------|------------------|-----------------|
| 1. Semianechoic Absorber Lined Chamber ETS LINDGREN FACT 3 200 STP         | N.A.             | N.A.            |
| 2. Shielded room ETS LINDGREN S101                                         | N.A.             | N.A.            |
| 3. Biconical/Log Antenna ETS LINDGREN 3142E                                | 2020/04          | 2023/04         |
| 4. RF pre-amplifier 10 MHz-6 GHz Bonn Elektronik BLNA 0160-01N             | 2020/02          | 2021/02         |
| 5. EMI Test Receiver ROHDE AND SCHWARZ ESR7                                | 2019/10          | 2021/10         |
| 6. Broadband Horn antenna 1-18 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9120 D | 2019/11          | 2022/11         |
| 7. RF pre-amplifier 1-18 GHz Bonn Elektronik BLMA 0118-1M                  | 2020/05          | 2021/05         |
| 8. Signal and Spectrum Analyzer ROHDE AND SCHWARZ FSV 40                   | 2019/09          | 2021/09         |
| 9. Broadband Horn antenna 18-40 GHz SCHWARZBECK BBHA 9170                  | 2018/07          | 2021/07         |
| 10. RF Pre-amplifier 30 dB, 18 GHz-40 GHz BONN ELEKTRONIK BLMA 1840-1M     | 2019/02          | 2021/02         |
| 11. AC power supply ELGAR CS-AC35(351SL)                                   | 2019/09          | 2022/09         |
| 12. Digital Multimeter FLUKE 175                                           | 2019/10          | 2020/10         |

## Testing verdicts

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

## Summary

### 1. WLAN 2.4 GHz (802.11 b/g/n20 1x1).

| FCC PART 15 PARAGRAPH / RSS-247               |                                              |         |        |
|-----------------------------------------------|----------------------------------------------|---------|--------|
| Requirement – Test case                       |                                              | Verdict | Remark |
| FCC 15.247 (a)(2) / RSS-247 5.2. (a)          | 6 dB Bandwidth                               | N/M     |        |
| FCC 15.247 (b) / RSS-247 5.4. (d)             | Maximum output power and antenna gain        | N/M     |        |
| FCC 15.247 (d) / RSS-247 5.5.                 | Band-edge emissions compliance (Transmitter) | N/M     |        |
| FCC 15.247 (e) / RSS-247 5.2. (b)             | Power spectral density                       | N/M     |        |
| FCC 15.247 (d) / RSS-247 5.5.                 | Emission limitations radiated (Transmitter)  | P       | (1)    |
| <u>Supplementary information and remarks:</u> |                                              |         |        |
| (1) Only test requested.                      |                                              |         |        |

## Appendix A: Test results. 802.11 bgn20 1x1



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## TEST CONDITIONS

### POWER SUPPLY (V):

|                       |             |
|-----------------------|-------------|
| V nominal:            | 110 Vac.    |
| Type of Power Supply: | AC voltage. |

### ANTENNA:

|                                |                              |
|--------------------------------|------------------------------|
| Type of Antenna:               | Integral. ANT162442DT-2001A2 |
| Maximum Declared Antenna Gain: | +1.05 dBi.                   |

### TEST FREQUENCIES:

|                     |          |
|---------------------|----------|
| Low Channel (1):    | 2412 MHz |
| Middle Channel (6): | 2437 MHz |
| High Channel (11):  | 2462 MHz |

The data rates of 1Mb/s for 802.11b, 6Mb/s for 802.11g and MCS0 for 802.11n20 were selected. A preliminary testing identified that 802.11b corresponds to the worst cases for output power and band edge levels at restricted bands.

### RADIATED MEASUREMENTS:

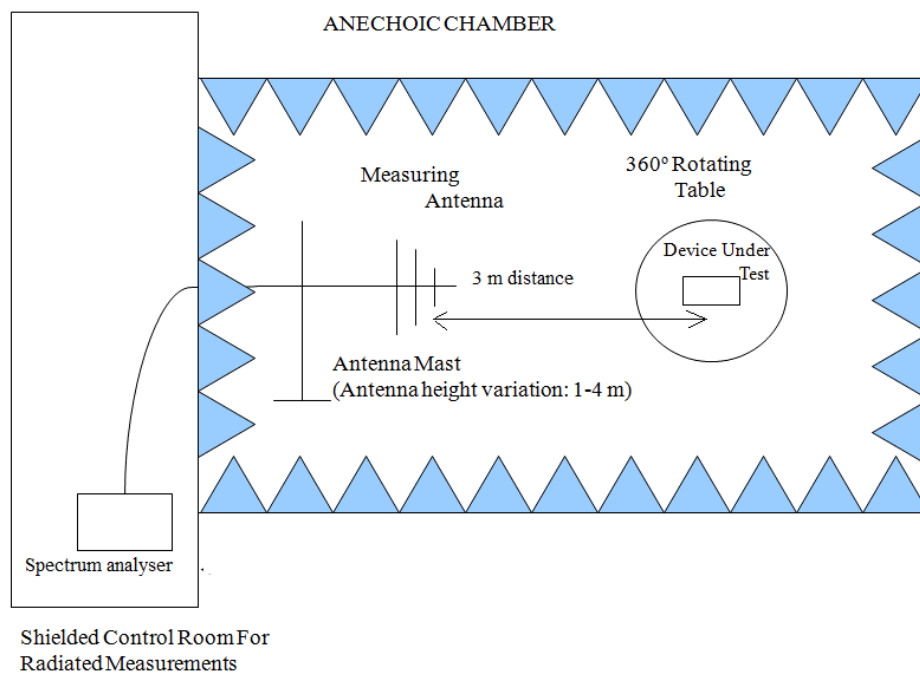
All radiated tests were performed in a semi-anechoic chamber. The measurement antenna (Bilog antenna for the range between 30 MHz to 1000 MHz and Double ridge horn antenna for the range between 1 GHz-17 GHz) is situated at a distance of 3 m and at a distance of 1m for the frequency range 17 GHz-26 GHz (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.

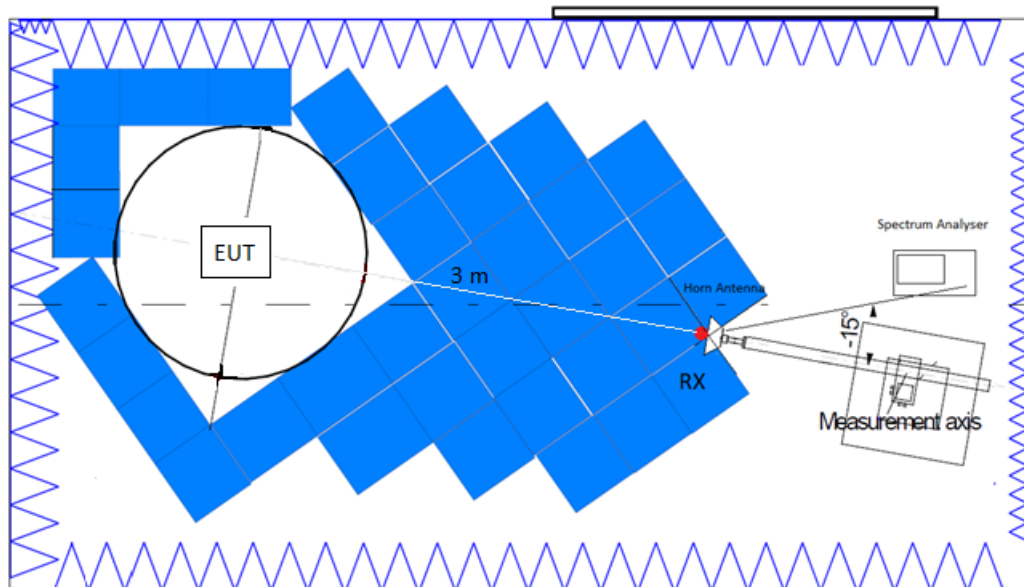
The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height (Bilog antenna and Double ridge horn antenna) was varied from 1 to 4 meters to find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

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

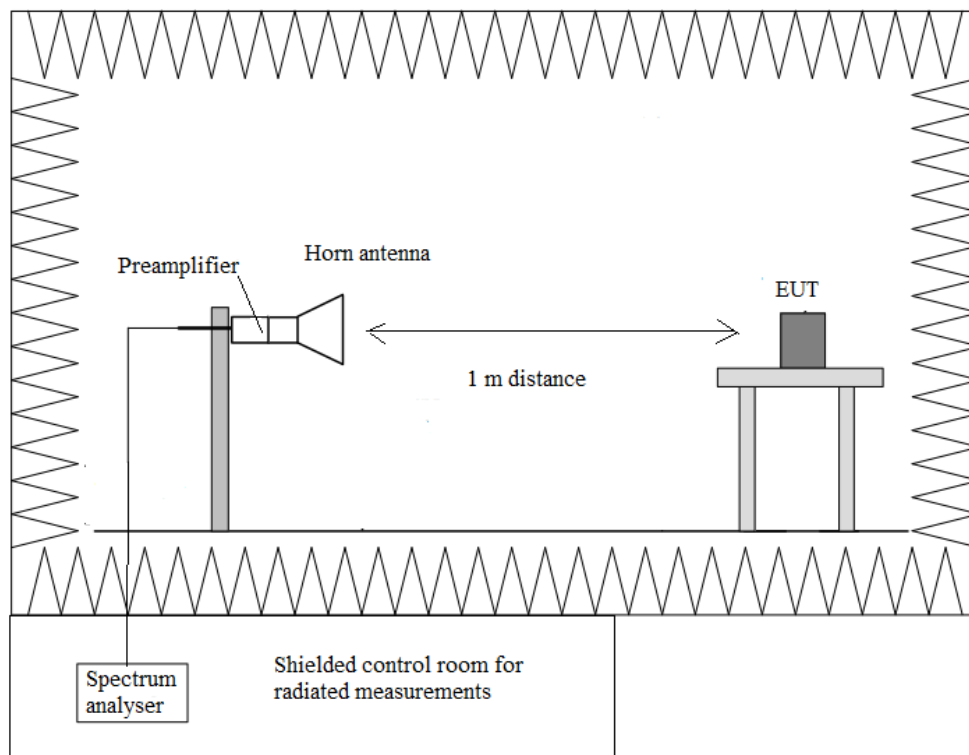
Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup from 1 GHz to 17 GHz:



Radiated measurements setup  $f > 17$  GHz:



## FCC 15.247 (d) / RSS-247 5.5. Emission limitations radiated (Transmitter)

### SPECIFICATION:

Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §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 - 25000           | 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.

### 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.

Only results for worst case 802.11b (DSSS) 1Mbps are shown below.

### Frequency range 30 MHz - 1 GHz:

The spurious frequencies do not depend neither on the operating channel nor the modulation mode.

Spurious frequencies at less than 20 dB below the limit:

| Spurious frequency (MHz) | Emission Level (dBμV/m) | Limit (dBμV/m) | Polarization | Detector   | Measurement Uncertainty (dB) |
|--------------------------|-------------------------|----------------|--------------|------------|------------------------------|
| 36.984                   | 17.74                   | 40             | V            | Quasi peak | <± 4.99                      |
| 63.5135                  | 21.24                   | 40             | V            | Quasi peak | <± 4.99                      |
| 117.494                  | 27.36                   | 43.5           | V            | Quasi peak | <± 4.99                      |
| 177.0035                 | 34.7                    | 43.5           | V            | Quasi peak | <± 4.99                      |
| 231.469                  | 28.09                   | 46             | V            | Quasi peak | <± 4.99                      |

Verdict: PASS

### 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.

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.** Spurious frequencies at less than 20 dB below the limit:

| Spurious frequency (GHz) | Detector | Emission Level (dBμV/m) | Polarization | Measurement Uncertainty (dB) |
|--------------------------|----------|-------------------------|--------------|------------------------------|
| 2.38367                  | Peak     | 58.87                   | H            | <± 3.98                      |
|                          | Average  | 46.90                   |              | <± 3.98                      |
| 2.43733                  | Peak     | 62.19                   | V            | <± 3.98                      |
|                          | Average  | 51.42                   |              | <± 3.98                      |
| 4.8240                   | Peak     | 46.57                   | H            | <± 4.98                      |

- **MIDDLE CHANNEL.** Spurious frequencies at less than 20 dB below the limit:

| Spurious frequency (GHz) | Detector | Emission Level (dBμV/m) | Polarization | Measurement Uncertainty (dB) |
|--------------------------|----------|-------------------------|--------------|------------------------------|
| 2.37567                  | Peak     | 62.18                   | V            | <± 3.98                      |
|                          | Average  | 47.40                   |              | <± 3.98                      |
| 4.8735                   | Peak     | 44.85                   | H            | <± 4.98                      |

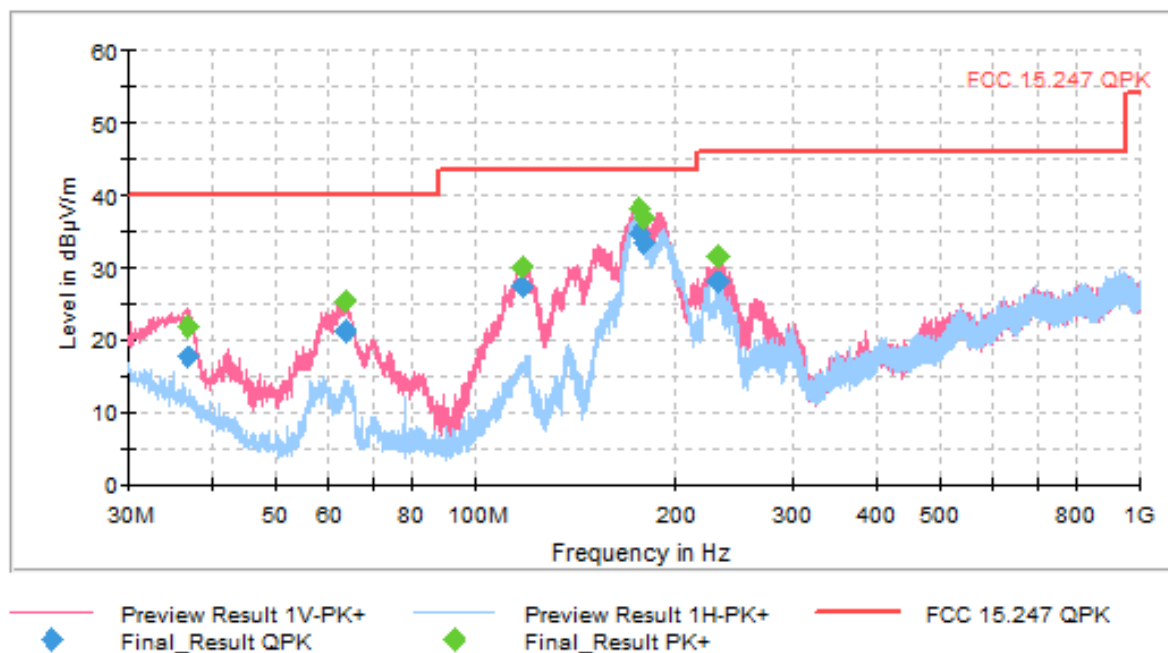
- **HIGH CHANNEL.** Spurious frequencies at less than 20 dB below the limit:

| Spurious frequency (GHz) | Detector | Emission Level (dBμV/m) | Polarization | Measurement Uncertainty (dB) |
|--------------------------|----------|-------------------------|--------------|------------------------------|
| 2.486466                 | Peak     | 60.85                   | V            | <± 3.98                      |
|                          | Average  | 49.66                   |              | <± 3.98                      |
| 3.607                    | Peak     | 46.97                   | V            | <± 4.98                      |
| 4.924                    | Peak     | 48.37                   | V            | <± 4.98                      |
| 7.3845                   | Peak     | 47.86                   | H            | <± 4.98                      |

Verdict: PASS

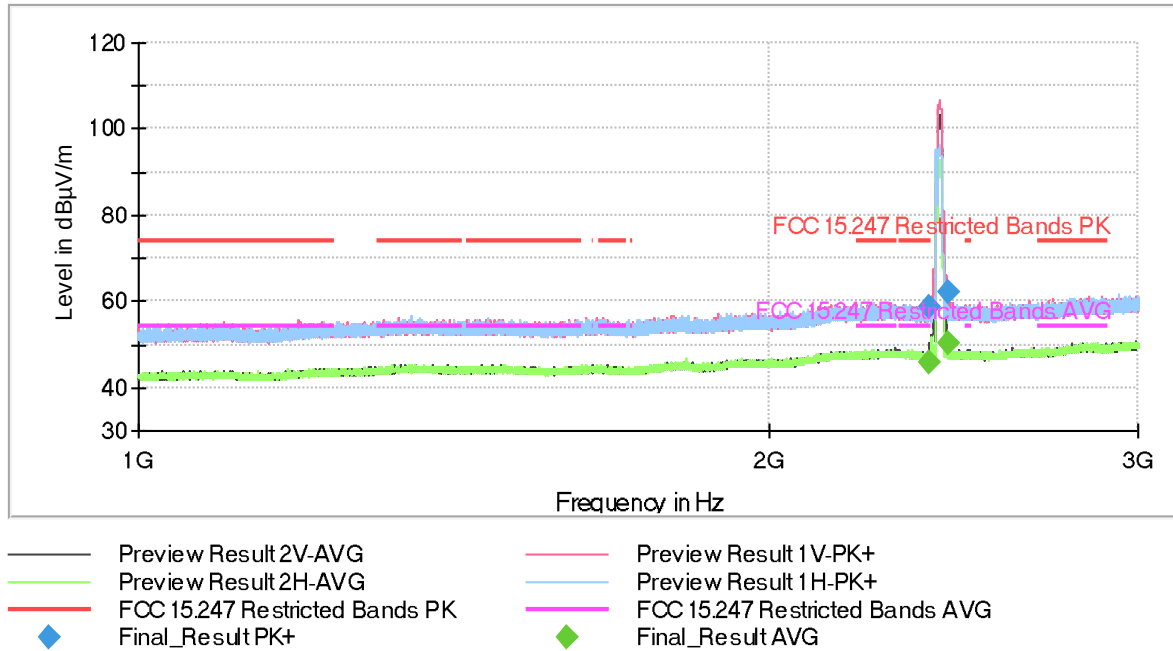
# **FREQUENCY RANGE 30 MHz - 1 GHz:**

This plot is valid for all the modulation modes and the Low, Middle and High Channels:



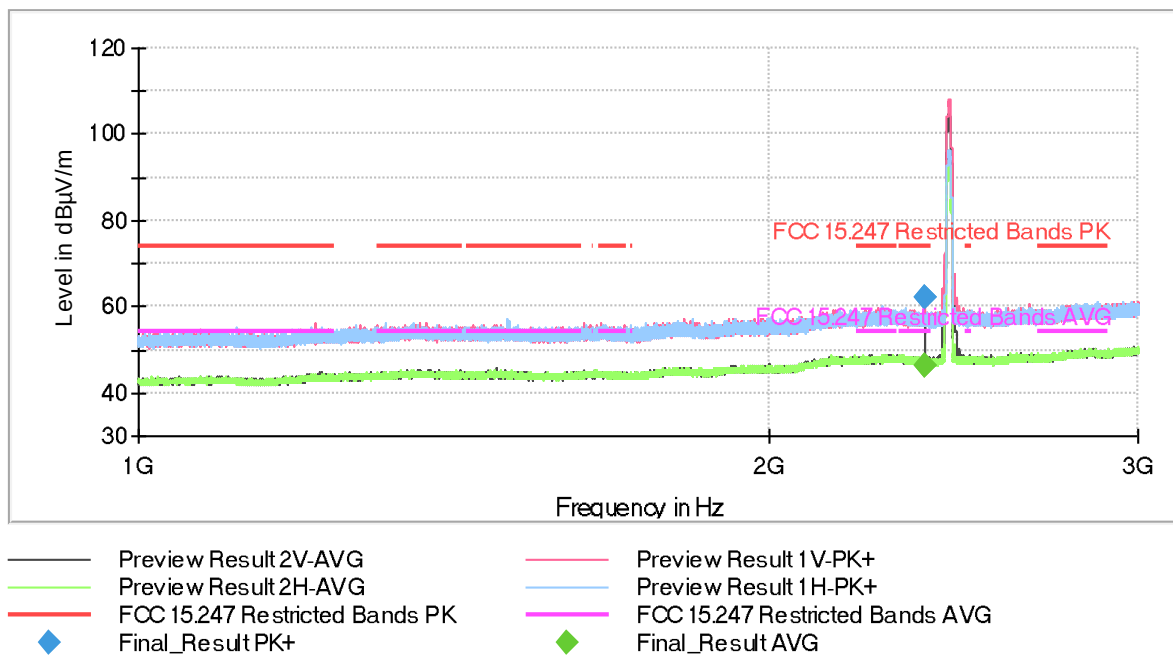
## FREQUENCY RANGE 1 - 3 GHz:

- Low Channel:



The peak above the limit is the carrier frequency.

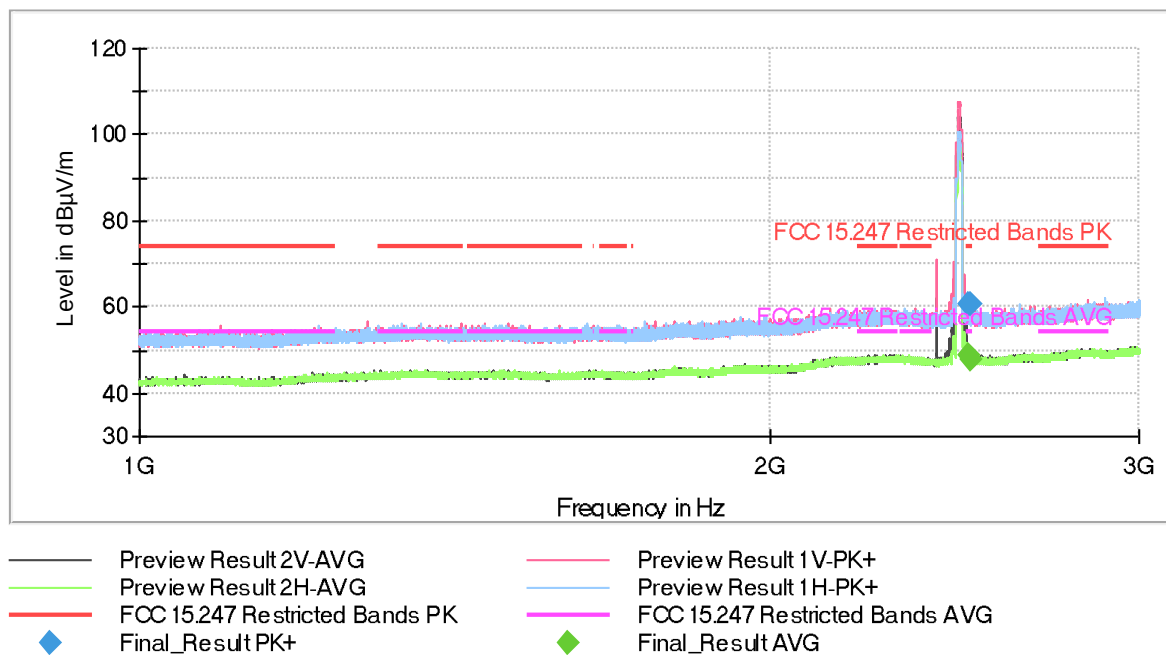
- Middle Channel:



The peak above the limit is the carrier frequency.



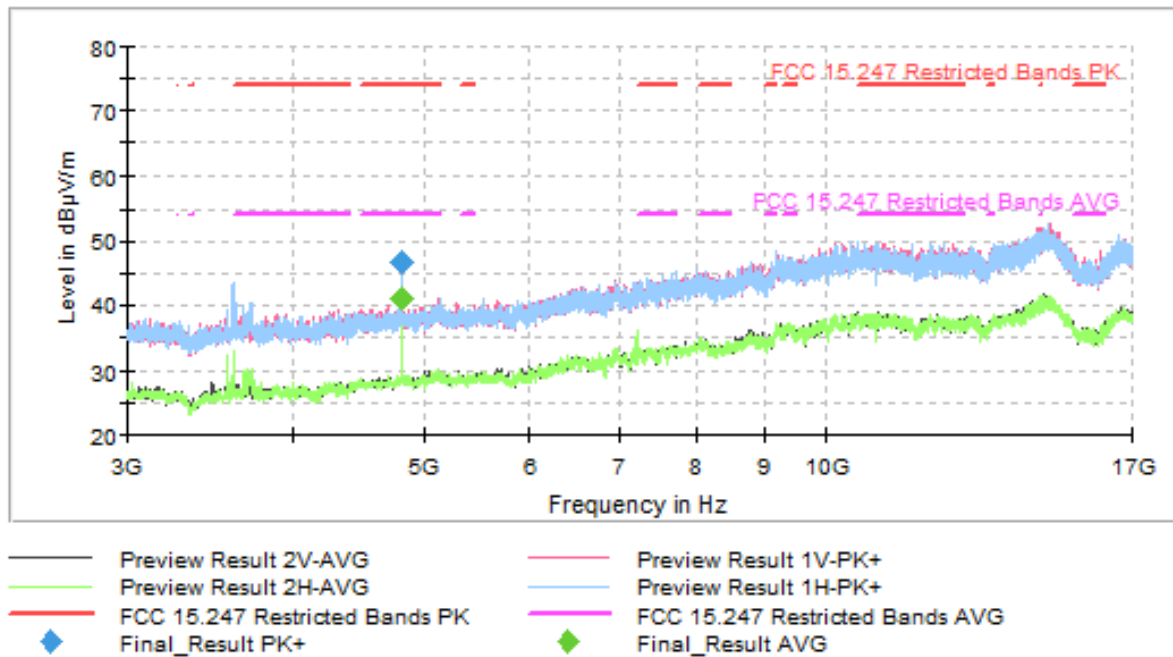
- High Channel:



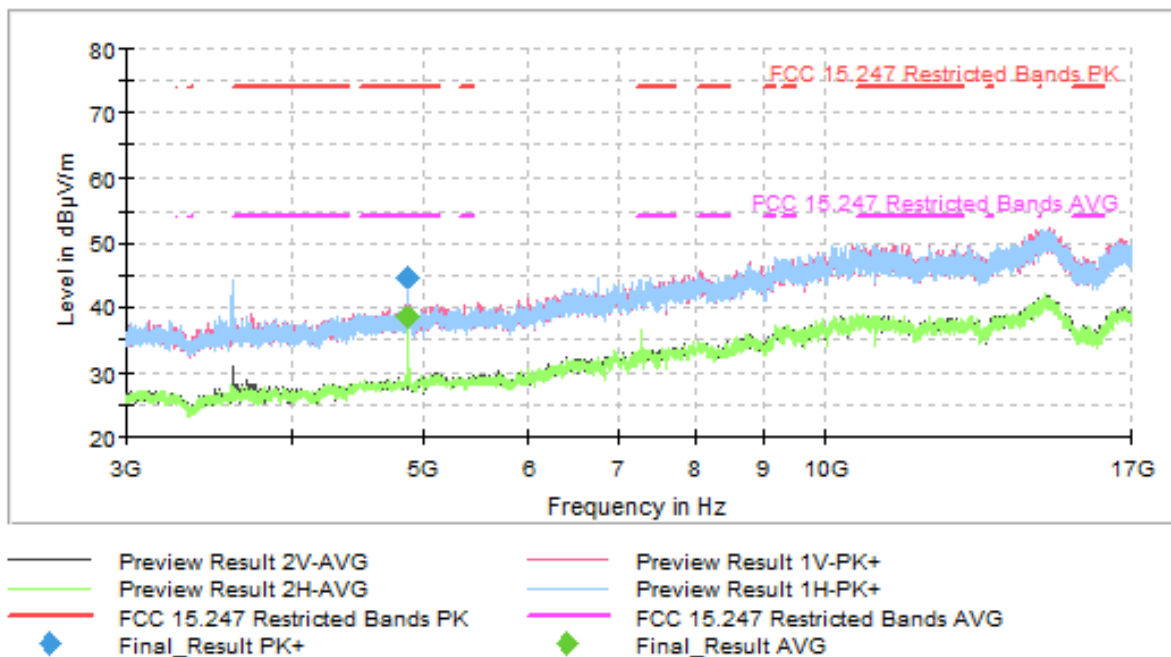
The peak above the limit is the carrier frequency.

### FREQUENCY RANGE 3 - 17 GHz:

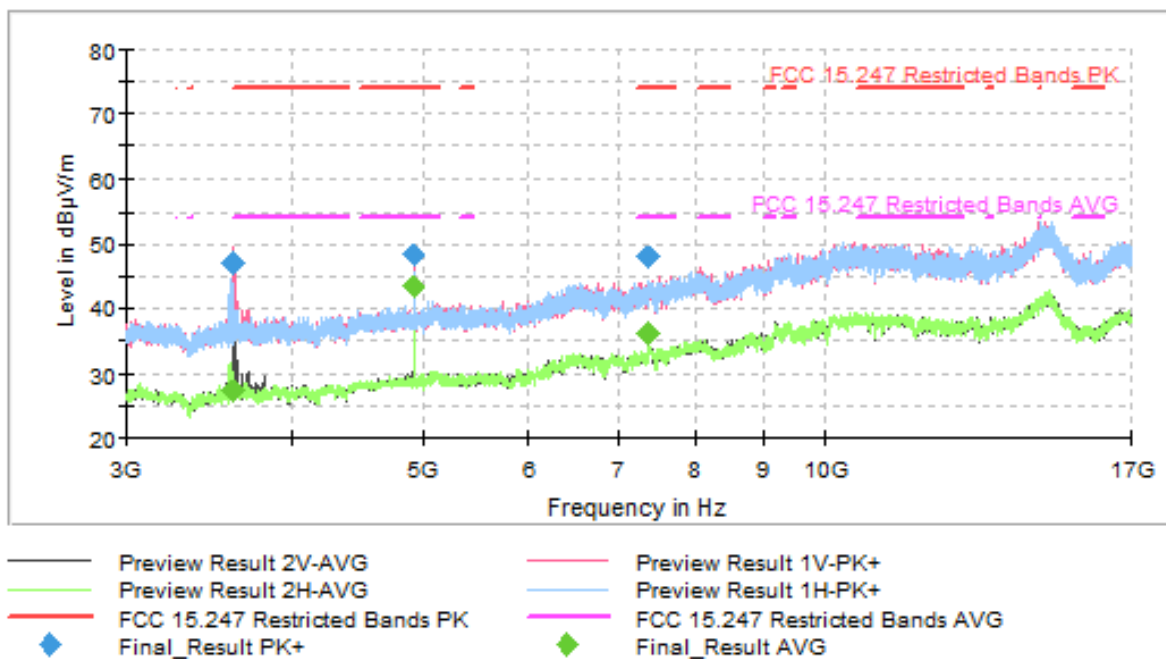
- Low Channel:



- Middle Channel:

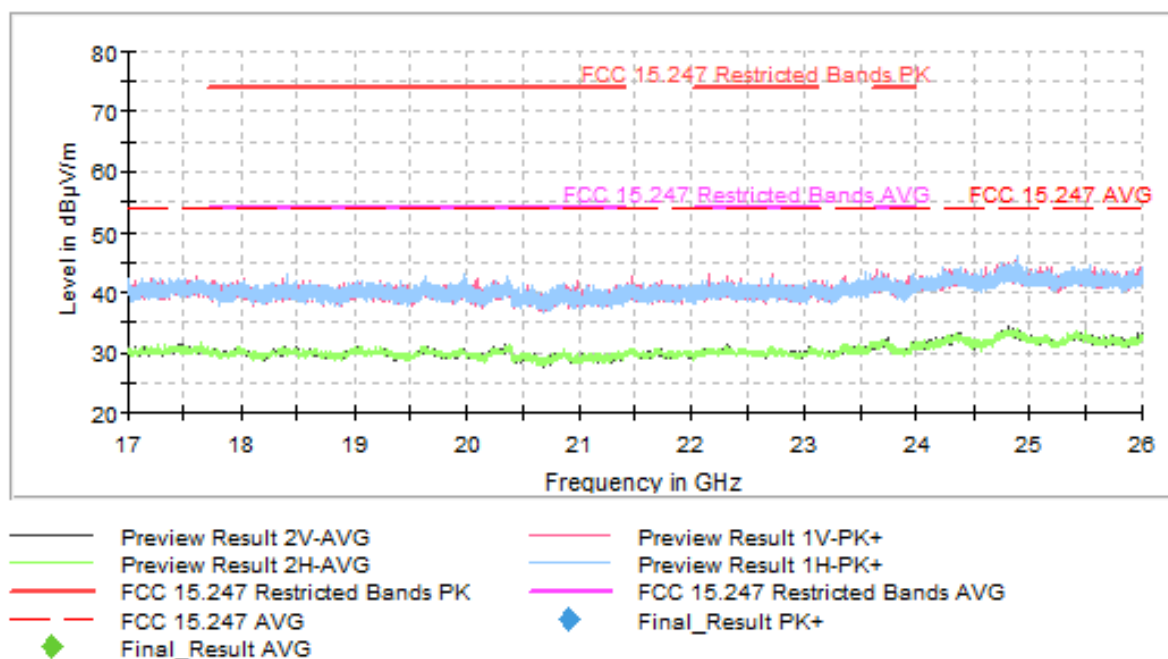


- High Channel:



## FREQUENCY RANGE 17 - 26 GHz:

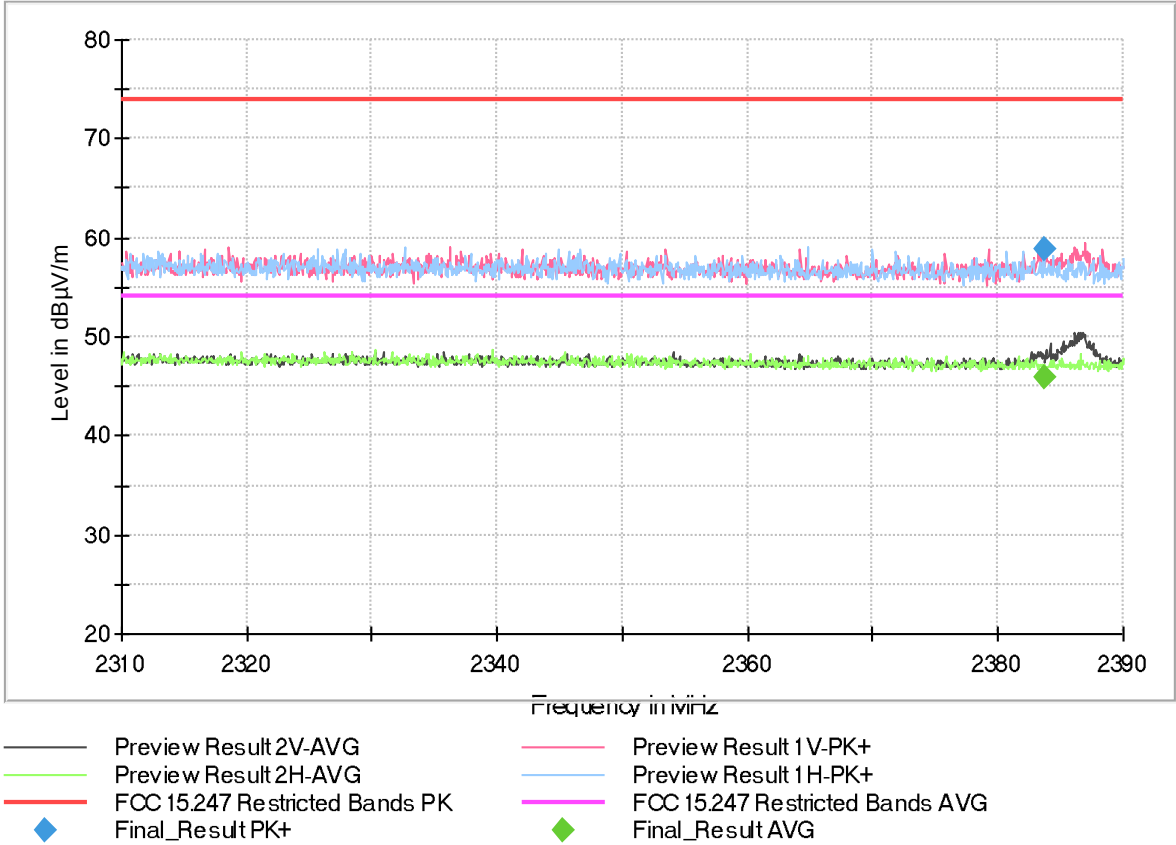
The spurious signals detected do not depend on the operating channel.



RESTRICTED BAND 2.31-2.39 GHz:

- Low Channel:

Full Spectrum



RESTRICTED BAND 2.4835-2.5 GHz:

- High Channel:

Full Spectrum

