



FCC LISTED, REGISTRATION  
NUMBER: 720267

ISED LISTED REGISTRATION  
NUMBER 4621A-2

Informe de ensayo n°:  
Test report No:

**NIE: 51982RRF.002**

## 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.

|                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Identificación del objeto ensayado.....:</b><br>Identification of item tested   | WiFi module                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Marca .....</b><br>Trademark                                                    | Telit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Modelo y/o referencia tipo .....</b><br>Model and /or type reference            | WE866A1-P                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Other identification of the product .....</b>                                   | FCC ID: RI7WE866A1P<br>IC: 5131A-WE866A1P                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Final HW version .....</b>                                                      | HW 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Final SW version .....</b>                                                      | 3.2.0.0.31.2.0.0.0.2.2.0.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Características .....</b><br>Features                                           | 802.11 b/g/n WiFi module                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Solicitante .....</b><br>Applicant                                              | TELIT COMUNICATIONS<br>Via Stazione di Prosecco 5/B<br>34010 Sgonico, Trieste-Italy                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Método de ensayo solicitado, norma.....:</b><br>Test method requested, standard | USA FCC Part 15.247 10-1-15 Edition: Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz.<br>USA FCC Part 15.209 10-1-15 Edition: Radiated emission limits; general requirements.<br>CANADA RSS-247 Issue 1 (May 2015).<br>CANADA RSS-Gen Issue 4 (November 2014).<br>ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.<br>Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 558074 D01 DTS Meas Guidance v04 dated 05/04/2017. |
| <b>Resultado .....</b><br>Summary                                                  | IN COMPLIANCE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

|                                                                                                 |                              |
|-------------------------------------------------------------------------------------------------|------------------------------|
| <b>Aprobado por (nombre / cargo y firma) .....</b><br>Approved by (name / position & signature) | A. Llamas<br>RF Lab. Manager |
| <b>Fecha de realización .....</b><br>Date of issue                                              | 2017-07-05                   |
| <b>Formato de informe No. ....</b><br>Report template No                                        | FDT08_19                     |

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## Competences and guarantees

DEKRA Testing and Certification 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 laboratory with a measurement facility in compliance with the requirements of Section 2.948 of the FCC rules and has been added to the list of facilities whose measurements data will be accepted in conjunction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Registration Number: 720267.

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

In order to assure the traceability to other national and international laboratories, DEKRA Testing and Certification has a calibration and maintenance program for its measurement equipment.

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 at the time of performance of the test.

DEKRA Testing and Certification is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

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

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## General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
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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 and the Accreditation Bodies.

## Uncertainty

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

## 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 |
|------------|-------------|-----------|--------------|-------------------|
| 51982/001  | WiFi module | WE866A1-P | 163490000001 | 2017-03-02        |
| 40081/003  | Cradle      | ---       | 113990003417 | 2013-07-13        |
| 51982/005  | Antenna     | ---       | ---          | 2017-03-02        |

1. Sample S/01 has undergone following test(s).

All radiated tests indicated in appendix A.

Sample S/01 is composed of the following elements:

| Control N° | Description | Model     | Serial N°    | Date of reception |
|------------|-------------|-----------|--------------|-------------------|
| 51982/001  | WiFi module | WE866A1-P | 163490000001 | 2017-03-02        |
| 40081/003  | Cradle      | ---       | 113990003417 | 2013-07-13        |

1. Sample S/01 has undergone following test(s).

All conducted tests indicated in appendix A.

## Test sample description

The test sample consists of a WIFI module.

## Identification of the client

TELIT COMUNICATIONS

Via Stazione di Prosecco 5/B

34010 Sgonico, Trieste-Italy

## Testing period

The performed test started on 2017-03-06 and finished on 2017-04-18.

The tests have been performed at DEKRA Testing and Certification.

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

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

|                                      |                                                                                             |
|--------------------------------------|---------------------------------------------------------------------------------------------|
| <b>Temperature</b>                   | Min. = 15 °C<br>Max. = 35 °C                                                                |
| <b>Relative humidity</b>             | Min. = 20 %<br>Max. = 75 %                                                                  |
| <b>Air pressure</b>                  | Min. = 860 mbar<br>Max. = 1060 mbar                                                         |
| <b>Shielding effectiveness</b>       | > 100 dB                                                                                    |
| <b>Electric insulation</b>           | > 10 kΩ                                                                                     |
| <b>Reference resistance to earth</b> | < 1 Ω                                                                                       |
| <b>Normal site attenuation (NSA)</b> | < ±4 dB at 10 m distance between item under test and receiver antenna, (30 MHz to 1000 MHz) |
| <b>Field homogeneity</b>             | More than 75% of illuminated surface is between 0 and 6 dB (26 MHz to 1000 MHz).            |

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

|                                      |                                     |
|--------------------------------------|-------------------------------------|
| <b>Temperature</b>                   | Min. = 15 °C<br>Max. = 35 °C        |
| <b>Relative humidity</b>             | Min. = 20 %<br>Max. = 75 %          |
| <b>Air pressure</b>                  | Min. = 860 mbar<br>Max. = 1060 mbar |
| <b>Shielding effectiveness</b>       | > 100 dB                            |
| <b>Electric insulation</b>           | > 10 kΩ                             |
| <b>Reference resistance to earth</b> | < 1 Ω                               |

## Remarks and comments

1; The tests have been performed by the technical personnel: Carolina Postigo, Pedro Parada, Carlos Alberto Contreras and Jose Carlos Luque.

2: Used instrumentation:

### Conducted Measurements

|                                     | Last Cal. date | Cal. due date |
|-------------------------------------|----------------|---------------|
| 1. Spectrum analyser Agilent E4440A | 2015/10        | 2017/10       |
| 2. DC power supply R&S NGPE 40/40   | 2014/11        | 2017/11       |
| 3. Wide power sensor R&S NRP-Z81    | 2017/04        | 2019/04       |

### Radiated Measurements

|     |                                                                  | Last Cal. date | Cal. due date |
|-----|------------------------------------------------------------------|----------------|---------------|
| 1.  | Semianechoic Absorber Lined Chamber ETS FACT3 200STP             | N.A.           | N.A.          |
| 2.  | BiconicalLog antenna ETS LINDGREN 3142E                          | 2015/06        | 2018/06       |
| 3.  | Multi Device Controller EMCO 2090                                | N.A.           | N.A.          |
| 4.  | Double-ridge Guide Horn antenna 1-18 GHz SCHWARZBECK BBHA 9120 D | 2016/11        | 2019/11       |
| 5.  | Broadband Horn antenna 18-40 GHz SCHWARZBECK BBHA 9170           | 2017/03        | 2020/03       |
| 6.  | EMI Test Receiver R&S ESU 40                                     | 2016/03        | 2018/03       |
| 7.  | Spectrum analyser Rohde & Schwarz FSW50                          | 2015/12        | 2017/12       |
| 8.  | RF pre-amplifier 20 MHz-7 GHz PAM-0207                           | 2016/09        | 2017/09       |
| 9.  | RF pre-amplifier 1-18 GHz Bonn Elektronik BLMA 0118-1M           | 2016/02        | 2018/02       |
| 10. | RF pre-amplifier 18-40 GHz BONN ELEKTRONIK BLMA 1840-1M          | 2015/12        | 2017/12       |

## Testing verdicts

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

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

| FCC PART 15 PARAGRAPH / RSS-247                     |                                                        | VERDICT |   |   |    |
|-----------------------------------------------------|--------------------------------------------------------|---------|---|---|----|
|                                                     |                                                        | NA      | P | F | NM |
| Section 15.247 Subclause (a) (2) / RSS-247 5.2. (1) | 6 dB Bandwidth                                         | P       |   |   |    |
| Section 15.247 Subclause (b) / RSS-247 5.4. (4)     | Maximum output power and antenna gain                  | P       |   |   |    |
| Section 15.247 Subclause (d) / RSS-247 5.5 ....     | Emission limitations conducted (Transmitter)           | P       |   |   |    |
| Section 15.247 Subclause (d) / RSS-247 5.5. ..      | Band-edge conducted emissions compliance (Transmitter) | P       |   |   |    |
| Section 15.247 Subclause (e) / RSS-247 5.2. (2)     | Power spectral density                                 | P       |   |   |    |
| Section 15.247 Subclause (d) / RSS-247 5.5. ...     | Emission limitations radiated (Transmitter)            | P       |   |   |    |

## Appendix A – Test result “WiFi 2.4 GHz (802.11b/g/n20)”

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## TEST CONDITIONS

Power supply (V):

$$V_{\text{nominal}} = 3.8 \text{ Vdc}$$

Type of power supply = DC voltage from Battery, external power supply or AC/DC adapter.

Declared Gain for antenna (maximum) = +2.2 dBi

TEST FREQUENCIES:

For WiFi 802.11b/g/n20:

Lowest channel (1): 2412 MHz

Middle channel (6): 2437 MHz

Highest channel (11): 2462 MHz

The test set-up was made in accordance to the general provisions of FCC DTS Measurement 558074 D01 DTS Meas Guidance v04 dated 05/04/2017.

The conducted RF output power was adjusted according to the client's supplied adjustment values (see following table), which were selected in the test software:

| Mode    | BW (MHz) | Channel / Freq. | Data Rate | Power adjustment |
|---------|----------|-----------------|-----------|------------------|
| 802.11b | 20       | 1 / 2412        | 1 Mbps    | 17.5             |
|         |          | 6 / 2437        |           | 17.5             |
|         |          | 11 / 2462       |           | 17.5             |
| 802.11g | 20       | 1 / 2412        | 6 Mbps    | 17.5             |
|         |          | 6 / 2437        |           | 17.5             |
|         |          | 11 / 2462       |           | 17.5             |
| 802.11n | 20       | 1 / 2412        | 6.5 Mbps  | 17.5             |
|         |          | 6 / 2437        |           | 17.5             |
|         |          | 11 / 2462       |           | 17.5             |

The field strength at the band edges was evaluated for each mode for the channel under test.

During transmitter test the EUT was being controlled by the SW tool to operate in a continuous transmit mode on the test channel as required and in each of the different modulation modes.

The data rates of 1Mb/s for 802.11b, 6Mb/s for 802.11g, MSC0 for 802.11n20 were selected based on preliminary testing that identified those rates corresponding to the worst cases for output power and band edge levels at restricted bands.

## CONDUCTED MEASUREMENTS

The equipment under test was set up in a shielded room and it is directly connected to the spectrum analyzer.



## RADIATED MEASUREMENTS

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m for the frequency range 30 MHz-1000 MHz (30 MHz-1000 MHz Bilog antenna) and at a distance of 1m for the frequency range 1 GHz-25 GHz (1 GHz-18 GHz Double ridge horn antenna and 18 GHz-40 GHz horn antenna).

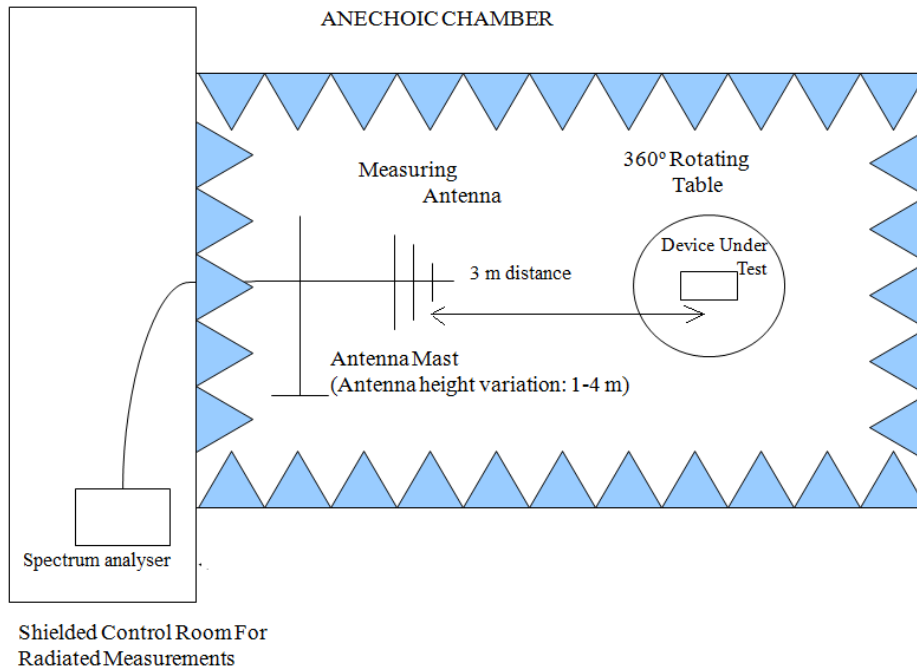
For radiated emissions in the range 1 GHz-25 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

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.

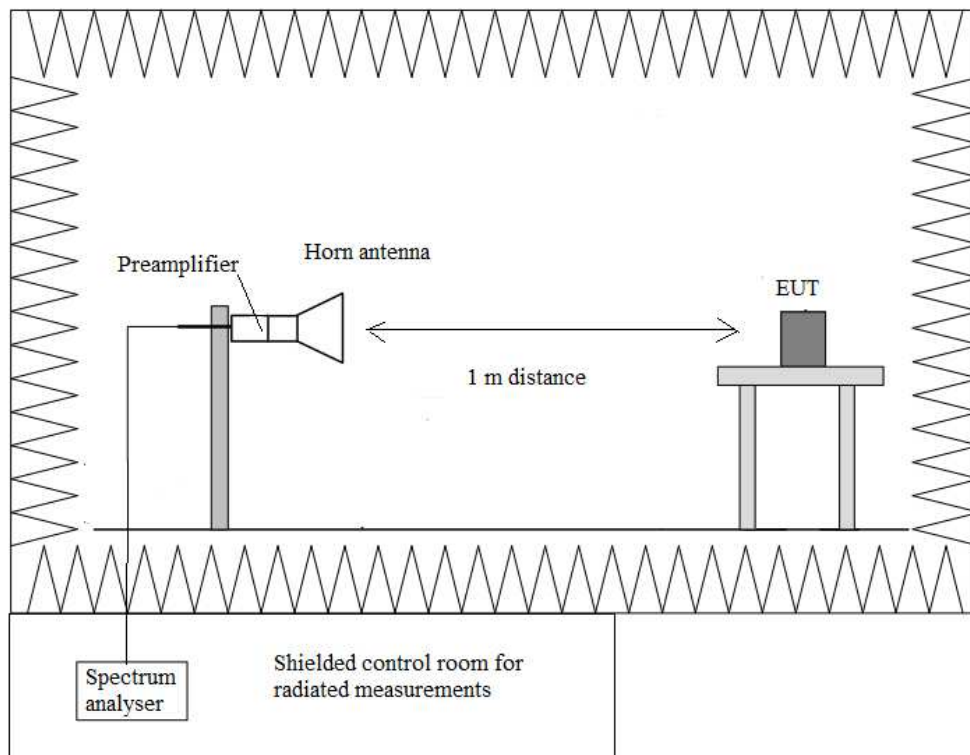
It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

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

## Radiated measurements setup $f < 1$ GHz



## Radiated measurements setup $f > 1$ GHz



## Occupied Bandwidth

### RESULTS

(see next plots)

#### Mode B

|                               | Lowest frequency<br>2412 MHz | Middle frequency<br>2437 MHz | Highest frequency<br>2462 MHz |
|-------------------------------|------------------------------|------------------------------|-------------------------------|
| 99% bandwidth (MHz)           | 13.992                       | 14.042                       | 14.072                        |
| -26 dBc bandwidth (MHz)       | 17.368                       | 17.746                       | 17.752                        |
| Measurement uncertainty (kHz) | <±50                         |                              |                               |

#### Mode G

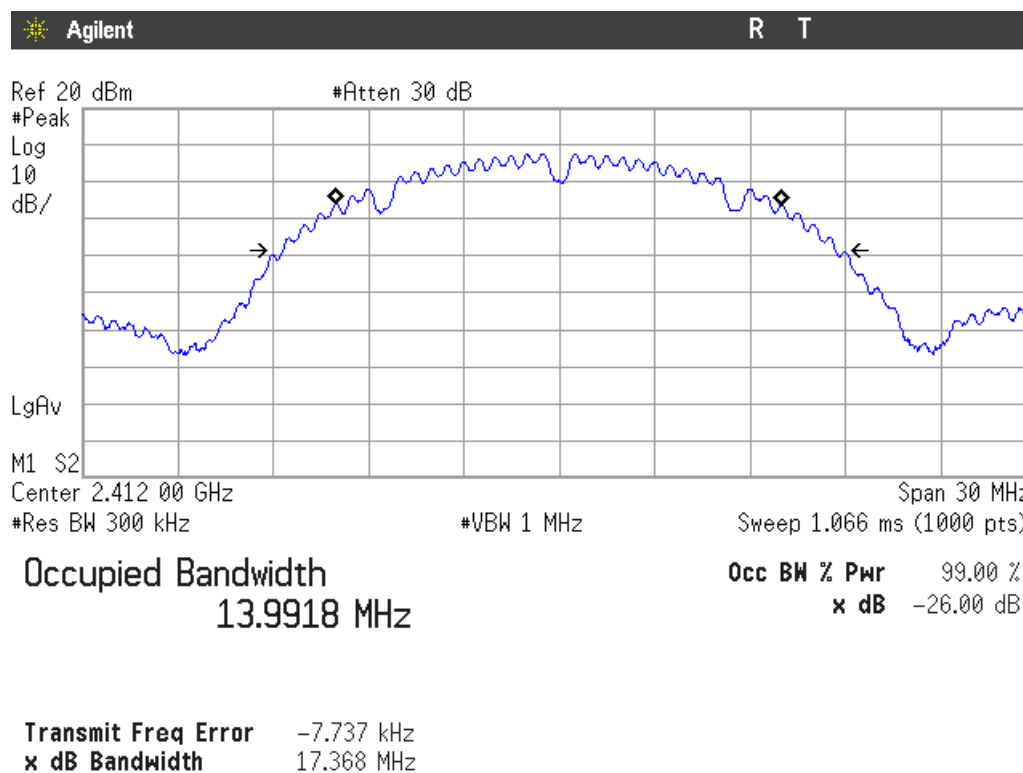
|                               | Lowest frequency<br>2412 MHz | Middle frequency<br>2437 MHz | Highest frequency<br>2462 MHz |
|-------------------------------|------------------------------|------------------------------|-------------------------------|
| 99% bandwidth (MHz)           | 16.712                       | 18.043                       | 16.723                        |
| -26 dBc bandwidth (MHz)       | 26.955                       | 33.769                       | 26.877                        |
| Measurement uncertainty (kHz) | <±50                         |                              |                               |

#### Mode N20

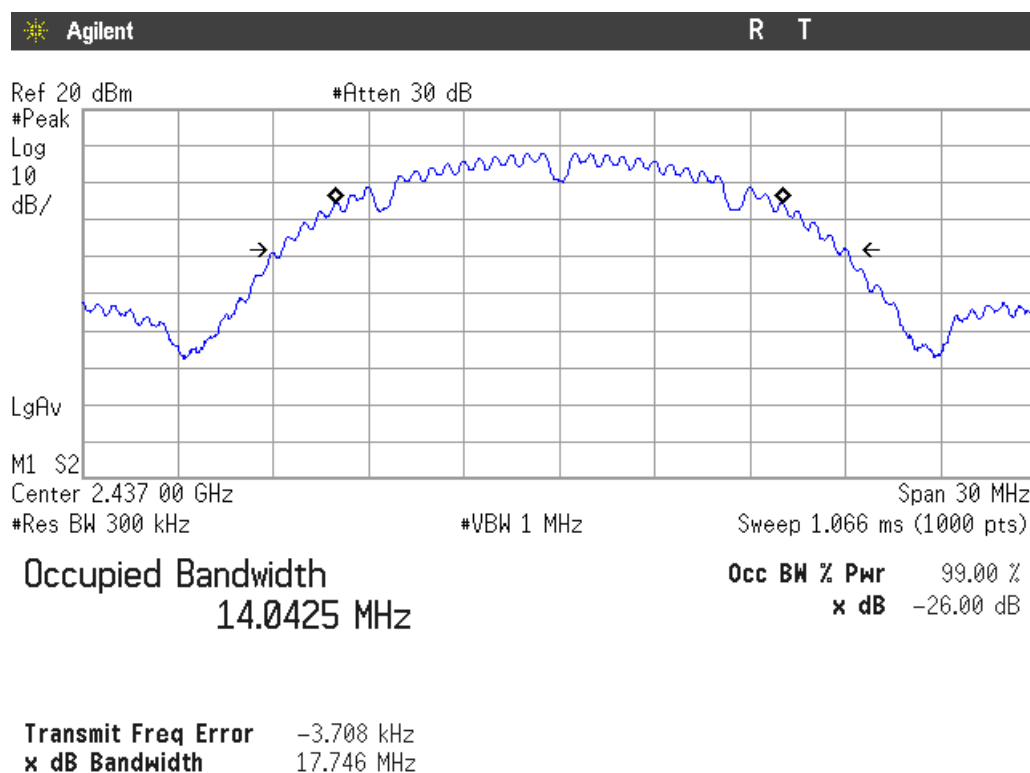
|                               | Lowest frequency<br>2412 MHz | Middle frequency<br>2437 MHz | Highest frequency<br>2462 MHz |
|-------------------------------|------------------------------|------------------------------|-------------------------------|
| 99% bandwidth (MHz)           | 17.702                       | 18.572                       | 17.775                        |
| -26 dBc bandwidth (MHz)       | 26.484                       | 31.723                       | 27.844                        |
| Measurement uncertainty (kHz) | <±50                         |                              |                               |

## Mode B

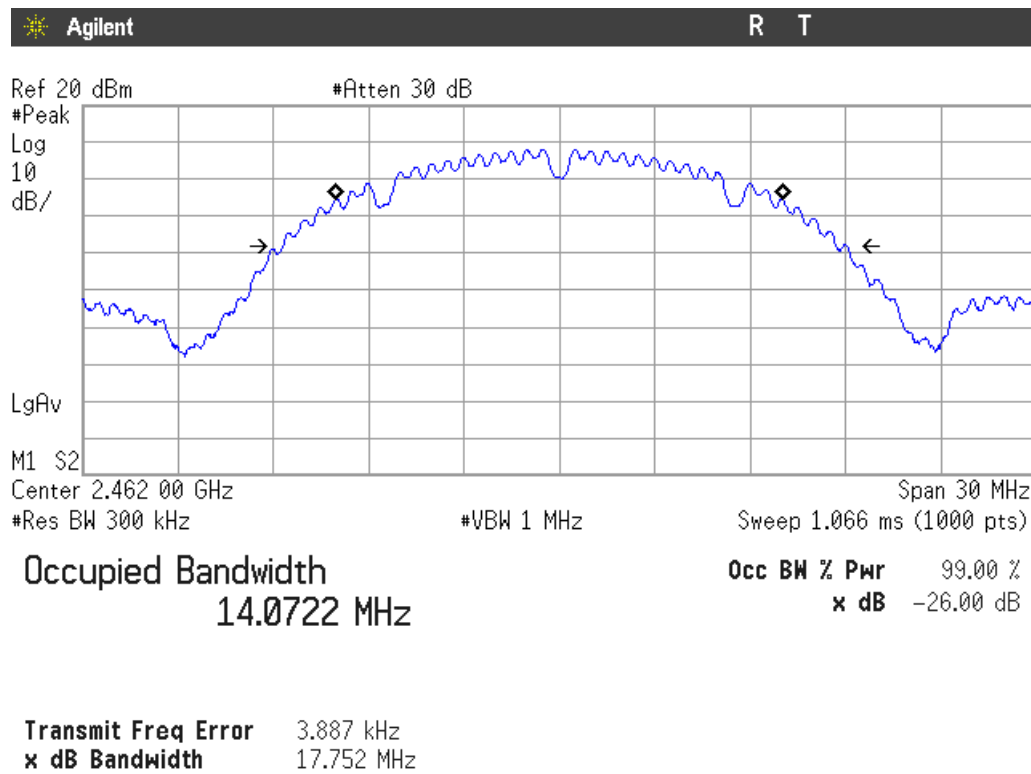
### Lowest Channel



### Middle Channel

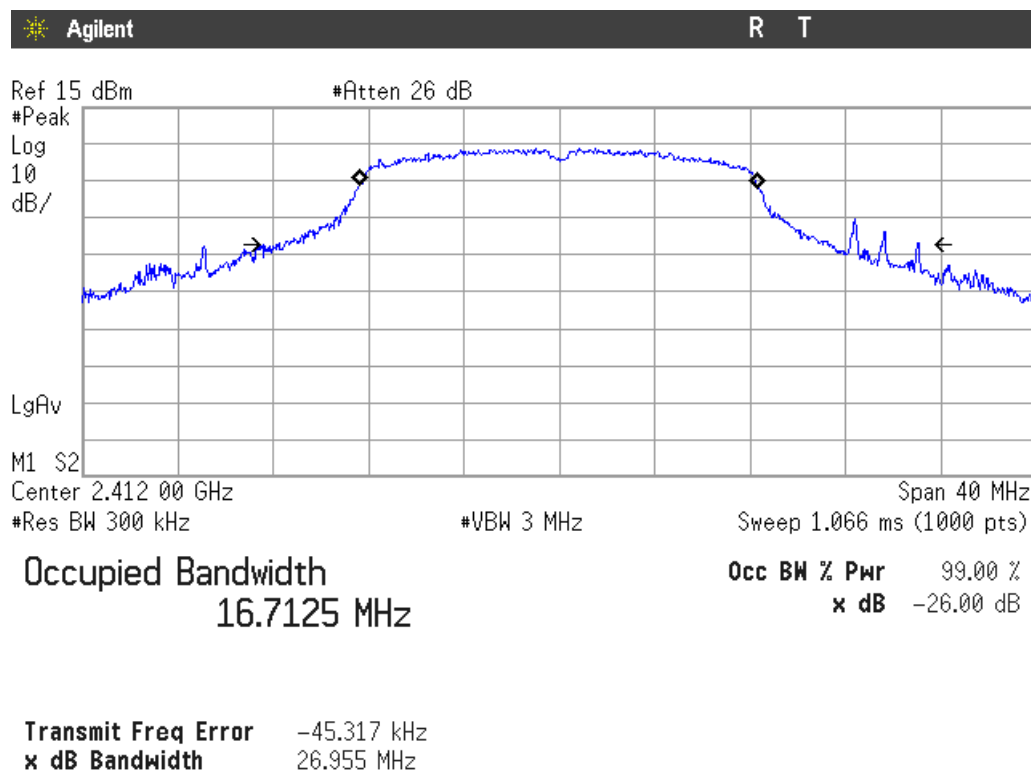


## Highest channel

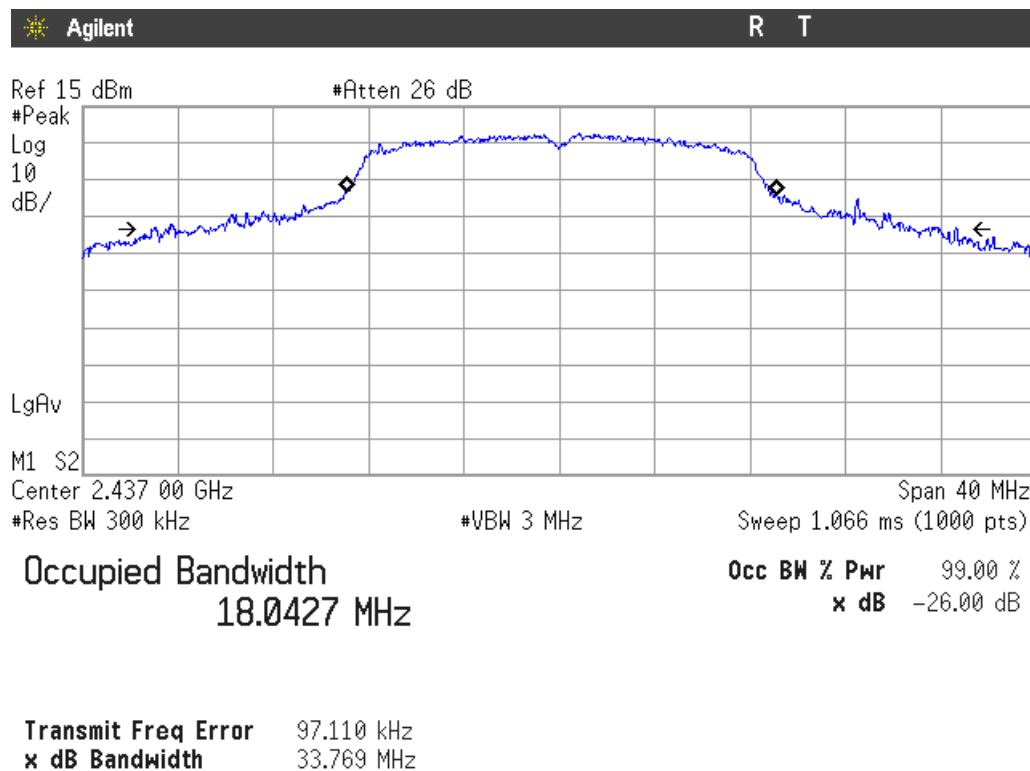


## Mode G

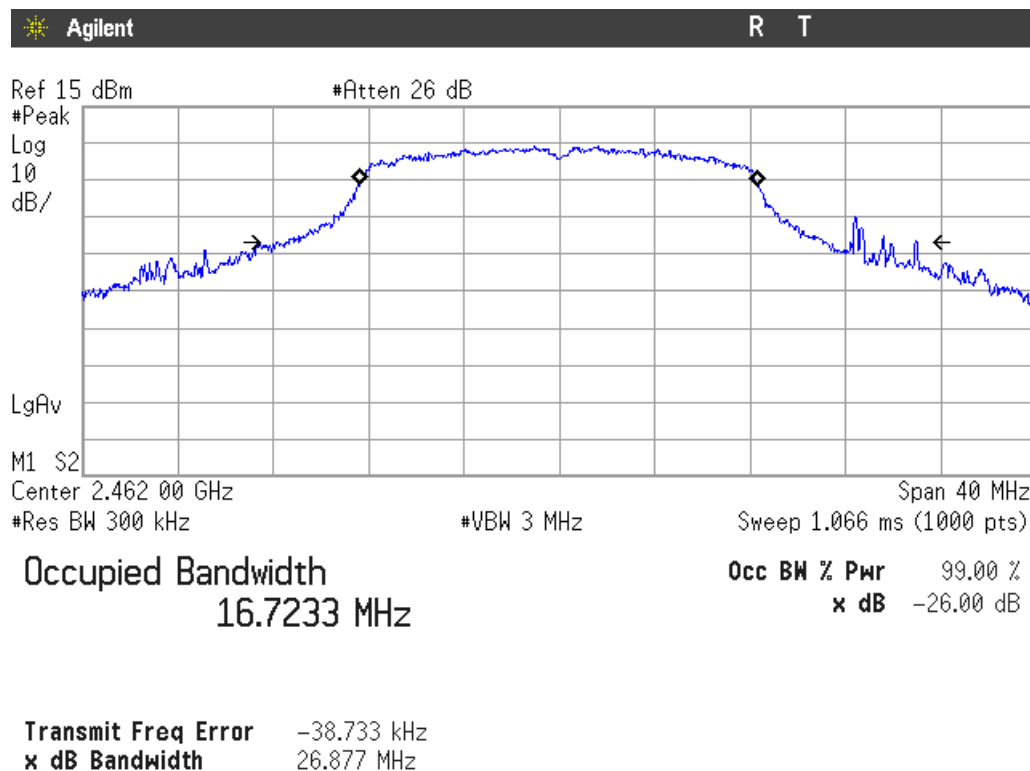
### Lowest Channel



## Middle Channel

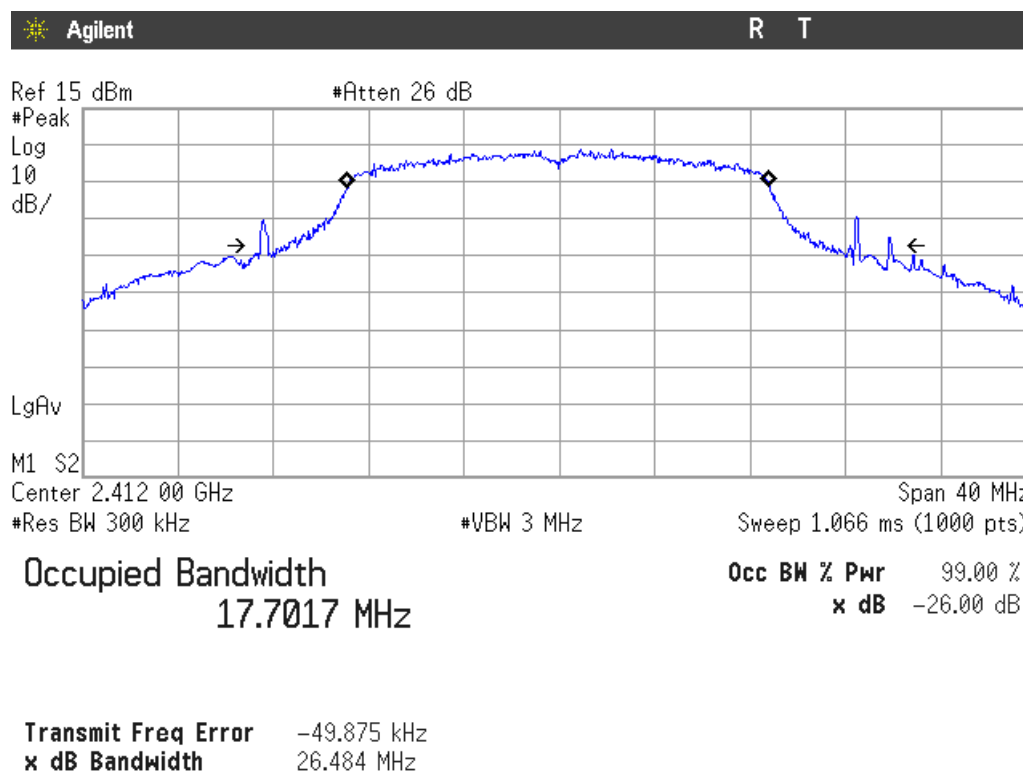


## Highest channel

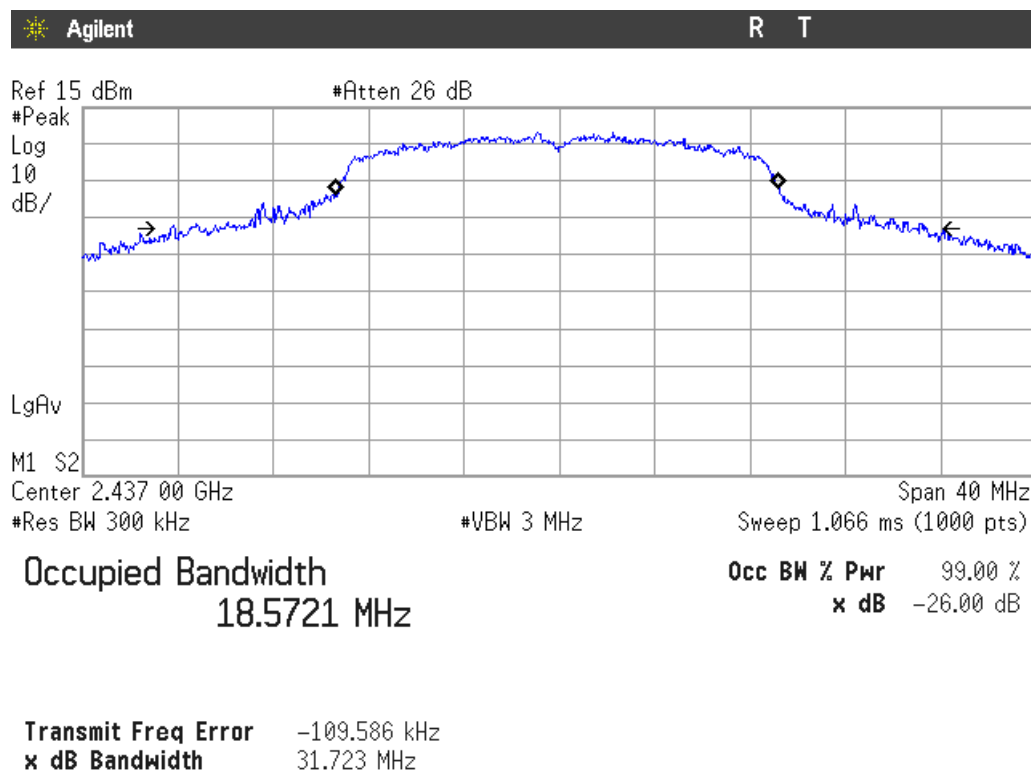


## Mode N20

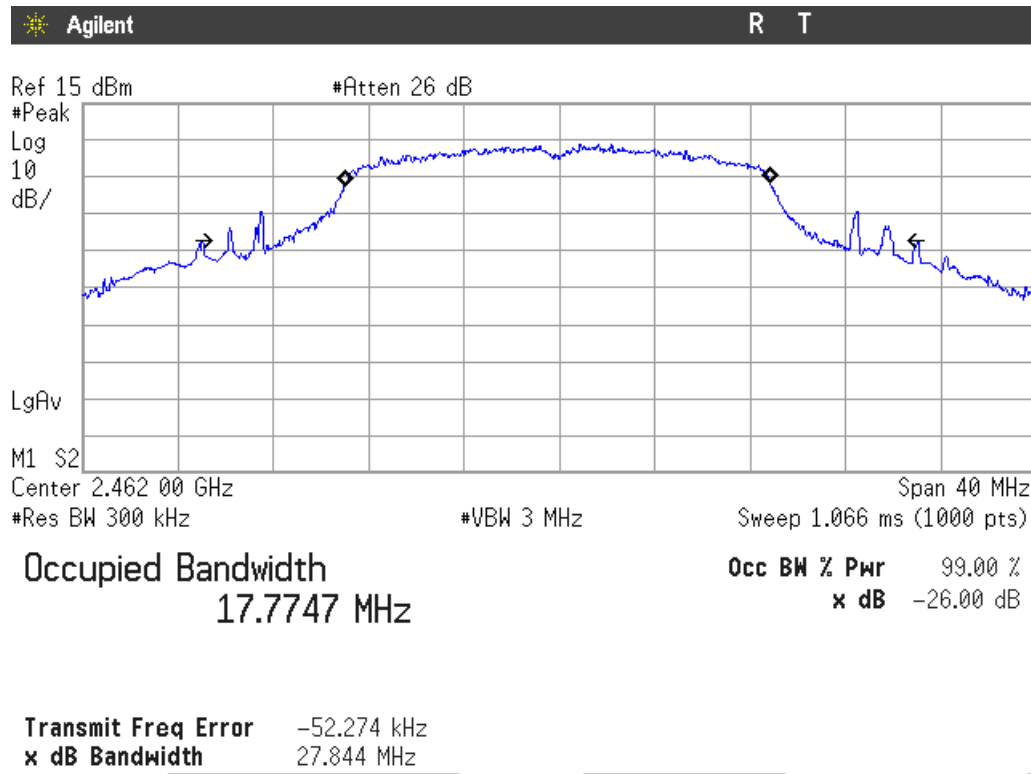
### Lowest Channel



### Middle Channel



## Highest channel



## Section 15.247 Subclause (a) (2) / RSS-247 5.2. (1). 6 dB Bandwidth

### SPECIFICATION

The minimum 6 dB bandwidth shall be at least 500 kHz.

### RESULTS

6 dB Bandwidth (see next plots).

#### Mode B

|                               | Lowest frequency<br>2412 MHz | Middle frequency<br>2437 MHz | Highest frequency<br>2462 MHz |
|-------------------------------|------------------------------|------------------------------|-------------------------------|
| 6 dB Spectrum bandwidth (MHz) | 10.030                       | 10.050                       | 10.030                        |
| Measurement uncertainty (kHz) | <±65.0                       |                              |                               |

#### Mode G

|                               | Lowest frequency<br>2412 MHz | Middle frequency<br>2437 MHz | Highest frequency<br>2462 MHz |
|-------------------------------|------------------------------|------------------------------|-------------------------------|
| 6 dB Spectrum bandwidth (MHz) | 15.140                       | 15.140                       | 15.090                        |
| Measurement uncertainty (kHz) | <±65.0                       |                              |                               |

#### Mode N20

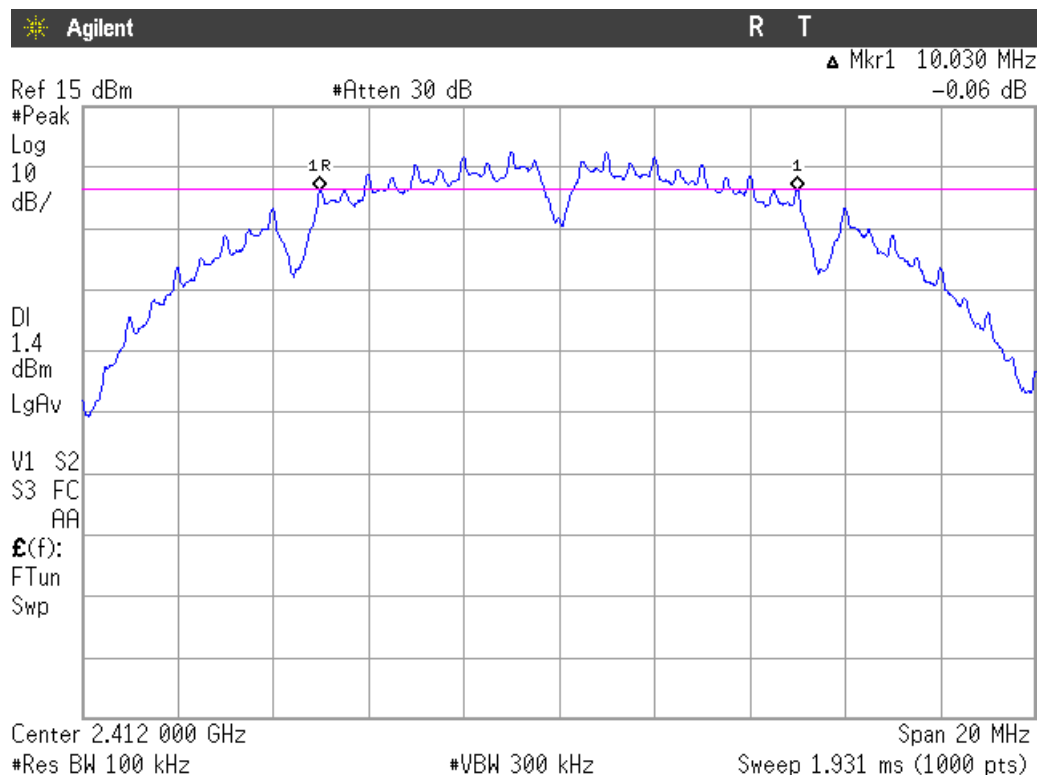
|                               | Lowest frequency<br>2412 MHz | Middle frequency<br>2437 MHz | Highest frequency<br>2462 MHz |
|-------------------------------|------------------------------|------------------------------|-------------------------------|
| 6 dB Spectrum bandwidth (MHz) | 15.140                       | 15.140                       | 15.170                        |
| Measurement uncertainty (kHz) | <±65.0                       |                              |                               |

Verdict: PASS

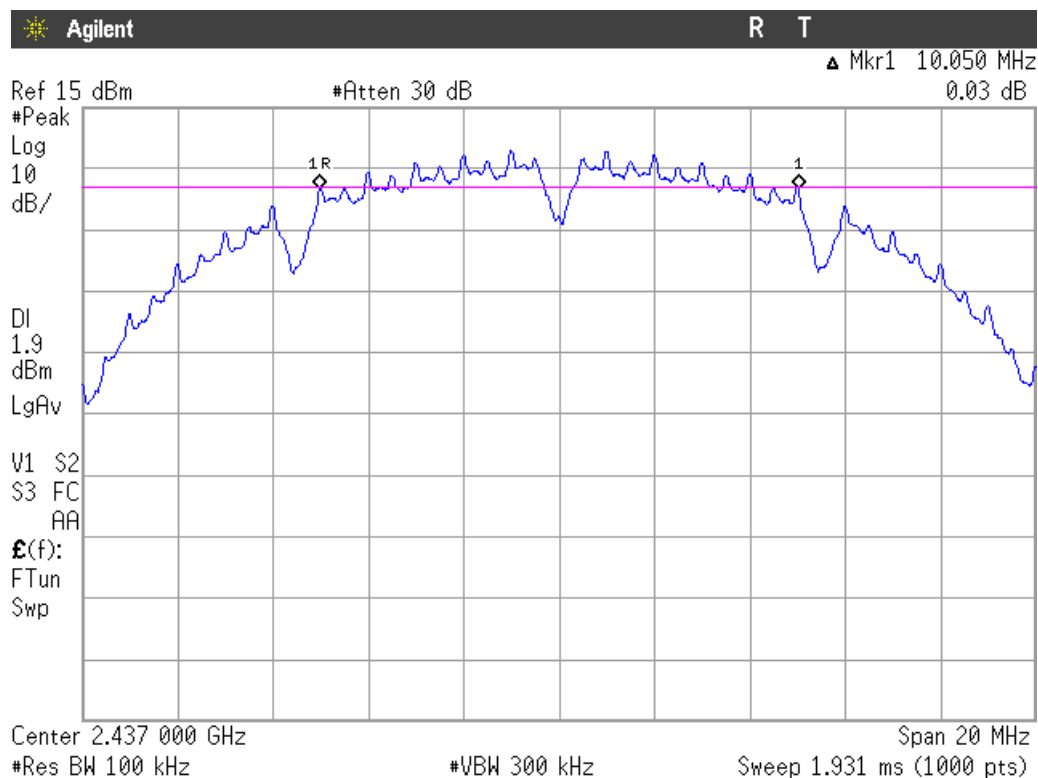
6 dB BANDWIDTH.

## Mode B

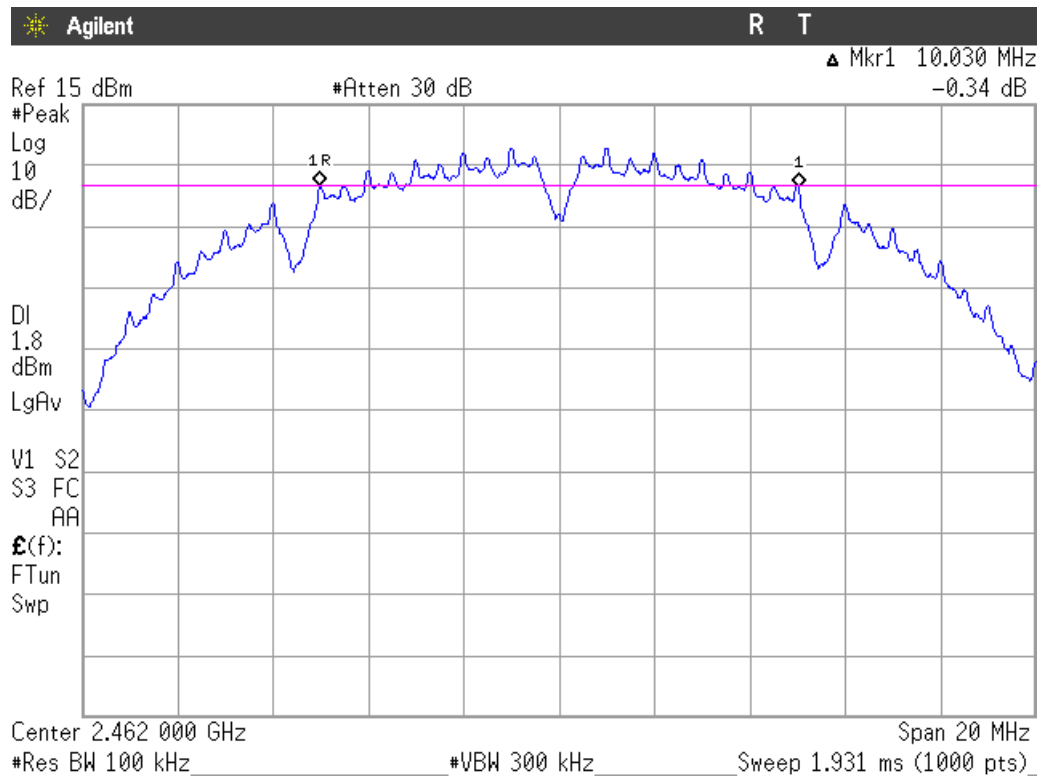
### Lowest Channel



### Middle Channel

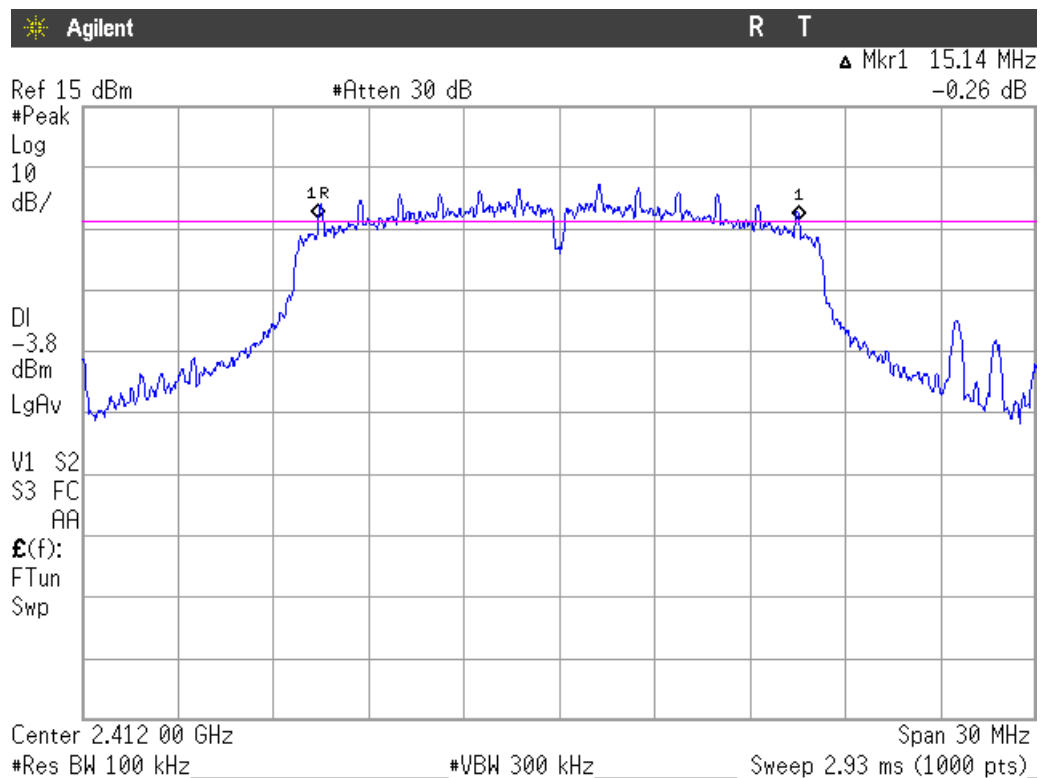


## Highest channel

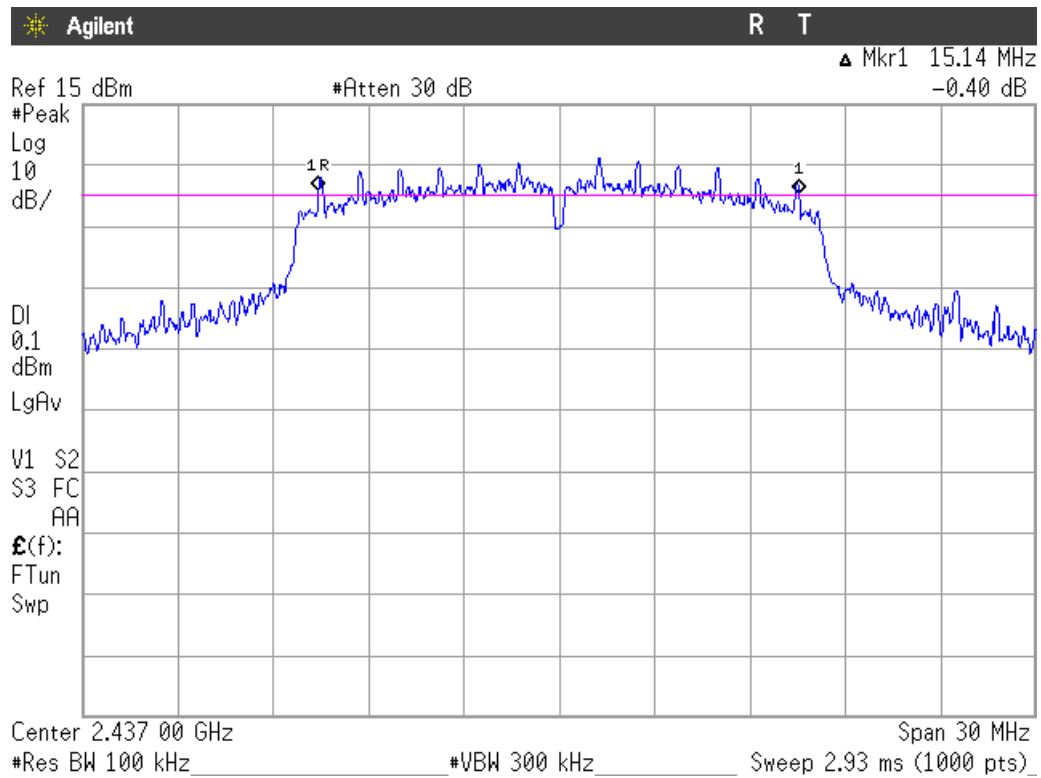


## Mode G

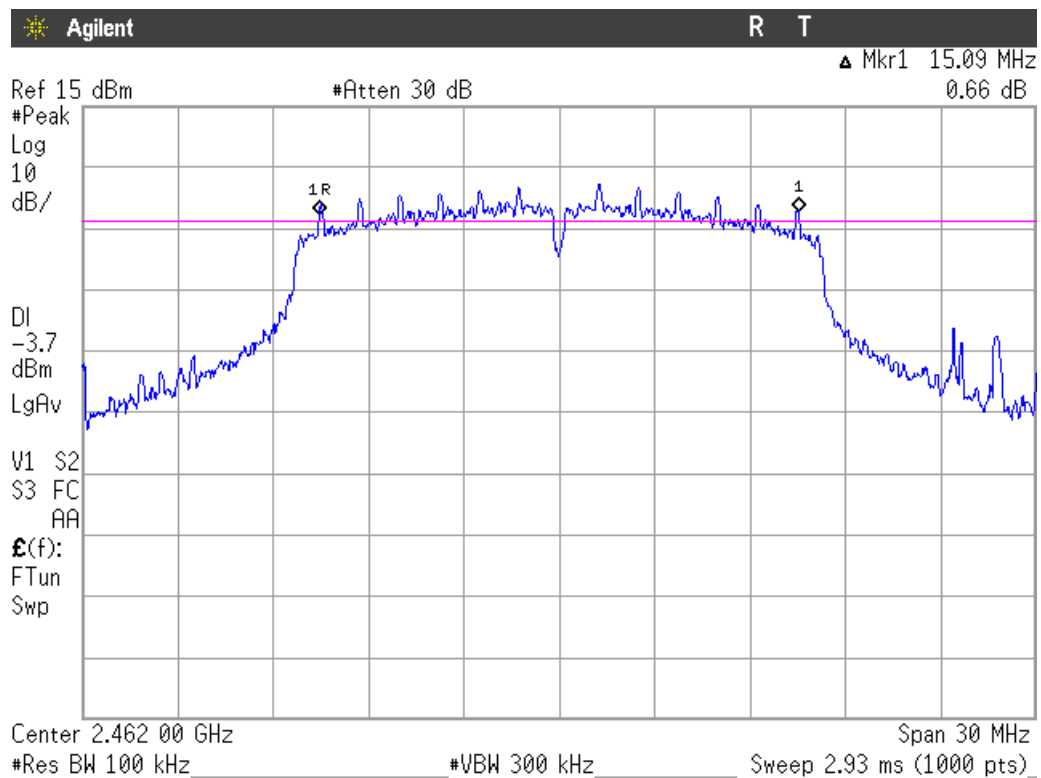
### Lowest Channel



## Middle Channel

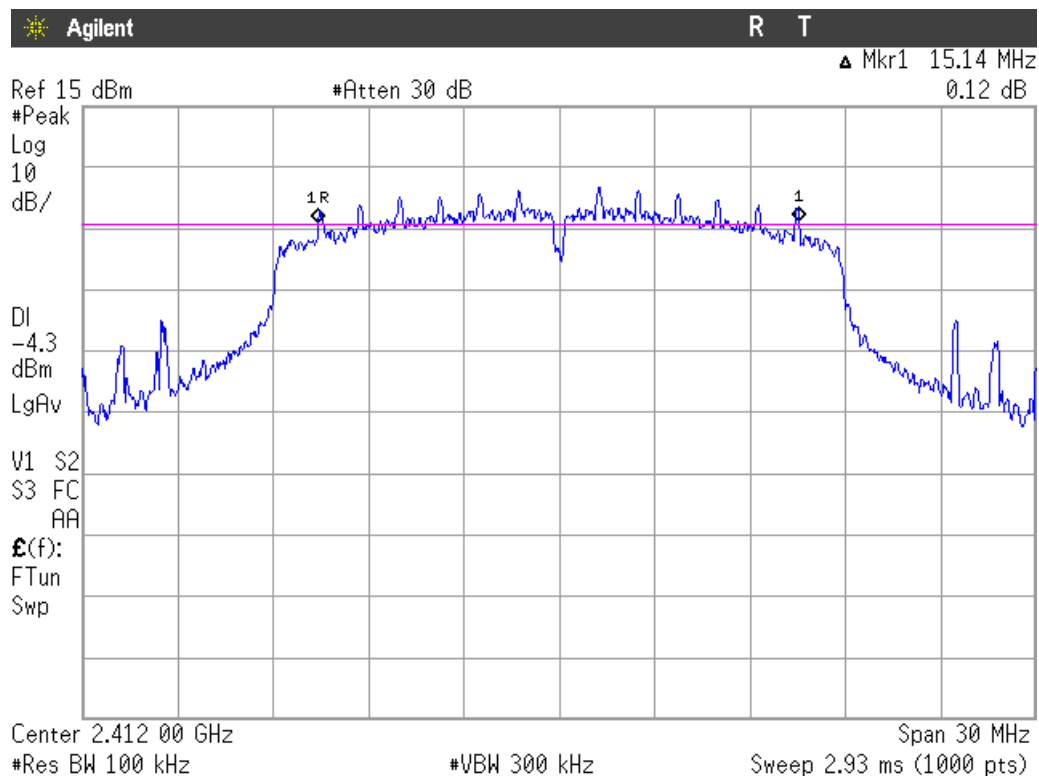


## Highest channel

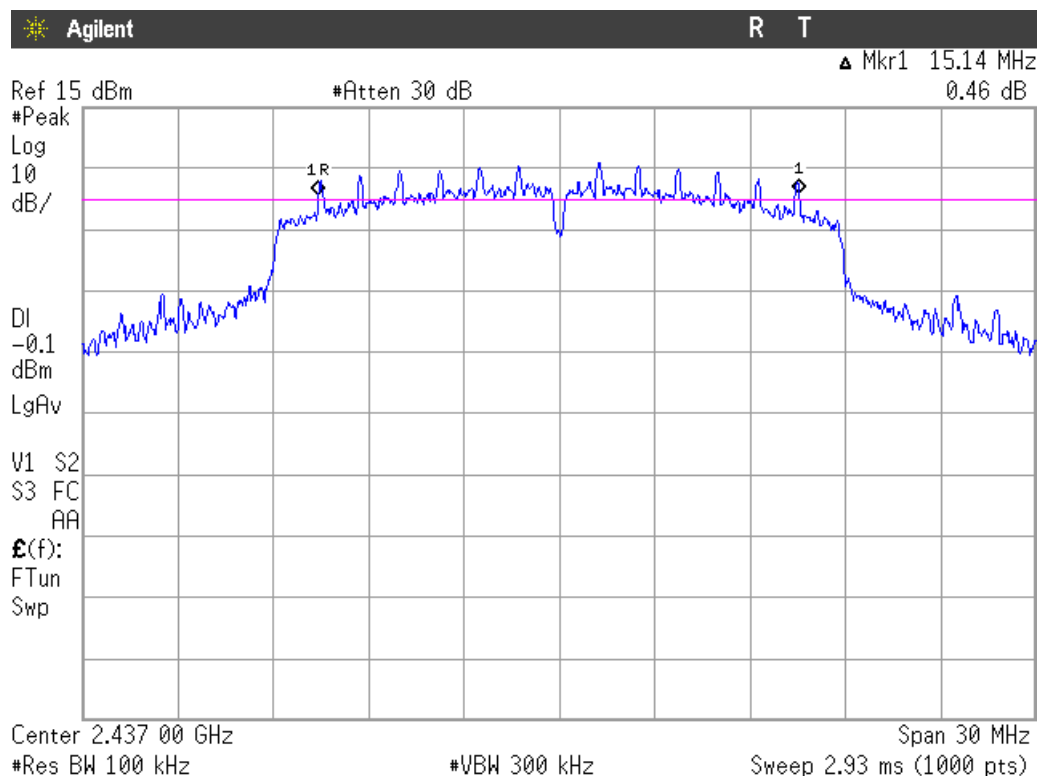


## Mode N20

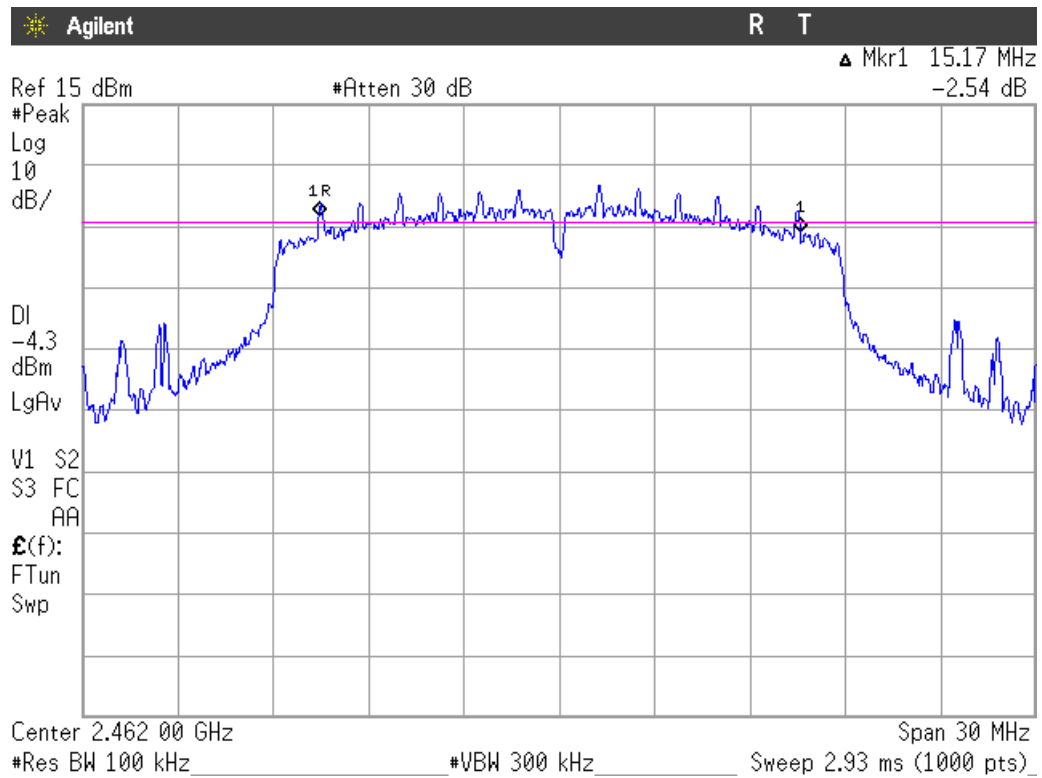
### Lowest Channel



### Middle Channel



## Highest channel



## Section 15.247 Subclause (b) / RSS-247 5.4. (4). Maximum output power and antenna gain

### SPECIFICATION

For systems using digital modulation in the 2400-2483.5 MHz band: 1 watt (30 dBm).  
The e.i.r.p. shall not exceed 4 W (36 dBm) (Canada).

### RESULTS

For b mode, the maximum conducted (average) output power was measured using the method according to point 9.2.2.2 of Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247 558074 D01 DTS Meas Guidance v04 dated 05/04/2017.

For g and n20 modes, the maximum conducted (peak) output power was measured using the method according to point 9.1.3 of Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247 558074 D01 DTS Meas Guidance v04 dated 05/04/2017.

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

MAXIMUM OUTPUT POWER. See next plots.

Maximum declared antenna gain: +2.2 dBi.

Mode B: Conducted (average) output power (See next plots).

|                               | Lowest frequency<br>2412 MHz | Middle frequency<br>2437 MHz | Highest frequency<br>2462 MHz |
|-------------------------------|------------------------------|------------------------------|-------------------------------|
| Maximum conducted power (dBm) | 13.65                        | 14.18                        | 14.34                         |
| Maximum EIRP power (dBm)      | 15.85                        | 16.38                        | 16.54                         |
| Measurement uncertainty (dB)  | <±0.78                       |                              |                               |

Mode G: Conducted (peak) output power.

|                               | Lowest frequency<br>2412 MHz | Middle frequency<br>2437 MHz | Highest frequency<br>2462 MHz |
|-------------------------------|------------------------------|------------------------------|-------------------------------|
| Maximum conducted power (dBm) | 19.37                        | 20.20                        | 19.45                         |
| Maximum EIRP power (dBm)      | 21.57                        | 22.40                        | 21.65                         |
| Measurement uncertainty (dB)  | <±0.33                       |                              |                               |

Mode N20: Conducted (peak) output power.

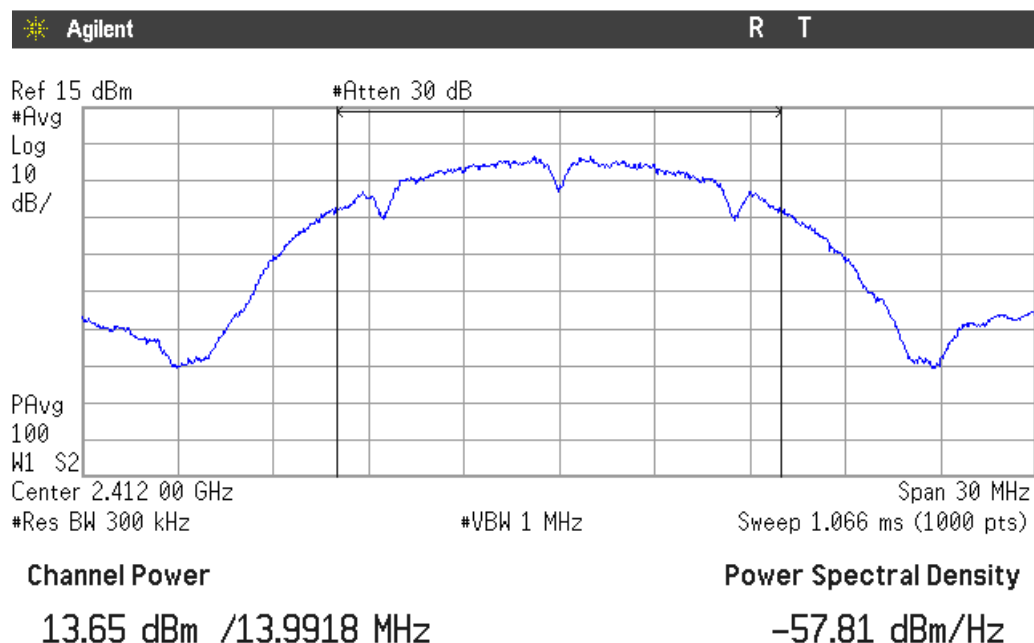
|                               | Lowest frequency<br>2412 MHz | Middle frequency<br>2437 MHz | Highest frequency<br>2462 MHz |
|-------------------------------|------------------------------|------------------------------|-------------------------------|
| Maximum conducted power (dBm) | 19.38                        | 19.82                        | 19.44                         |
| Maximum EIRP power (dBm)      | 21.58                        | 22.02                        | 21.64                         |
| Measurement uncertainty (dB)  | <±0.33                       |                              |                               |

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

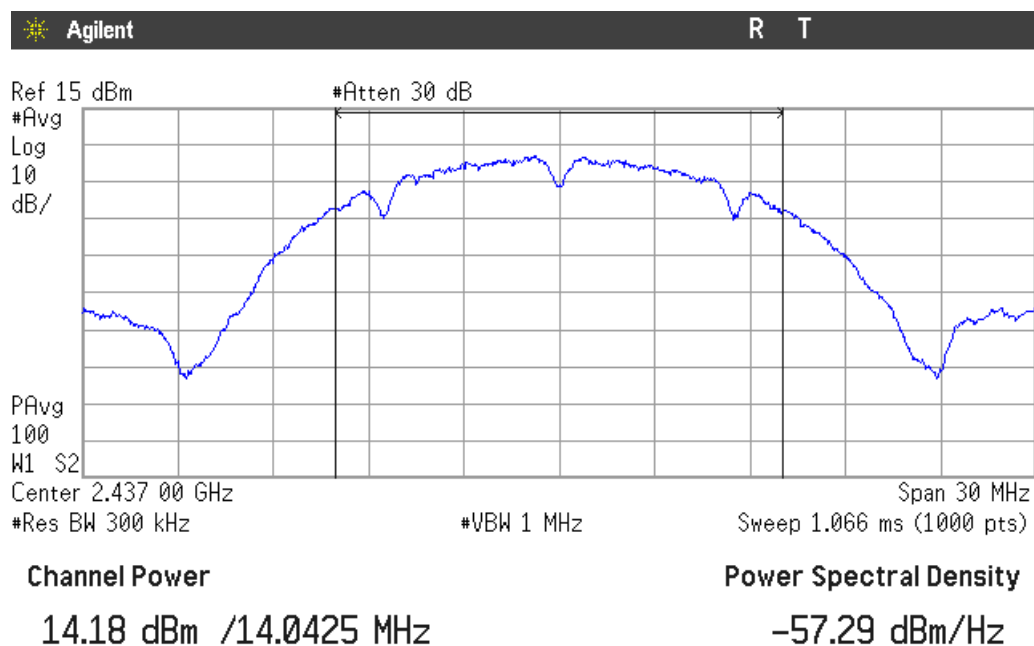
Verdict: PASS

## 1. WiFi 2.4GHz 802.11 b mode

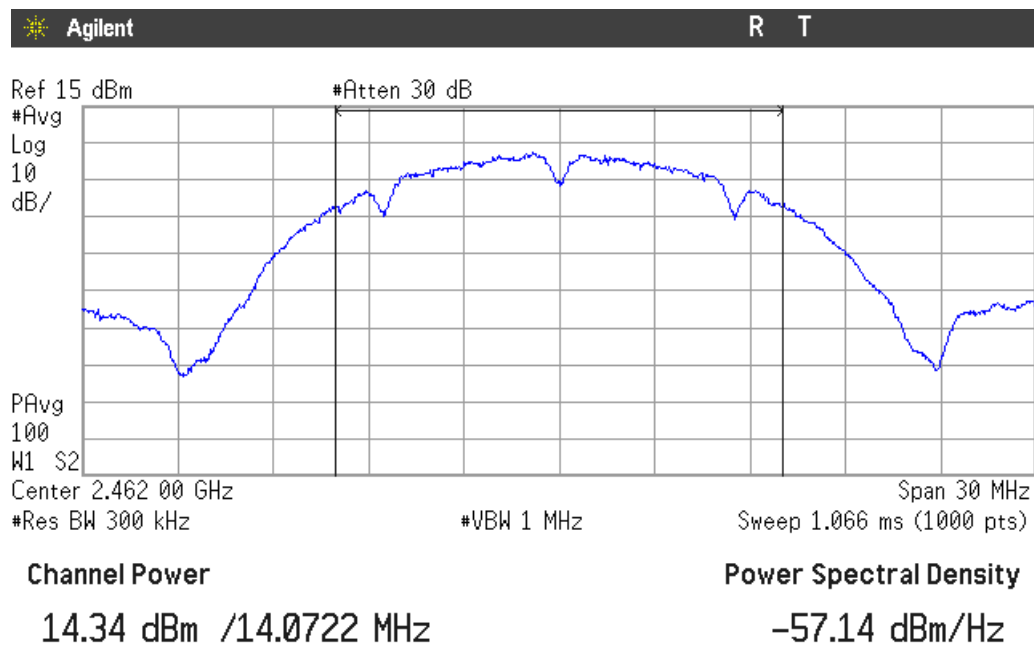
Lowest frequency 2412 MHz.



Middle frequency 2437 MHz.



Highest frequency 2462 MHz.



## Section 15.247 Subclause (d) / RSS-247 5.5. Emission limitations conducted (Transmitter)

### SPECIFICATION

In any 100 kHz bandwidth outside the frequency band in which the digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required shall be 30 dB instead of 20 dB.

### RESULTS:

#### Reference Level Measurement

##### Mode B

|                                      | Lowest frequency<br>2412 MHz | Middle frequency<br>2437 MHz | Highest frequency<br>2462 MHz |
|--------------------------------------|------------------------------|------------------------------|-------------------------------|
| Reference Level Measurement<br>(dBm) | 7.42                         | 7.85                         | 7.80                          |
| Measurement uncertainty (dB)         | <±0.78                       |                              |                               |

##### Mode G

|                                      | Lowest frequency<br>2412 MHz | Middle frequency<br>2437 MHz | Highest frequency<br>2462 MHz |
|--------------------------------------|------------------------------|------------------------------|-------------------------------|
| Reference Level Measurement<br>(dBm) | 2.38                         | 6.14                         | 2.33                          |
| Measurement uncertainty (dB)         | <±0.78                       |                              |                               |

##### Mode N20

|                                      | Lowest frequency<br>2412 MHz | Middle frequency<br>2437 MHz | Highest frequency<br>2462 MHz |
|--------------------------------------|------------------------------|------------------------------|-------------------------------|
| Reference Level Measurement<br>(dBm) | 1.67                         | 5.92                         | 1.73                          |
| Measurement uncertainty (dB)         | <±0.78                       |                              |                               |

## Mode B

Lowest frequency 2412 MHz

| Spurious frequency (GHz) | Level (dBm) | Limit (dBm) | Uncertainty (dB) |
|--------------------------|-------------|-------------|------------------|
| 4.020                    | -41.02      | -22.58      | $<\pm 2.03$ dB   |

Middle frequency 2437 MHz

| Lowest frequency 2412 MHz                      | Limit (dBm) |
|------------------------------------------------|-------------|
| All peaks are more than 20 dB below the limit. | -22.15      |

Highest frequency 2462 MHz

| Lowest frequency 2412 MHz                      | Limit (dBm) |
|------------------------------------------------|-------------|
| All peaks are more than 20 dB below the limit. | -22.20      |

## Mode G

| Lowest frequency 2412 MHz                      | Limit (dBm) |
|------------------------------------------------|-------------|
| All peaks are more than 20 dB below the limit. | -17.62      |

| Middle frequency 2437 MHz                      | Limit (dBm) |
|------------------------------------------------|-------------|
| All peaks are more than 20 dB below the limit. | -13.86      |

| Highest frequency 2462 MHz                     | Limit (dBm) |
|------------------------------------------------|-------------|
| All peaks are more than 20 dB below the limit. | -17.67      |

## Mode N20

| Lowest frequency 2412 MHz                      | Limit (dBm) |
|------------------------------------------------|-------------|
| All peaks are more than 20 dB below the limit. | -18.33      |

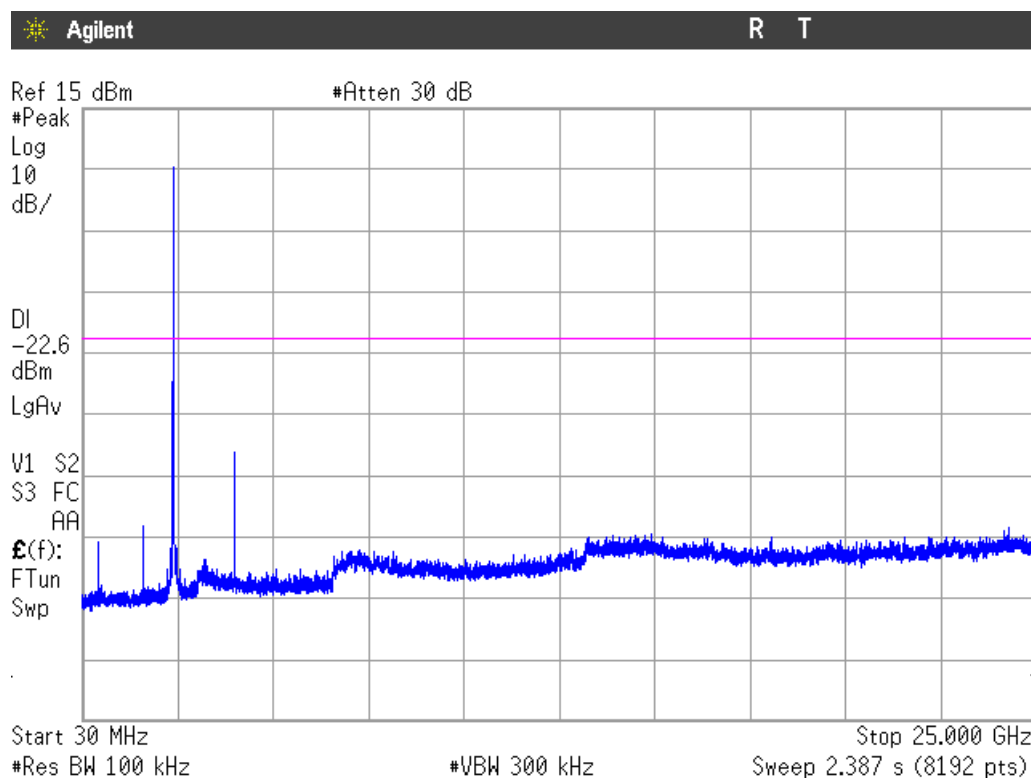
| Middle frequency 2437 MHz                      | Limit (dBm) |
|------------------------------------------------|-------------|
| All peaks are more than 20 dB below the limit. | -14.08      |

| Highest frequency 2462 MHz                     | Limit (dBm) |
|------------------------------------------------|-------------|
| All peaks are more than 20 dB below the limit. | -18.27      |

Verdict: PASS

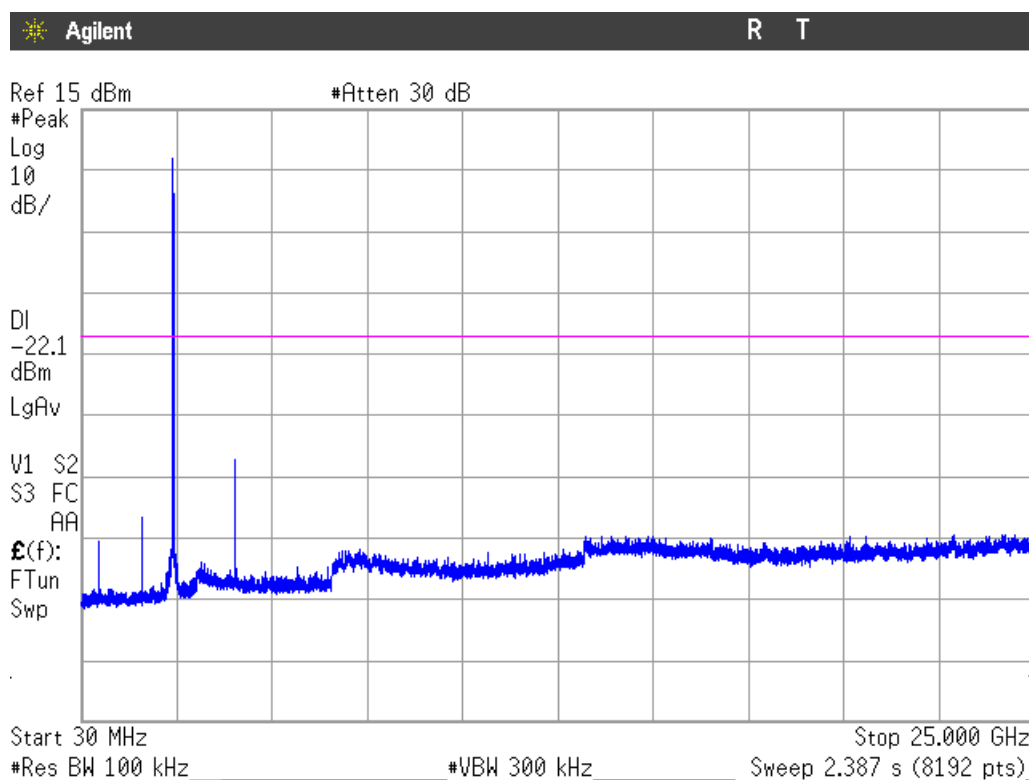
## Mode B

### Lowest Channel



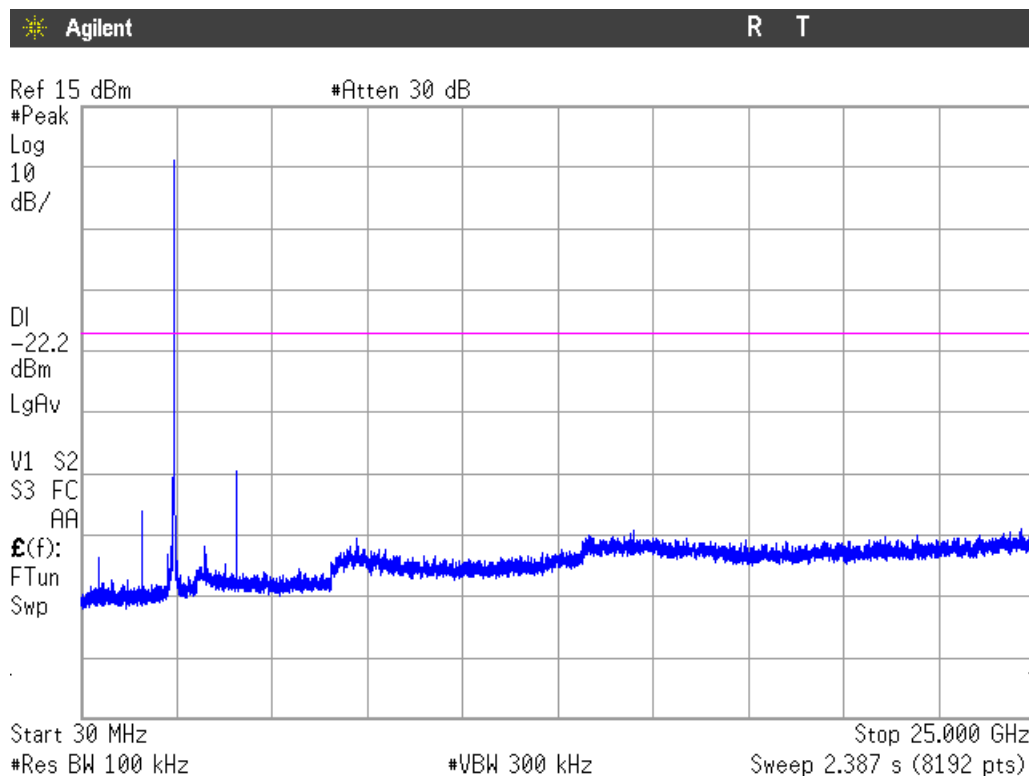
Note: The peak shown in the plot above the limit is the carrier frequency.

### Middle Channel



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

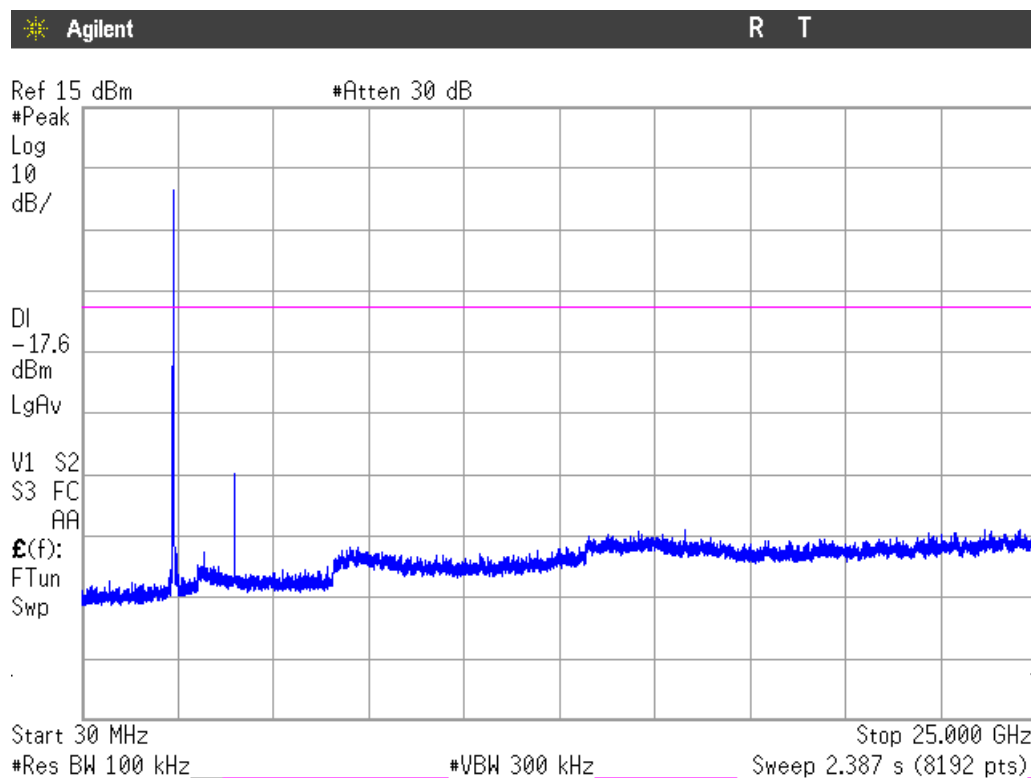
## Highest channel



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

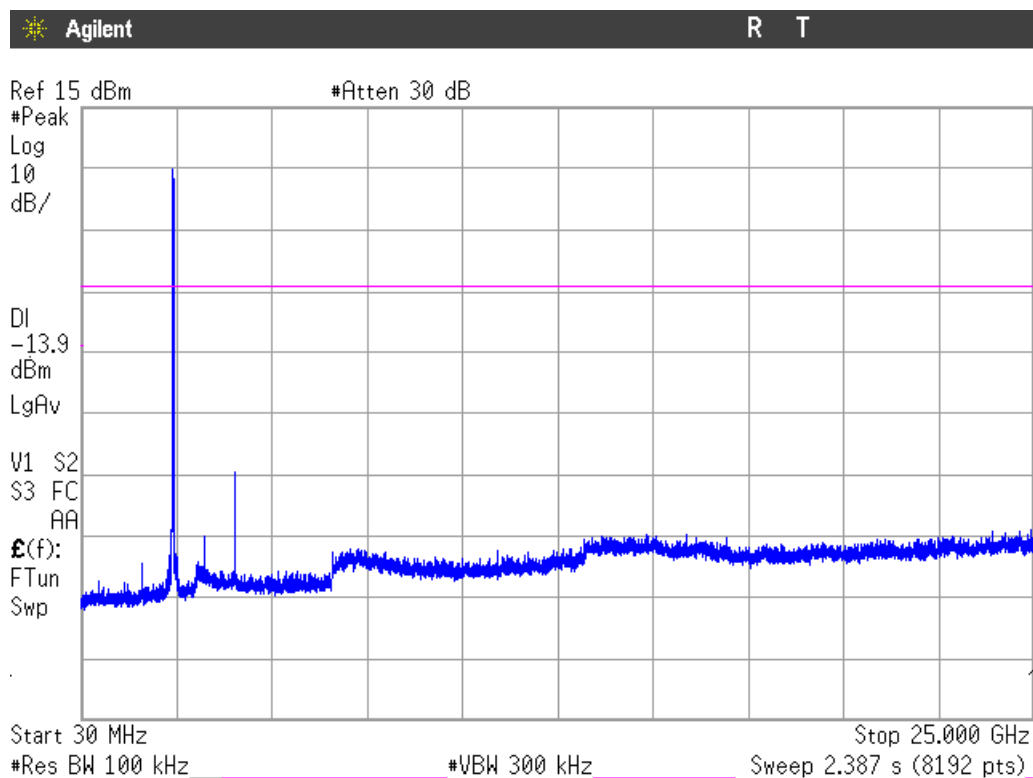
## Mode G

### Lowest Channel



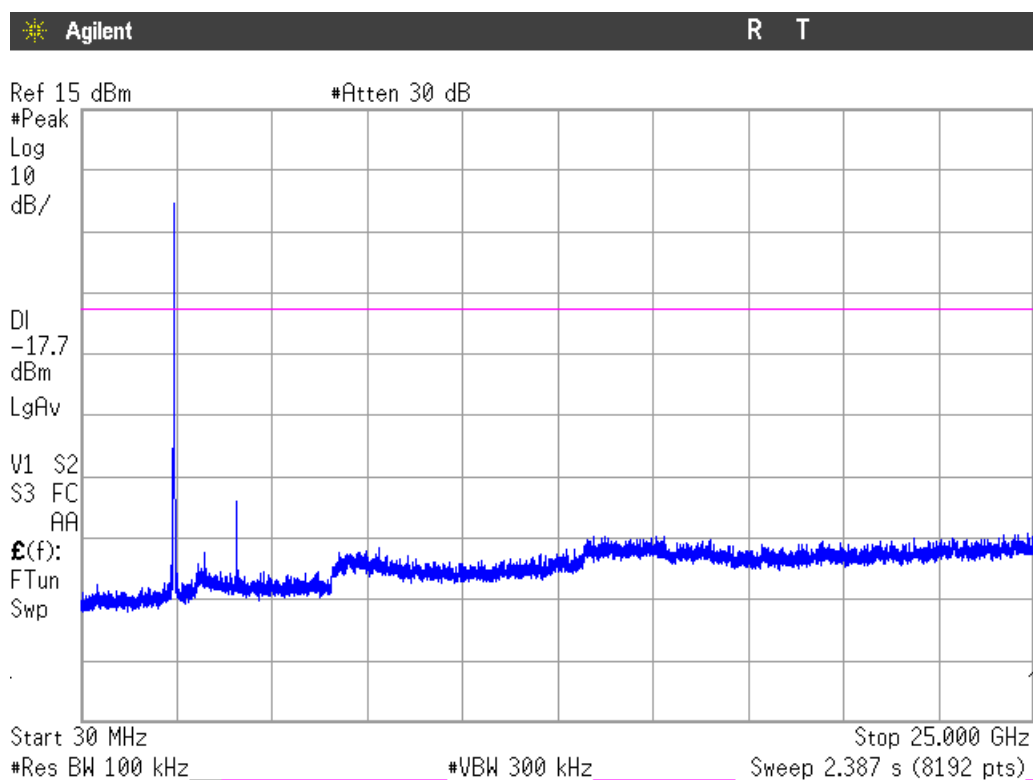
Note: The peak shown in the plot above the limit is the carrier frequency.

## Middle Channel



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

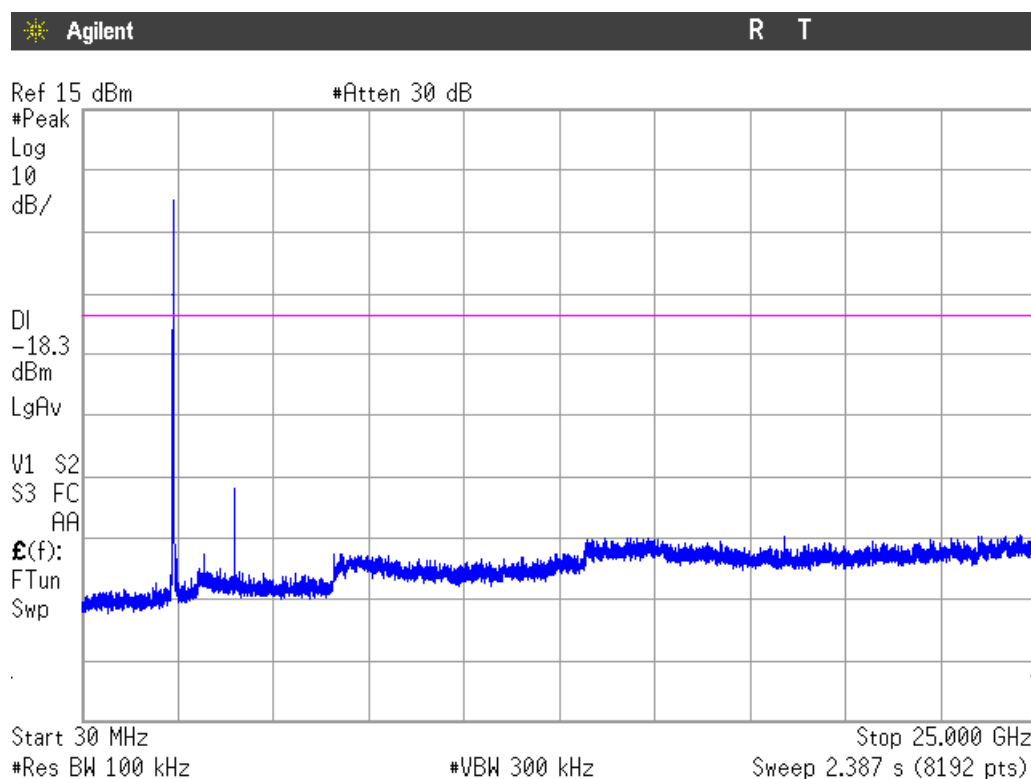
## Highest channel



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

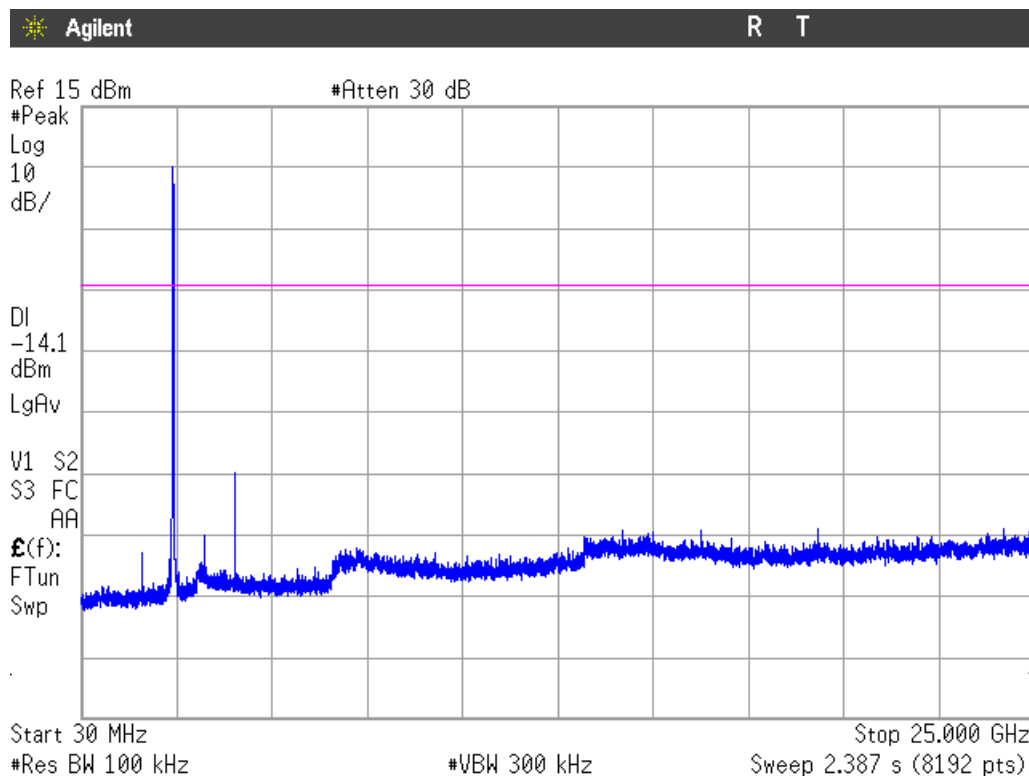
## Mode N20

### Lowest Channel



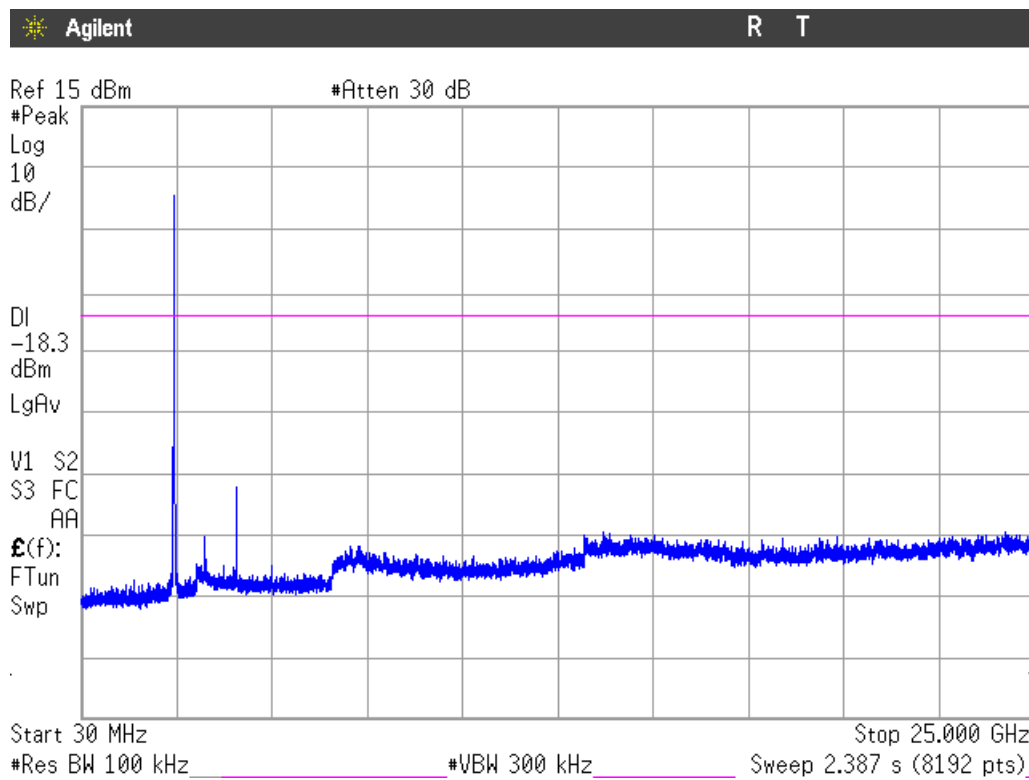
Note: The peak shown in the plot above the limit is the carrier frequency.

### Middle Channel



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

## Highest channel



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

## Section 15.247 Subclause (d) / RSS-247 5.5. Band-edge emissions compliance (Transmitter)

### SPECIFICATION

In any 100 kHz bandwidth outside the frequency band in which the digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required shall be 30 dB instead of 20 dB.

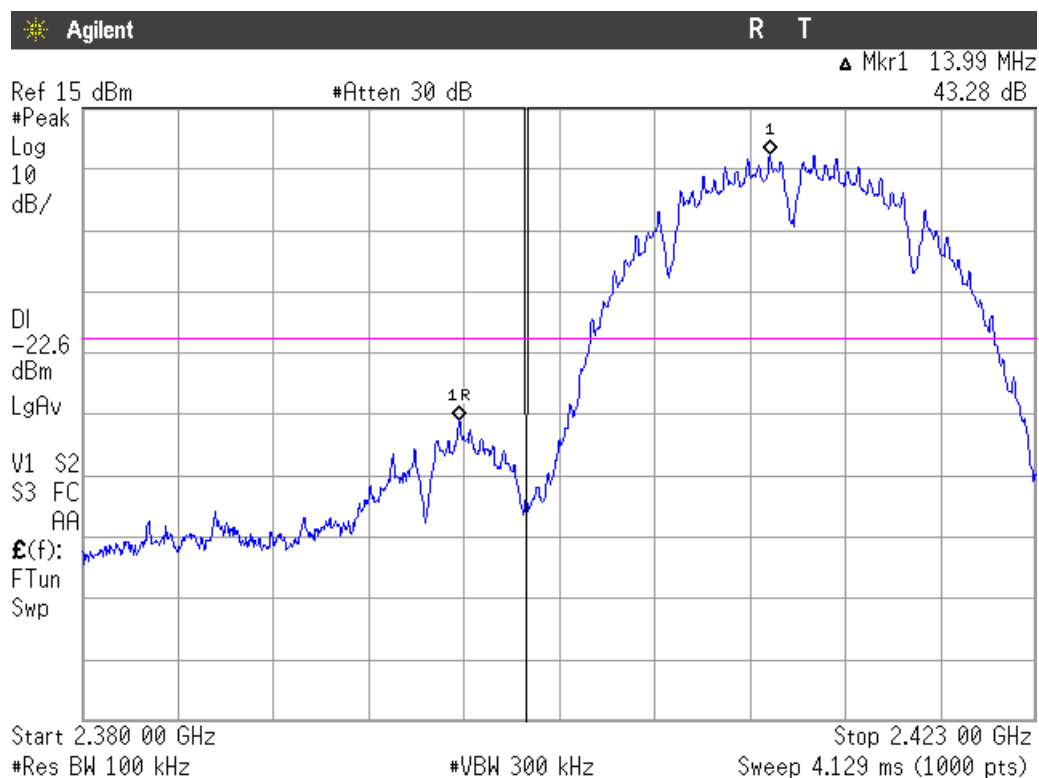
### RESULTS:

Note: Radiated measurements were used to show compliance with the limits in the restricted bands 2.31-2.39 GHz and 2.4835-2.5 GHz.

LOW FREQUENCY SECTION 2412 MHz (b/g/n20). CONDUCTED.

### Mode B

See next plot.



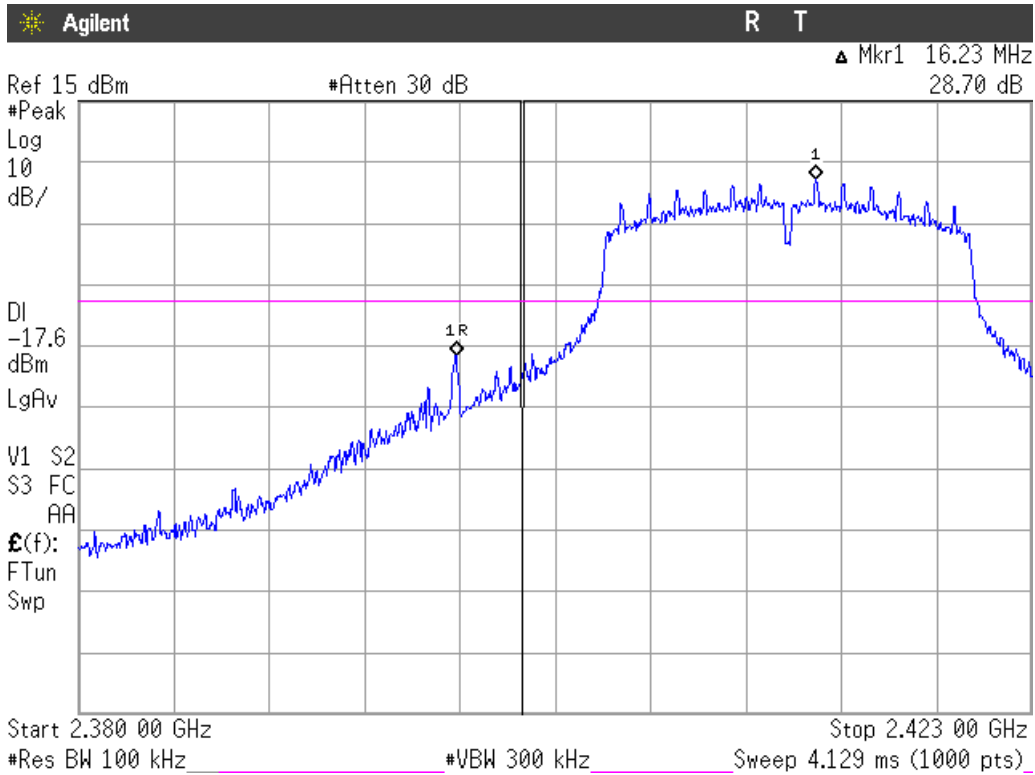
Measurement uncertainty (dB)

< ±2.03

Verdict: PASS

Mode G

See next plot.

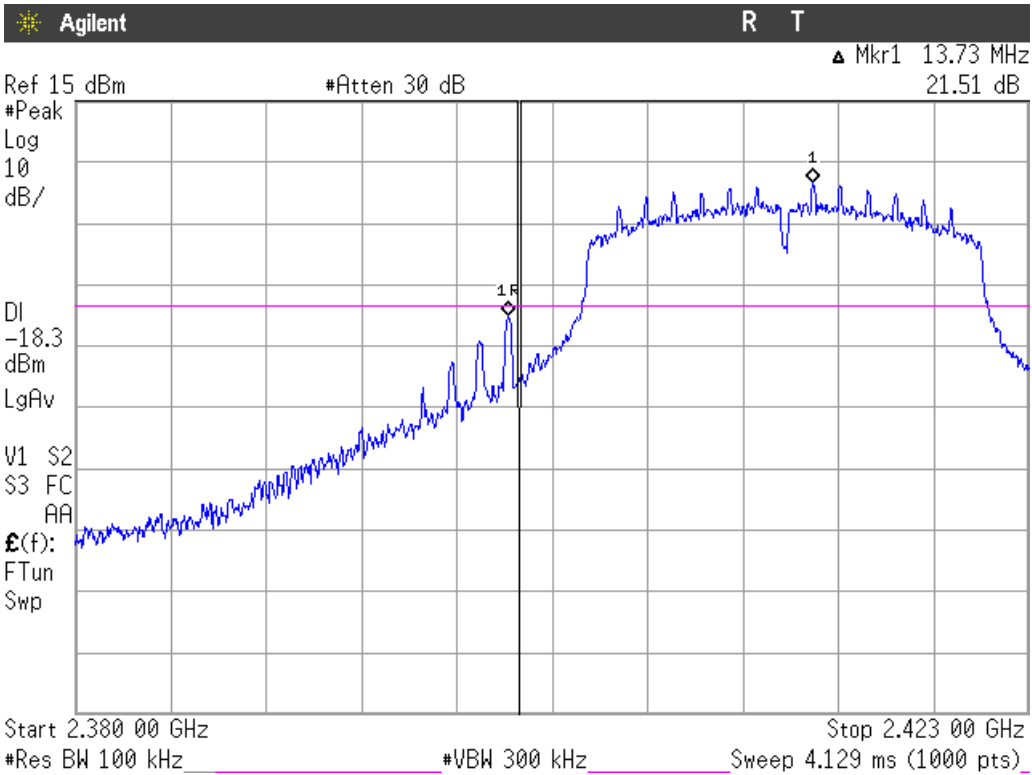


|                              |         |
|------------------------------|---------|
| Measurement uncertainty (dB) | < ±2.03 |
|------------------------------|---------|

Verdict: PASS

Mode N20

See next plot.



|                              |         |
|------------------------------|---------|
| Measurement uncertainty (dB) | < ±2.03 |
|------------------------------|---------|

Verdict: PASS

## Section 15.247 Subclause (e) / RSS-247 5.2. (2) Power spectral density

### SPECIFICATION

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

### RESULTS

For b mode, the maximum power spectral density level in the fundamental emission was measured using the method AVGPSD-1 (AVG PSD) according to point 10.3. of Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 558074 D01 DTS Meas Guidance v04 dated 05/04/2017.

For g and n20 modes, the maximum power spectral density level in the fundamental emission was measured using the method PKPSD (Peak PSD) according to point 10.2. of Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 558074 D01 DTS Meas Guidance v04 dated 05/04/2017.

Power spectral density (see next plots).

Mode B Conducted (average) power density.

|                              | Lowest frequency<br>2412 MHz | Middle frequency<br>2437 MHz | Highest frequency<br>2462 MHz |
|------------------------------|------------------------------|------------------------------|-------------------------------|
| Power spectral density (dBm) | -2.641                       | -2.124                       | -2.420                        |
| Measurement uncertainty (dB) | <±0.78                       |                              |                               |

Mode G Conducted (peak) power density.

|                              | Lowest frequency<br>2412 MHz | Middle frequency<br>2437 MHz | Highest frequency<br>2462 MHz |
|------------------------------|------------------------------|------------------------------|-------------------------------|
| Power spectral density (dBm) | 1.95                         | 5.84                         | 2.18                          |
| Measurement uncertainty (dB) | <±0.78                       |                              |                               |

Mode N20 Conducted (peak) power density.

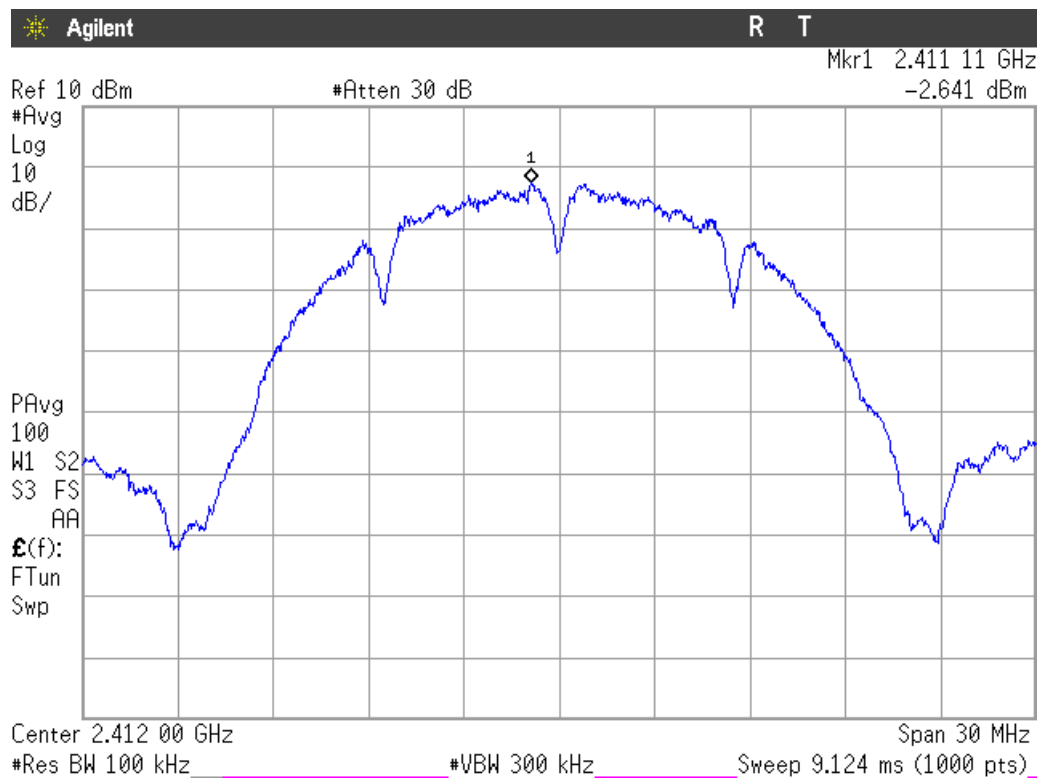
|                              | Lowest frequency<br>2412 MHz | Middle frequency<br>2437 MHz | Highest frequency<br>2462 MHz |
|------------------------------|------------------------------|------------------------------|-------------------------------|
| Power spectral density (dBm) | 1.94                         | 5.84                         | 2.30                          |
| Measurement uncertainty (dB) | <±0.78                       |                              |                               |

Verdict: PASS

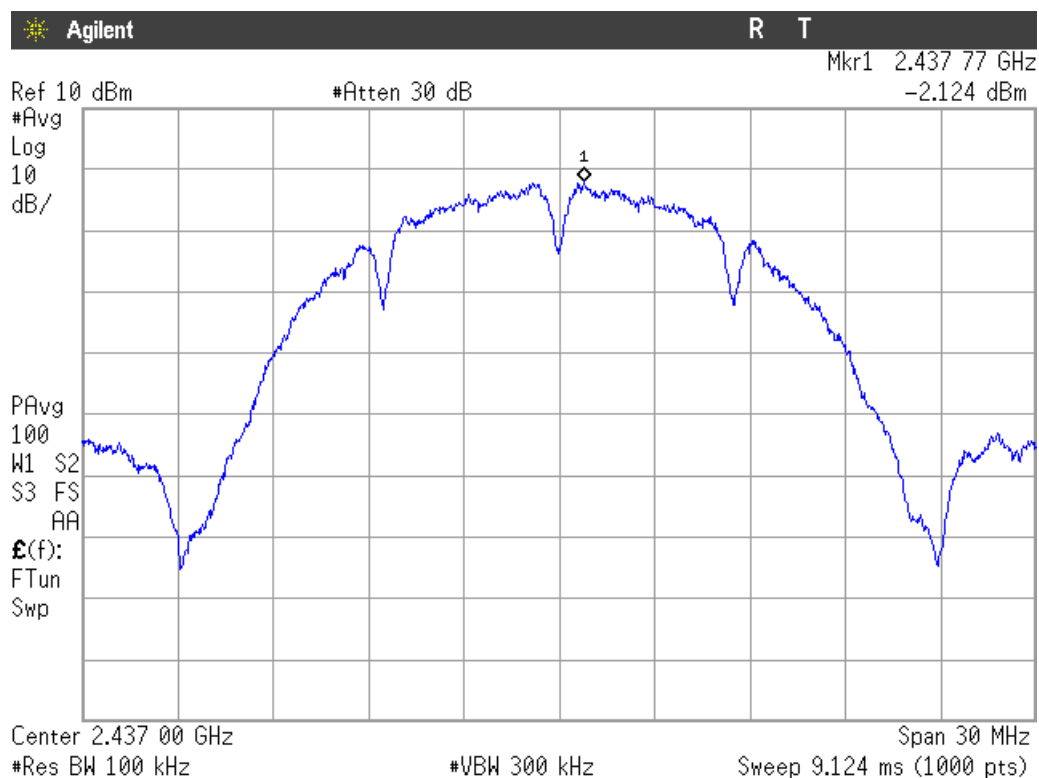
Power spectral density.

Mode B

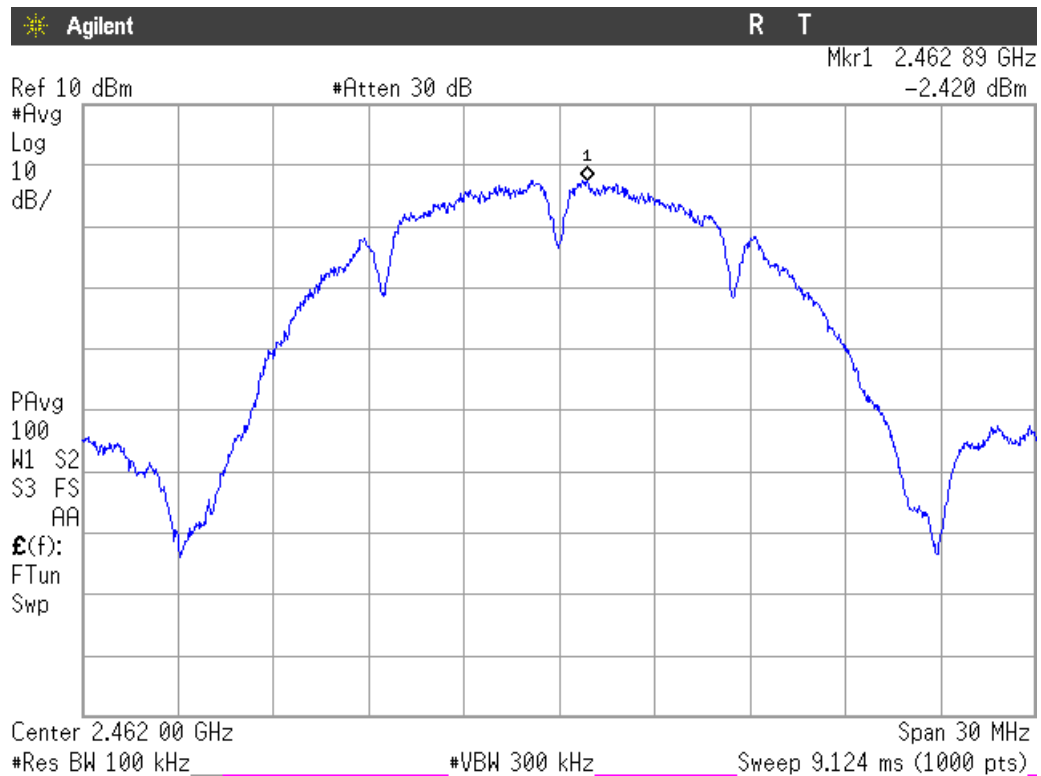
Lowest Channel



Middle Channel

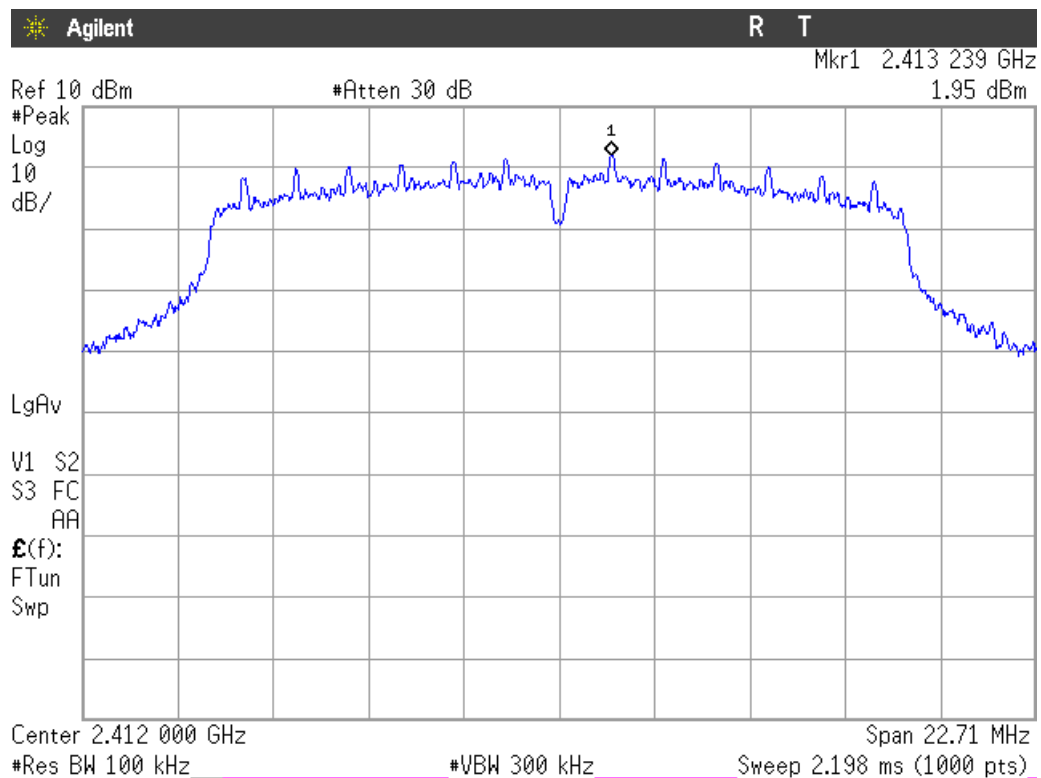


## Highest channel

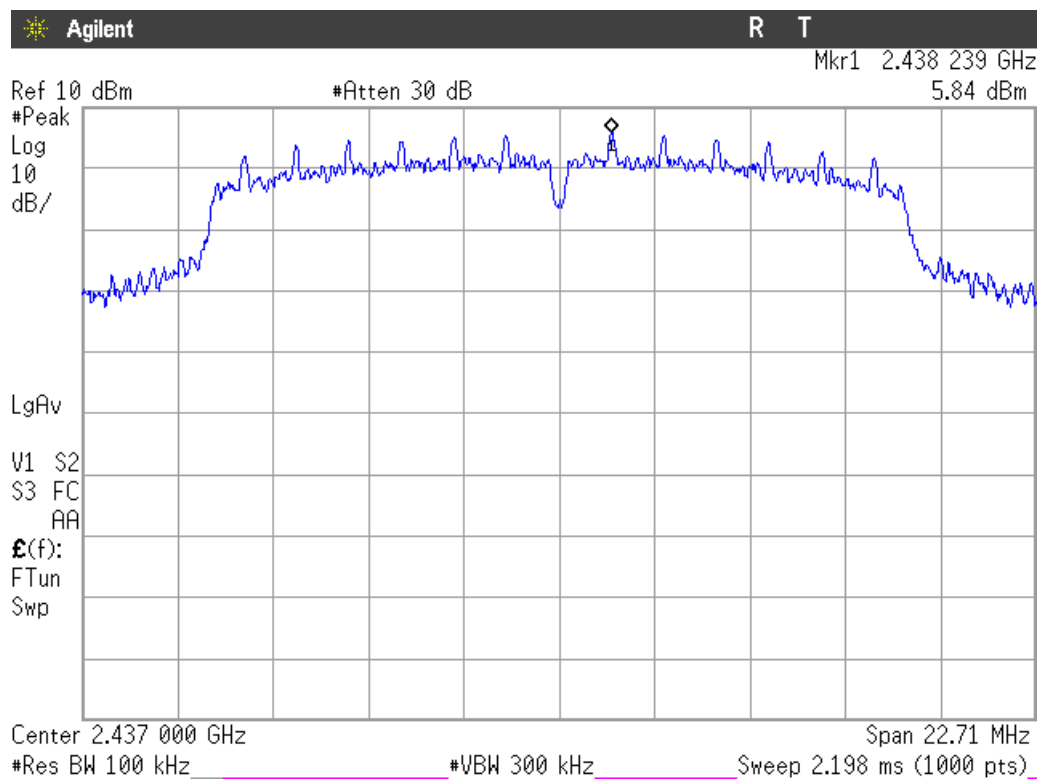


## Mode G

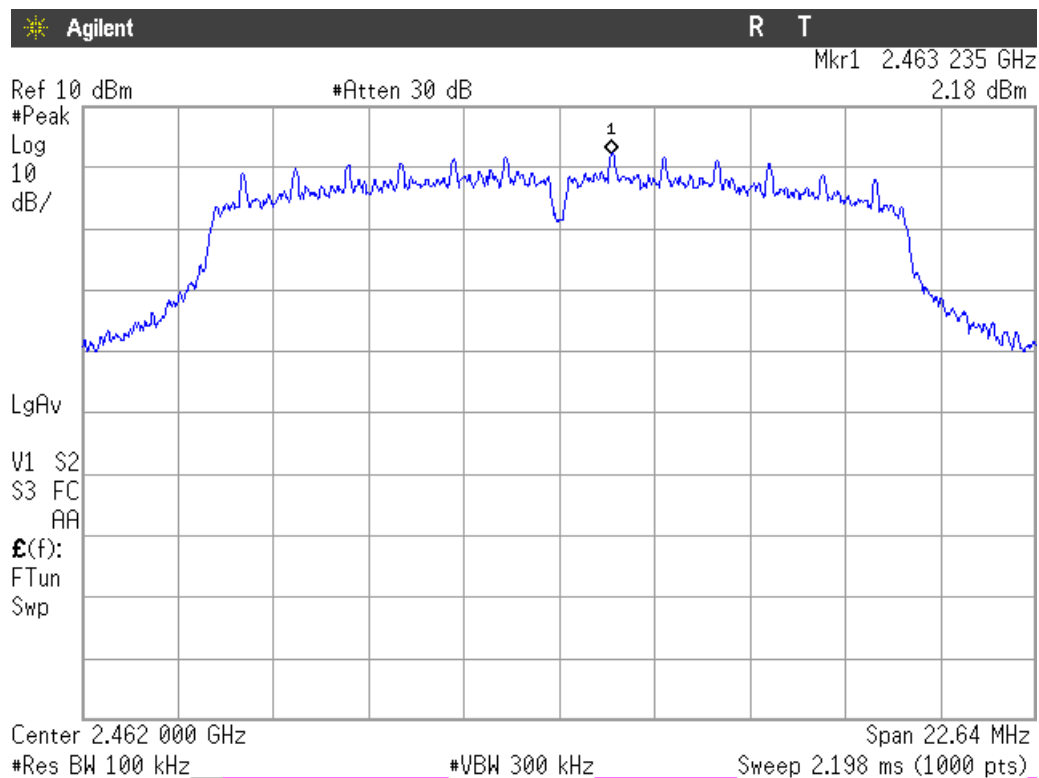
### Lowest Channel



## Middle Channel

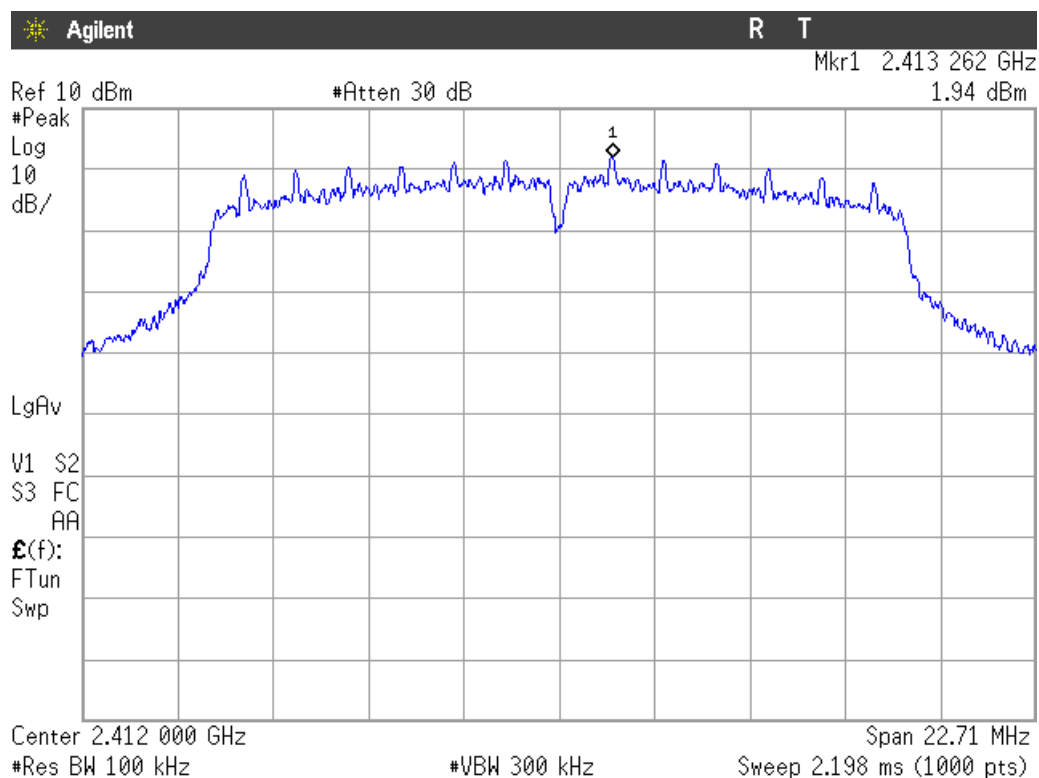


## Highest channel

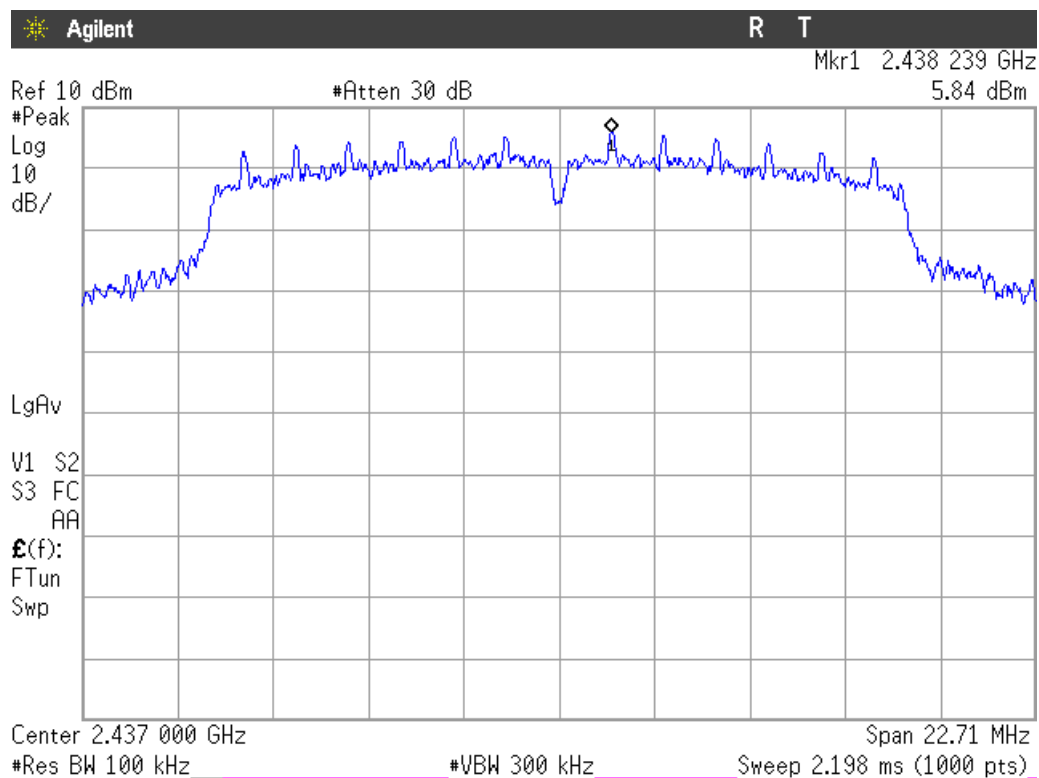


## Mode N20

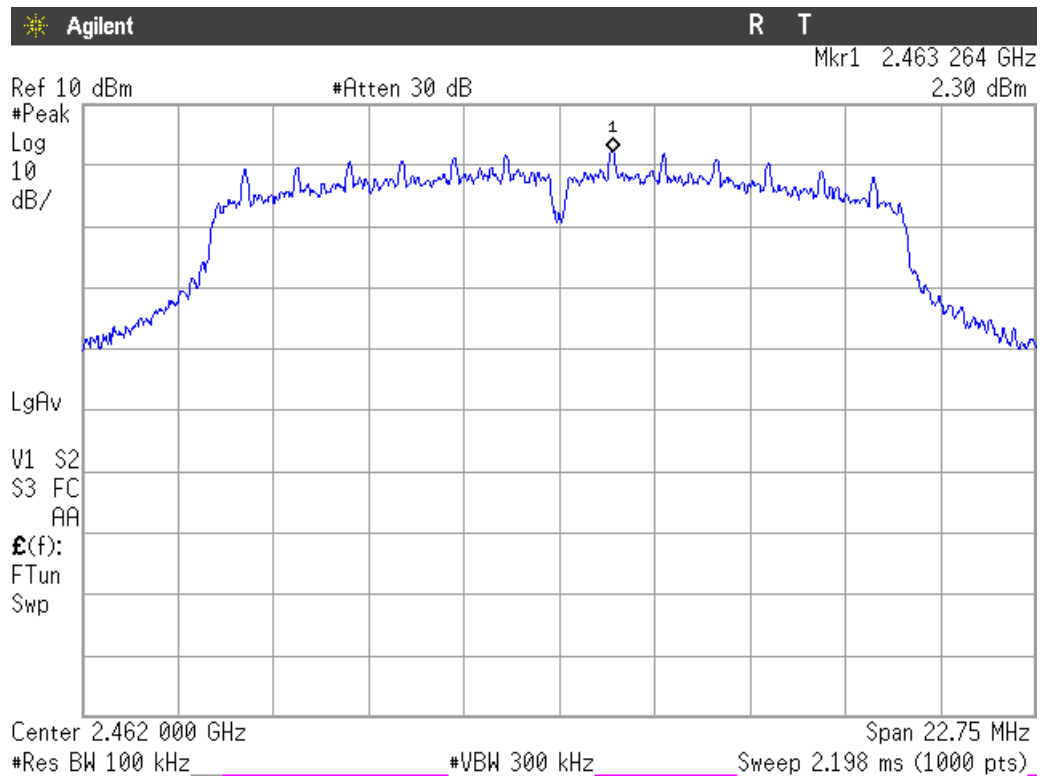
### Lowest Channel



### Middle Channel



## Highest channel



## Section 15.247 Subclause (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.

RSS-247. Attenuation below the general field strength limits specified in RSS-Gen is not required.

### RESULTS:

The situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

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

All tests were performed in a semi-anechoic chamber at a distance of 3 m for the frequency range 30 MHz-1000 MHz and at distance of 1m for the frequency range 1 GHz-25 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-1000 MHz.

The spurious signals detected do not depend on either the operating channel or the modulation mode.

| Spurious frequency (MHz) | Polarization | Detector  | Emission Level (dB $\mu$ V/m) | Measurement Uncertainty (dB) |
|--------------------------|--------------|-----------|-------------------------------|------------------------------|
| 122.78050                | V            | QuasiPeak | 37.58                         | $\pm 3.88$                   |
| 812.83850                | H            | QuasiPeak | 27.32                         | $\pm 3.88$                   |

### Frequency range 1 GHz-25 GHz.

The results in the next tables show the maximum measured levels in the 1-25 GHz range including the restricted bands 2.31-2.39 GHz and 2.4835-2.5 GHz (see next plots).

The field strength at the band edges was evaluated for each mode for the channel under test.

Spurious signals with peak levels above the average limit (54 dB $\mu$ V/m at 3 m) are measured with AVG detector for checking compliance with the average limit.

#### 1. WiFi 2.4GHz 802.11 b mode.

1.1. CHANNEL 1: LOWEST (2412 MHz). Out-of-band spurious emissions in the 1-25 GHz range and inside restricted band 2.31-2.39 GHz.

| Spurious frequency (GHz) | Polarization | Detector | Emission Level (dB $\mu$ V/m) | Measurement Uncertainty (dB) |
|--------------------------|--------------|----------|-------------------------------|------------------------------|
| 1.60790                  | V            | Peak     | 45.71                         | $\pm 4.87$                   |
| 2.33110                  | V            | Peak     | 54.06                         | $\pm 4.87$                   |
|                          |              | Average  | 40.16                         | $\pm 4.87$                   |
| 2.38632                  | V            | Peak     | 54.19                         | $\pm 4.87$                   |
|                          |              | Average  | 44.37                         | $\pm 4.87$                   |
| 2.49317                  | V            | Peak     | 49.56                         | $\pm 4.87$                   |
| 4.01875                  | V            | Peak     | 52.74                         | $\pm 4.87$                   |
| 4.82425                  | V            | Peak     | 41.86                         | $\pm 4.87$                   |
| 6.43175                  | V            | Peak     | 47.19                         | $\pm 4.87$                   |

## 1.2. CHANNEL 6: MIDDLE (2437 MHz). Out-of-band spurious emissions in the 1-25 GHz.

| Spurious frequency (GHz) | Polarization | Detector | Emission Level (dB $\mu$ V/m) | Measurement Uncertainty (dB) |
|--------------------------|--------------|----------|-------------------------------|------------------------------|
| 1.62470                  | V            | Peak     | 50.34                         | $\pm 4.87$                   |
| 2.27603                  | V            | Peak     | 46.91                         | $\pm 4.87$                   |
| 2.35790                  | V            | Peak     | 49.83                         | $\pm 4.87$                   |
| 2.51877                  | V            | Peak     | 49.56                         | $\pm 4.87$                   |
| 4.06325                  | V            | Peak     | 51.37                         | $\pm 4.87$                   |
| 4.87425                  | V            | Peak     | 41.40                         | $\pm 4.87$                   |
| 6.49875                  | V            | Peak     | 46.28                         | $\pm 4.87$                   |

## 1.3. CHANNEL 11: HIGHEST (2462 MHz). Out-of-band spurious emissions in the 1-25 GHz range and inside restricted band 2.4835-2.5 GHz.

| Spurious frequency (GHz) | Polarization | Detector | Emission Level (dB $\mu$ V/m) | Measurement Uncertainty (dB) |
|--------------------------|--------------|----------|-------------------------------|------------------------------|
| 1.64137                  | V            | Peak     | 48.91                         | $\pm 4.87$                   |
| 2.30330                  | V            | Peak     | 48.01                         | $\pm 4.87$                   |
| 2.38270                  | V            | Peak     | 49.87                         | $\pm 4.87$                   |
| 2.48351                  | V            | Peak     | 54.95                         | $\pm 4.87$                   |
|                          |              | Average  | 47.33                         | $\pm 4.87$                   |
| 2.48688                  | V            | Peak     | 54.36                         | $\pm 4.87$                   |
|                          |              | Average  | 47.84                         | $\pm 4.87$                   |
| 4.10475                  | V            | Peak     | 50.33                         | $\pm 4.87$                   |
| 4.92375                  | V            | Peak     | 42.32                         | $\pm 4.87$                   |
| 6.56525                  | V            | Peak     | 47.87                         | $\pm 4.87$                   |

Verdict: PASS

## 2. WiFi 2.4GHz 802.11 g mode

2.1. CHANNEL 1: LOWEST (2412 MHz). Out-of-band spurious emissions in the 1-25 GHz range and inside restricted band 2.31-2.39 GHz.

| Spurious frequency (GHz) | Polarization | Detector | Emission Level (dBμV/m) | Measurement Uncertainty (dB) |
|--------------------------|--------------|----------|-------------------------|------------------------------|
| 1.61057                  | H            | Peak     | 44.47                   | ± 4.87                       |
| 2.38999                  | V            | Peak     | 64.39                   | ± 4.87                       |
|                          |              | Average  | 50.17                   | ± 4.87                       |
| 4.01725                  | V            | Peak     | 50.34                   | ± 4.87                       |
| 6.34175                  | V            | Peak     | 45.14                   | ± 4.87                       |
| 14.28025                 | V            | Peak     | 54.15                   | ± 4.87                       |
|                          |              | Average  | 40.89                   | ± 4.87                       |

2.2. CHANNEL 6: MIDDLE (2437 MHz). Out-of-band spurious emissions in the 1-25 GHz.

| Spurious frequency (GHz) | Polarization | Detector | Emission Level (dBμV/m) | Measurement Uncertainty (dB) |
|--------------------------|--------------|----------|-------------------------|------------------------------|
| 1.62383                  | V            | Peak     | 48.66                   | ± 4.87                       |
| 2.35883                  | V            | Peak     | 50.22                   | ± 4.87                       |
| 2.51723                  | V            | Peak     | 49.44                   | ± 4.87                       |
| 4.06275                  | V            | Peak     | 51.39                   | ± 4.87                       |
| 6.49875                  | V            | Peak     | 48.06                   | ± 4.87                       |

2.3. CHANNEL 11: HIGHEST (2462 MHz). Out-of-band spurious emissions in the 1-25 GHz range and inside restricted band 2.4835-2.5 GHz.

| Spurious frequency (GHz) | Polarization | Detector | Emission Level (dBμV/m) | Measurement Uncertainty (dB) |
|--------------------------|--------------|----------|-------------------------|------------------------------|
| 1.64137                  | V            | Peak     | 43.67                   | ± 4.87                       |
| 2.37957                  | V            | Peak     | 48.75                   | ± 4.87                       |
| 2.48355                  | V            | Peak     | 66.51                   | ± 4.87                       |
|                          |              | Average  | 52.48                   | ± 4.87                       |
| 4.10175                  | V            | Peak     | 48.96                   | ± 4.87                       |
| 6.56525                  | V            | Peak     | 45.68                   | ± 4.87                       |

Verdict: PASS

### 3. WiFi 2.4GHz 802.11 n20 mode

3.1. CHANNEL 1: LOWEST (2412 MHz). Out-of-band spurious emissions in the 1-25 GHz range and inside restricted band 2.31-2.39 GHz.

| Spurious frequency (GHz) | Polarization | Detector | Emission Level (dBμV/m) | Measurement Uncertainty (dB) |
|--------------------------|--------------|----------|-------------------------|------------------------------|
| 1.61043                  | H            | Peak     | 44.13                   | ± 4.87                       |
| 2.33477                  | V            | Peak     | 47.02                   | ± 4.87                       |
| 2.38998                  | V            | Peak     | 66.69                   | ± 4.87                       |
|                          |              | Average  | 49.83                   | ± 4.87                       |
| 2.49637                  | V            | Peak     | 48.98                   | ± 4.87                       |
| 4.01875                  | V            | Peak     | 50.03                   | ± 4.87                       |
| 6.43175                  | V            | Peak     | 45.30                   | ± 4.87                       |

3.2. CHANNEL 6: MIDDLE (2437 MHz). Out-of-band spurious emissions in the 1-25 GHz.

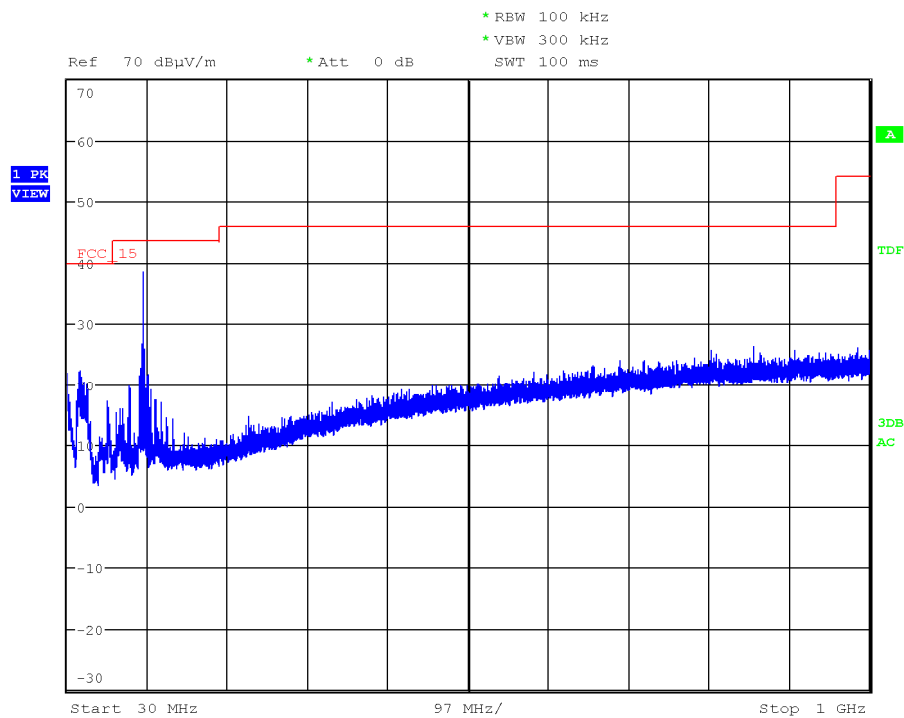
| Spurious frequency (GHz) | Polarization | Detector | Emission Level (dBμV/m) | Measurement Uncertainty (dB) |
|--------------------------|--------------|----------|-------------------------|------------------------------|
| 1.62483                  | V            | Peak     | 48.33                   | ± 4.87                       |
| 2.35717                  | V            | Peak     | 52.29                   | ± 4.87                       |
| 2.51763                  | V            | Peak     | 49.00                   | ± 4.87                       |
| 4.06575                  | V            | Peak     | 51.60                   | ± 4.87                       |
| 6.49875                  | V            | Peak     | 47.37                   | ± 4.87                       |

3.3. CHANNEL 11: HIGHEST (2462 MHz). Out-of-band spurious emissions in the 1-25 GHz range and inside restricted band 2.4835-2.5 GHz.

| Spurious frequency (GHz) | Polarization | Detector | Emission Level (dBμV/m) | Measurement Uncertainty (dB) |
|--------------------------|--------------|----------|-------------------------|------------------------------|
| 2.37910                  | V            | Peak     | 47.83                   | ± 4.87                       |
| 2.48367                  | V            | Peak     | 68.48                   | ± 4.87                       |
|                          |              | Average  | 52.22                   | ± 4.87                       |
| 4.10425                  | V            | Peak     | 47.72                   | ± 4.87                       |
| 6.56575                  | V            | Peak     | 45.92                   | ± 4.87                       |

Verdict: PASS

## FREQUENCY RANGE 30 MHz-1000 MHz.

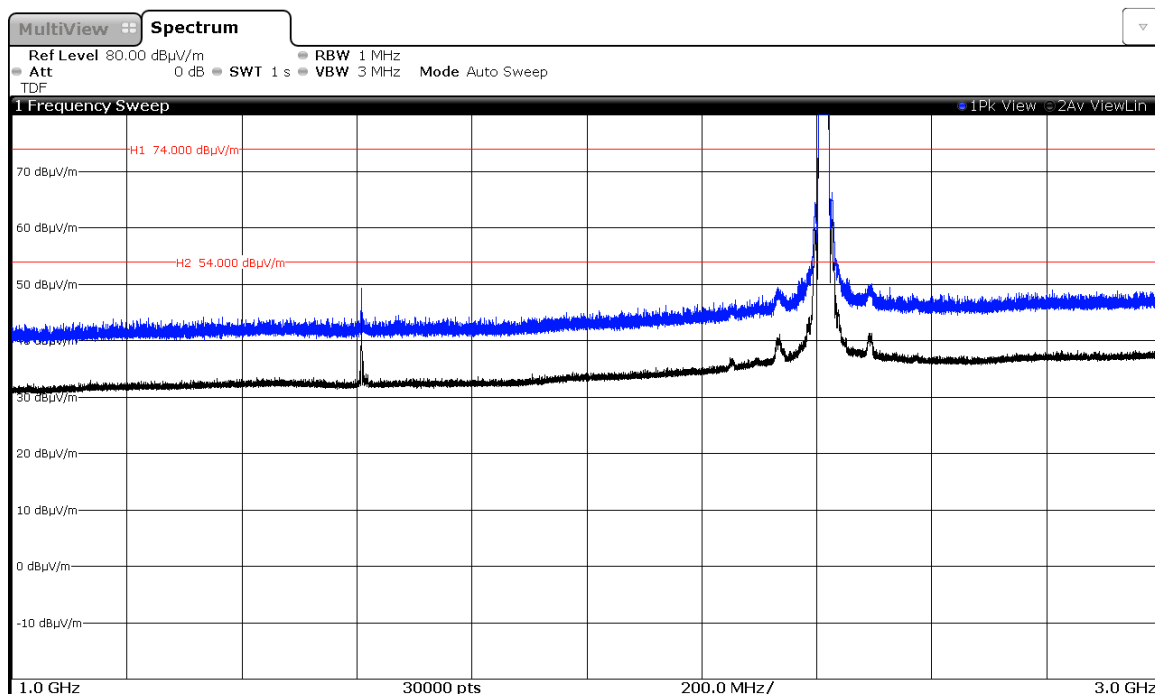


(This plot is valid for all three channels and all modulation modes).

FREQUENCY RANGE 1 GHz to 3 GHz.

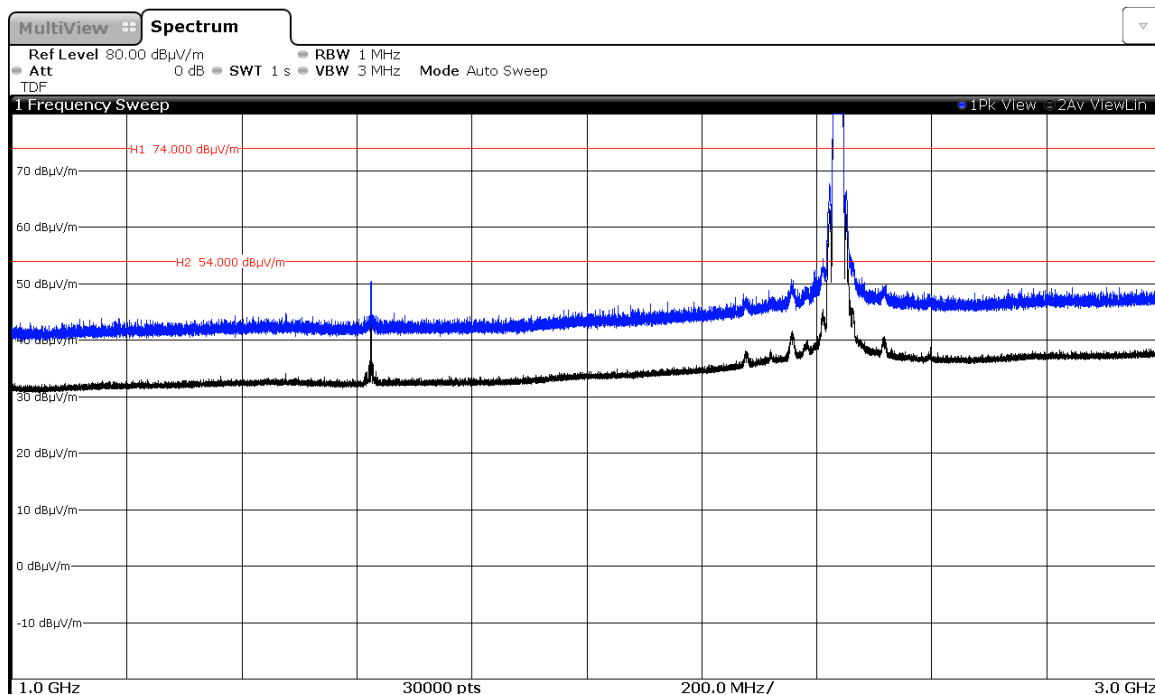
### 1. WiFi 2.4GHz 802.11 b mode

CHANNEL 1 (2412 MHz).



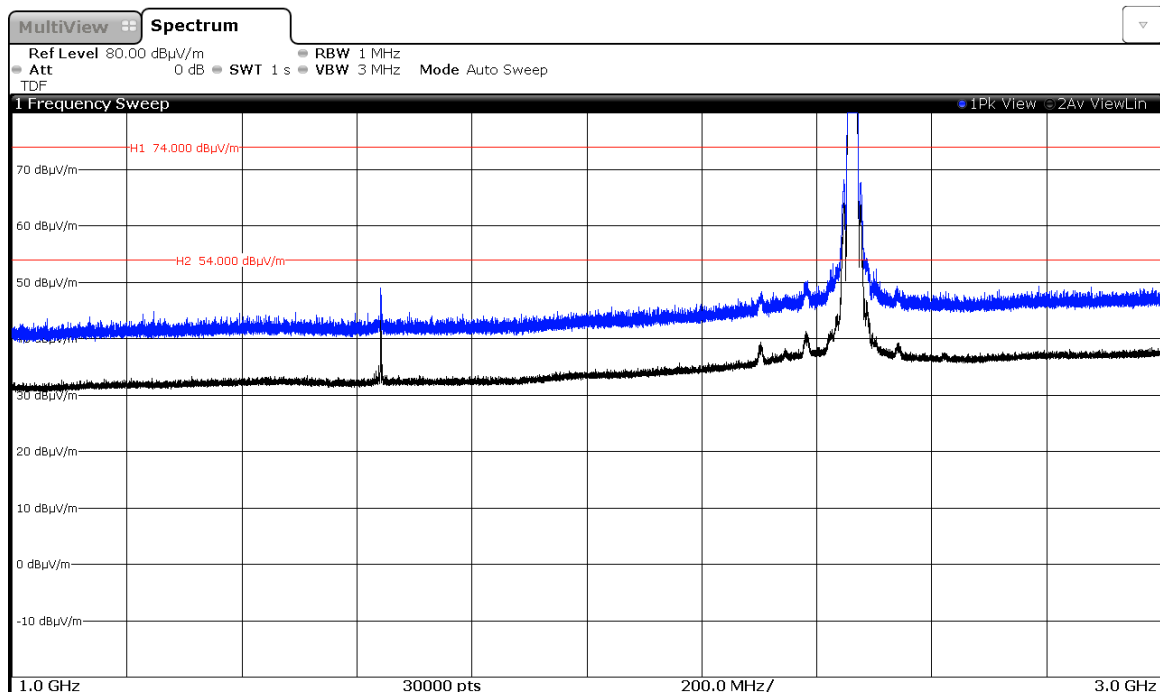
Note: The peak above the limit is the carrier frequency.

CHANNEL 6 (2437 MHz).



Note: The peak above the limit is the carrier frequency.

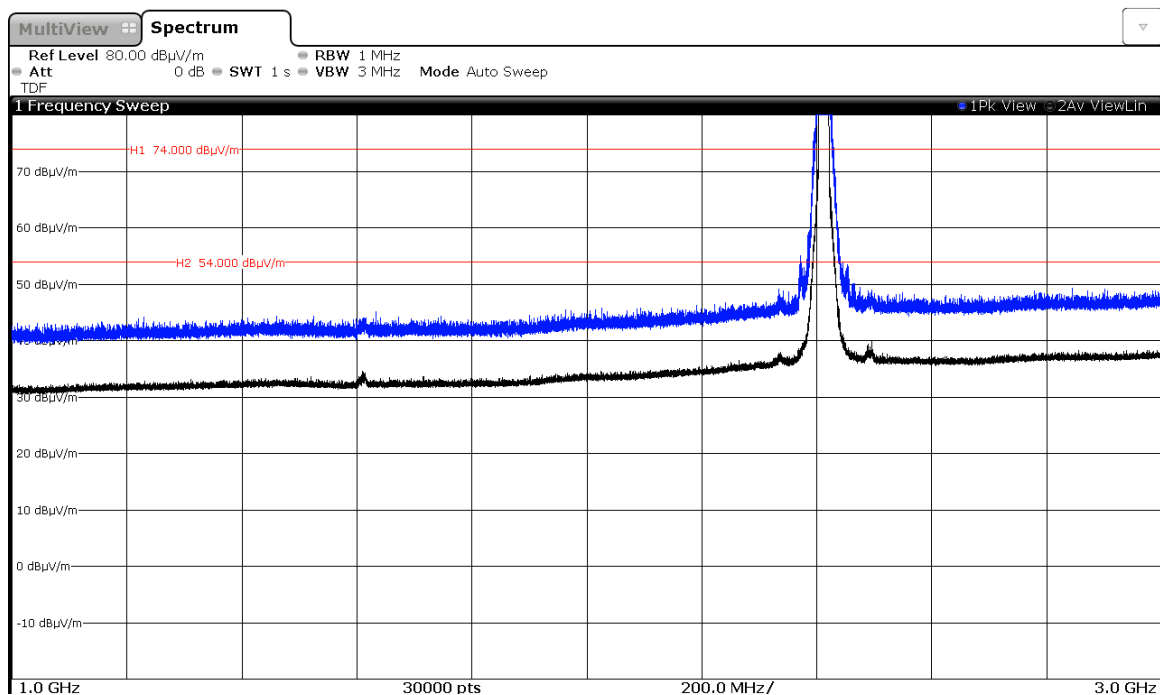
CHANNEL 11 (2462 MHz).



Note: The peak above the limit is the carrier frequency.

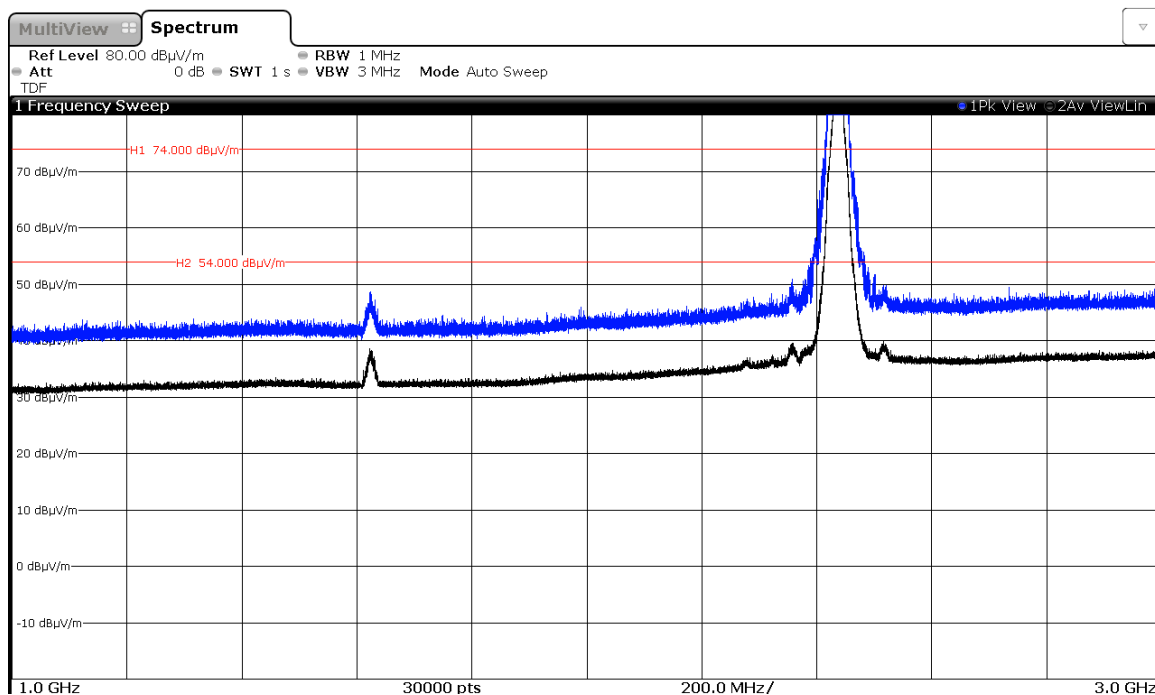
## 2. WiFi 2.4GHz 802.11 g mode

CHANNEL 1 (2412 MHz).



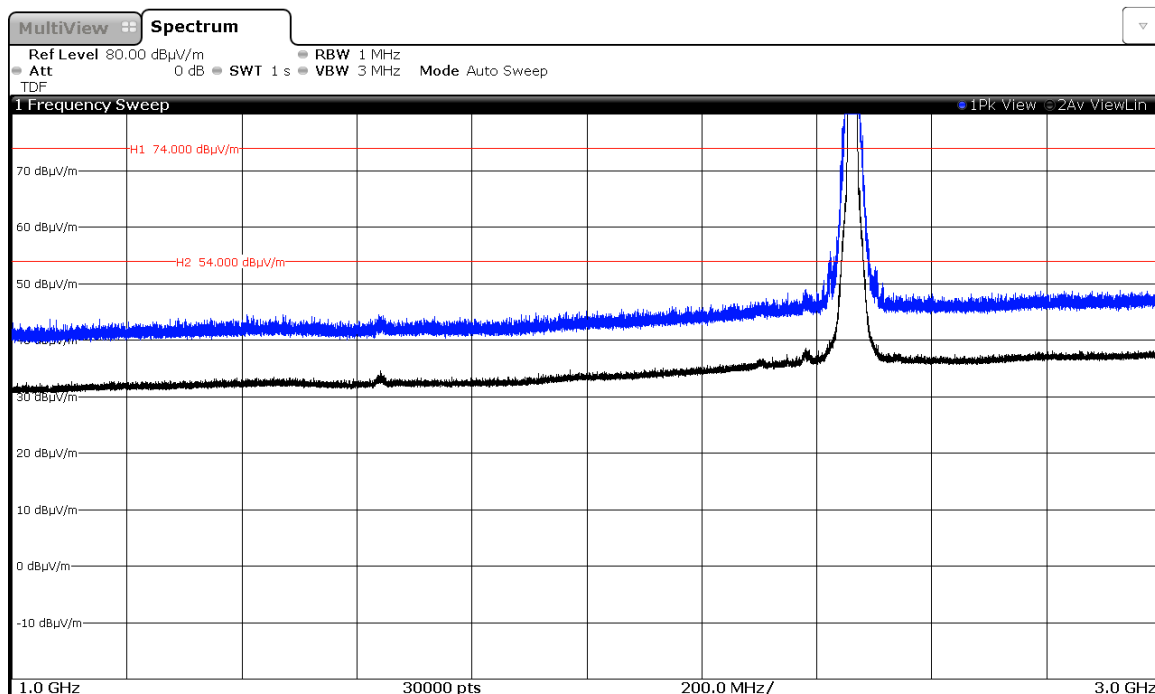
Note: The peak above the limit is the carrier frequency.

## CHANNEL 6 (2437 MHz).



Note: The peak above the limit is the carrier frequency.

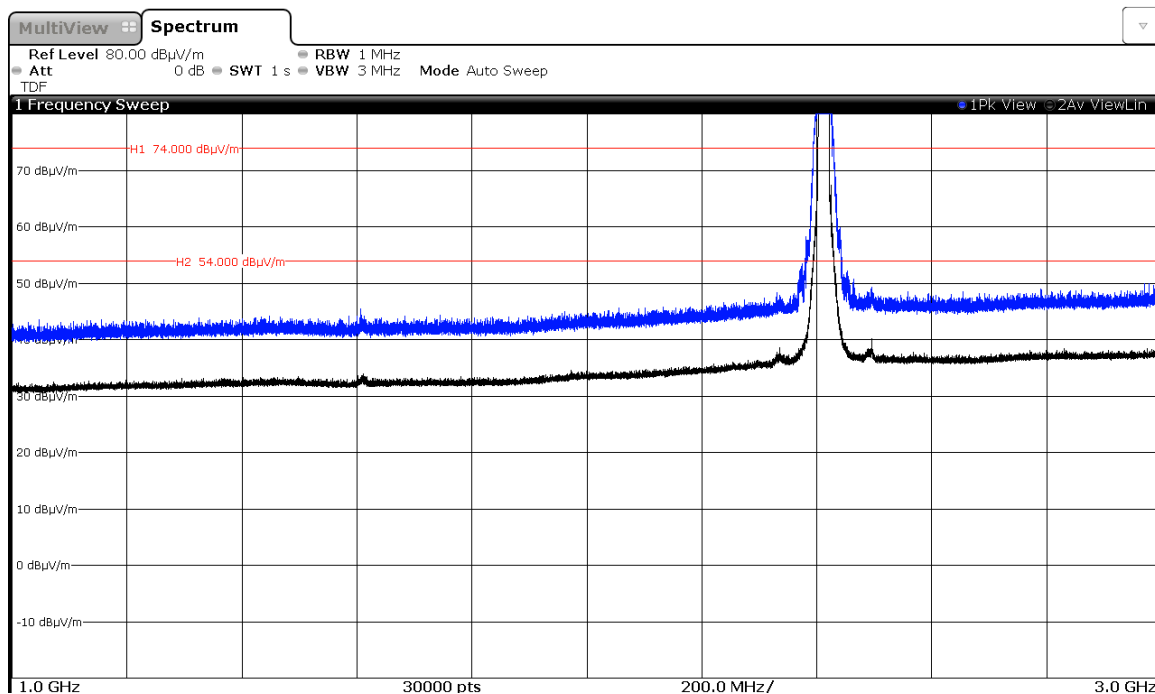
## CHANNEL 11 (2462 MHz).



Note: The peak above the limit is the carrier frequency.

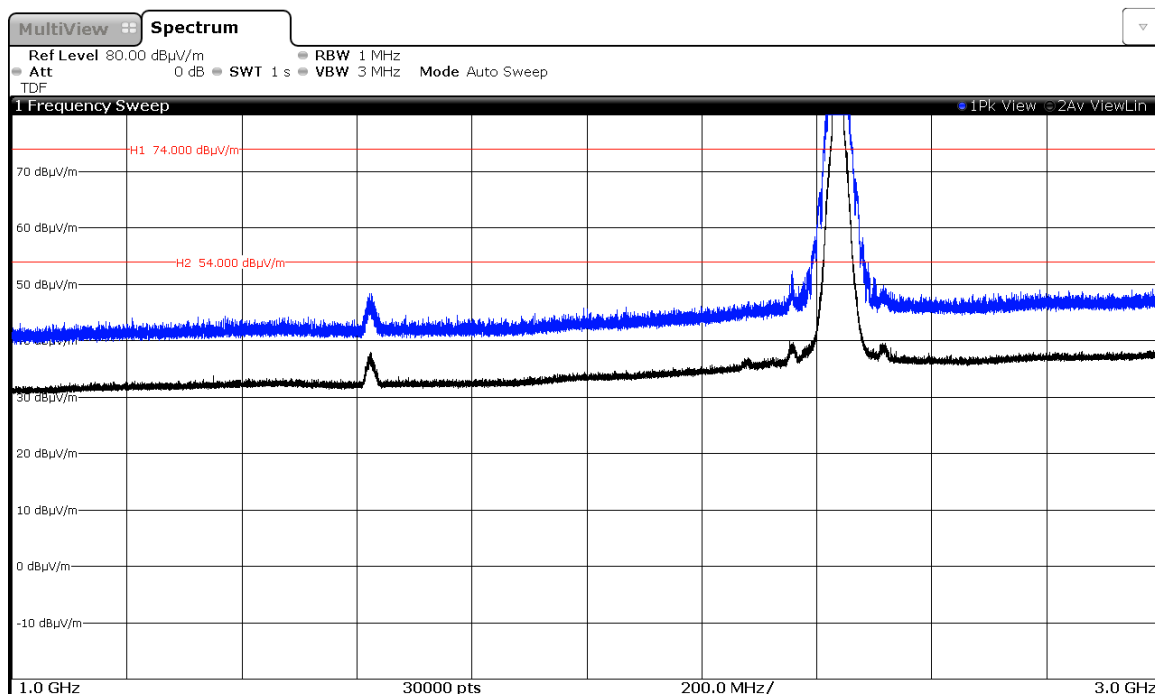
### 3. WiFi 2.4GHz 802.11 n20 mode

CHANNEL 1 (2412 MHz).



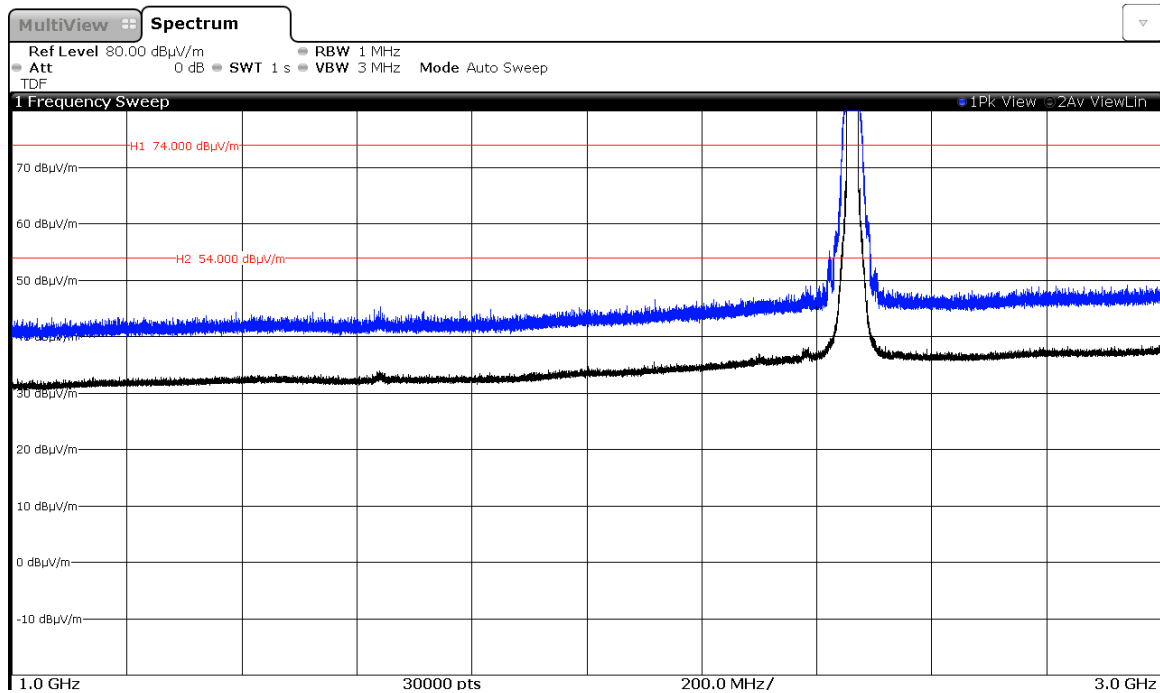
Note: The peak above the limit is the carrier frequency.

CHANNEL 6 (2437 MHz).



Note: The peak above the limit is the carrier frequency.

CHANNEL 11 (2462 MHz).

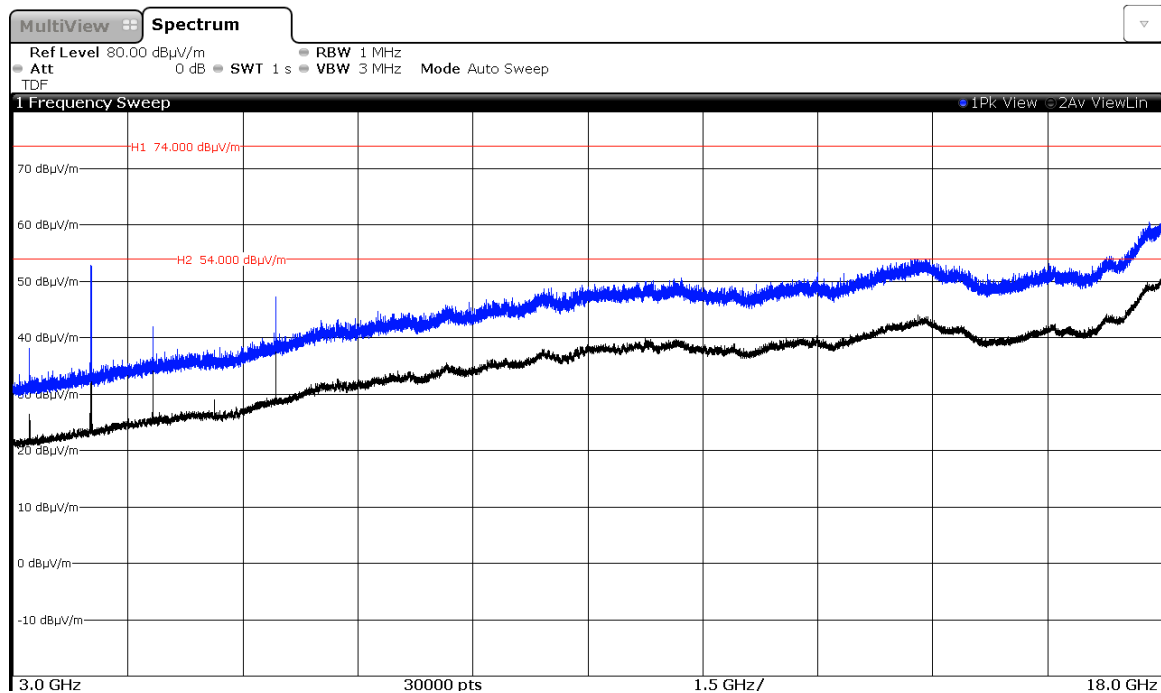


Note: The peak above the limit is the carrier frequency.

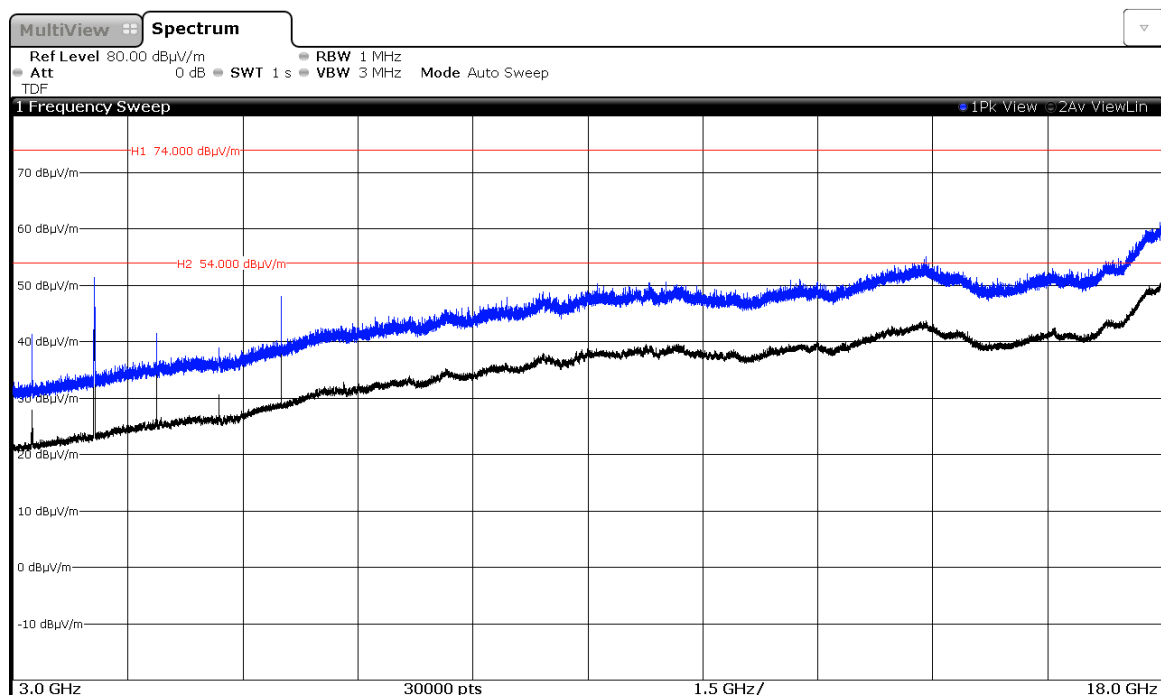
FREQUENCY RANGE 3 GHz to 18 GHz.

### 1. WiFi 2.4GHz 802.11 b mode

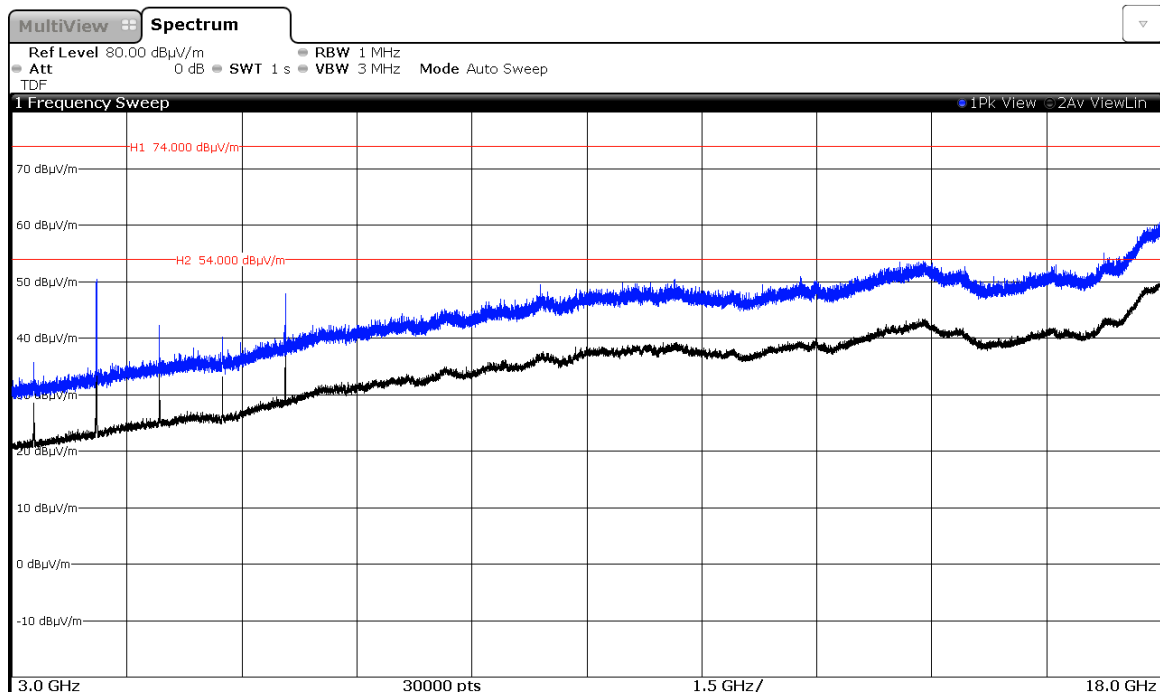
CHANNEL 1 (2412 MHz).



CHANNEL 6 (2437 MHz).

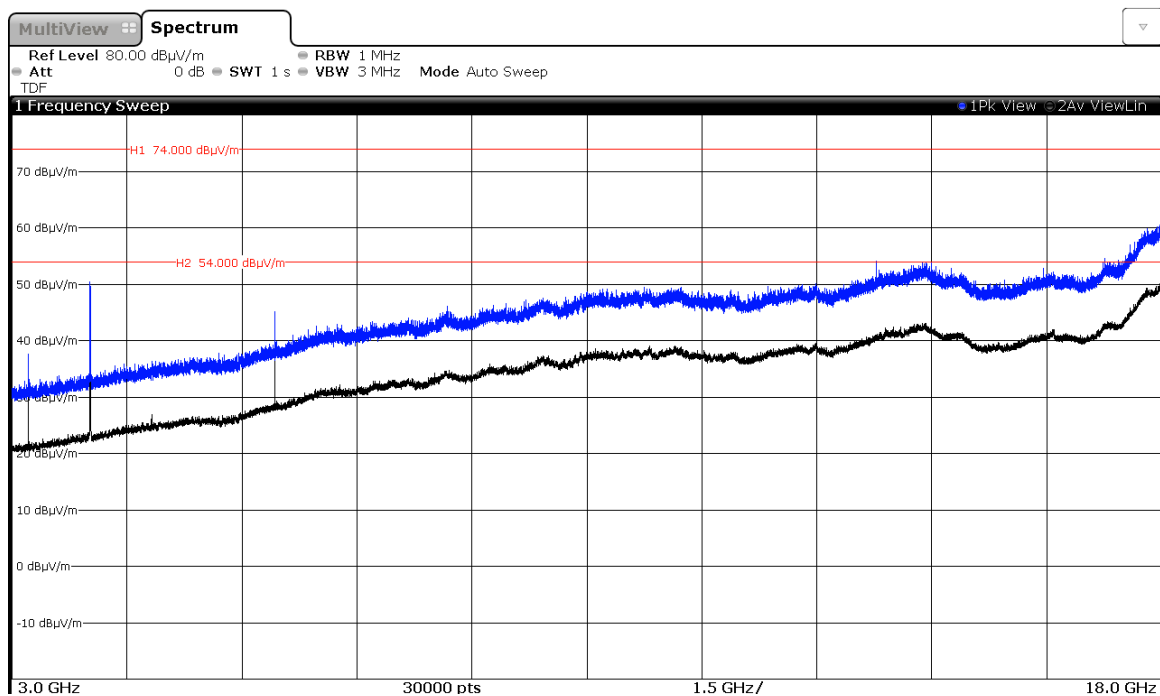


## CHANNEL 11 (2462 MHz).

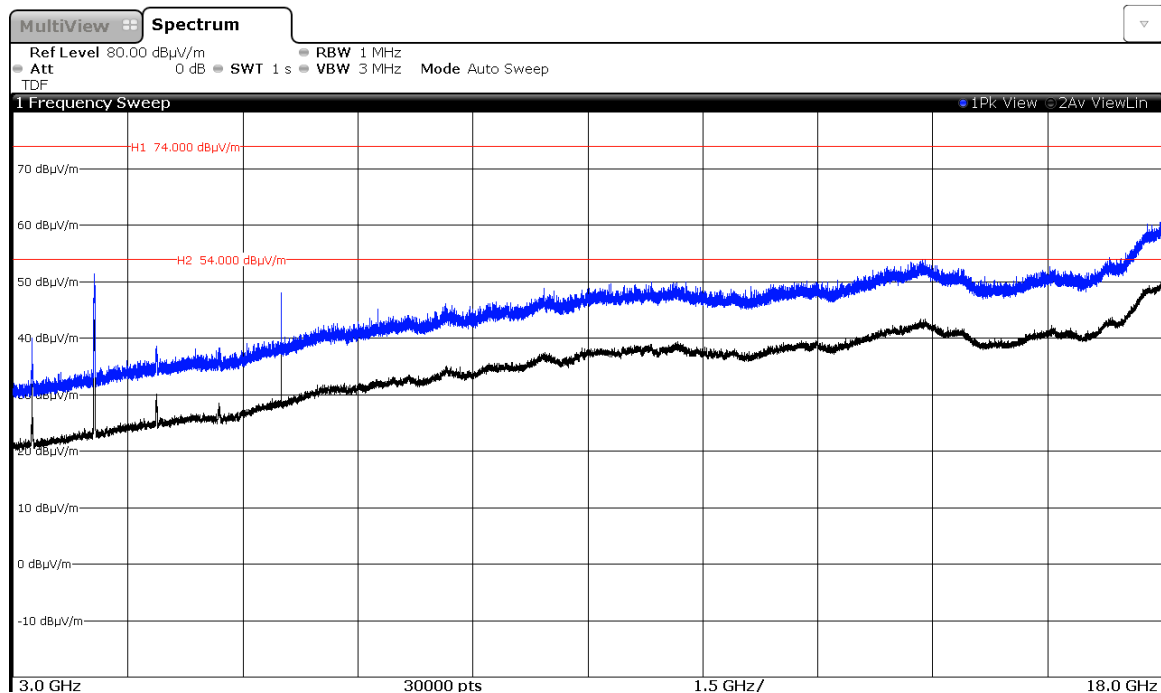


## 2. WiFi 2.4GHz 802.11 g mode

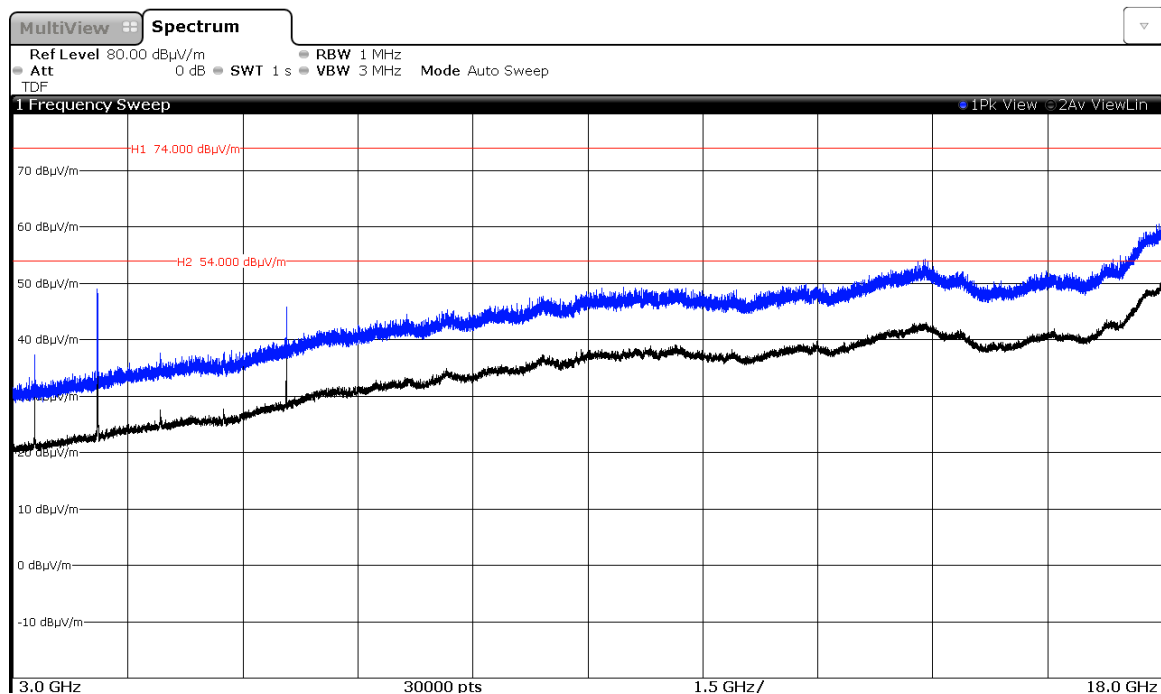
### CHANNEL 1 (2412 MHz).



## CHANNEL 6 (2437 MHz).

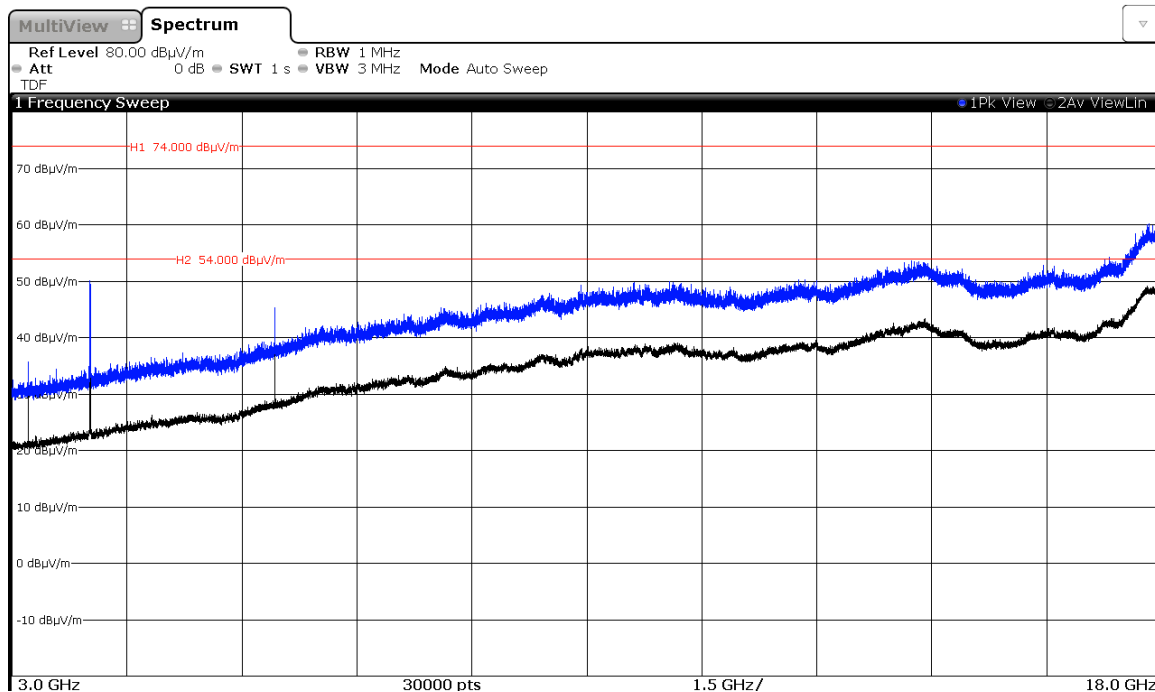


## CHANNEL 11 (2462 MHz).

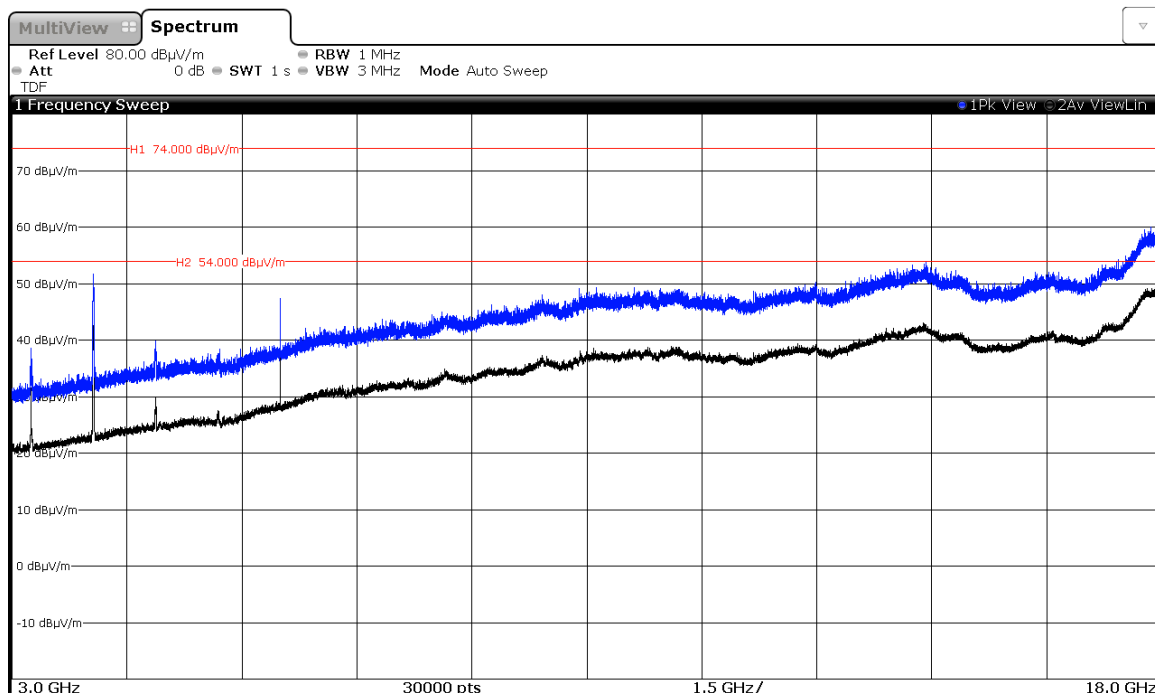


### 3. WiFi 2.4GHz 802.11 n20 mode

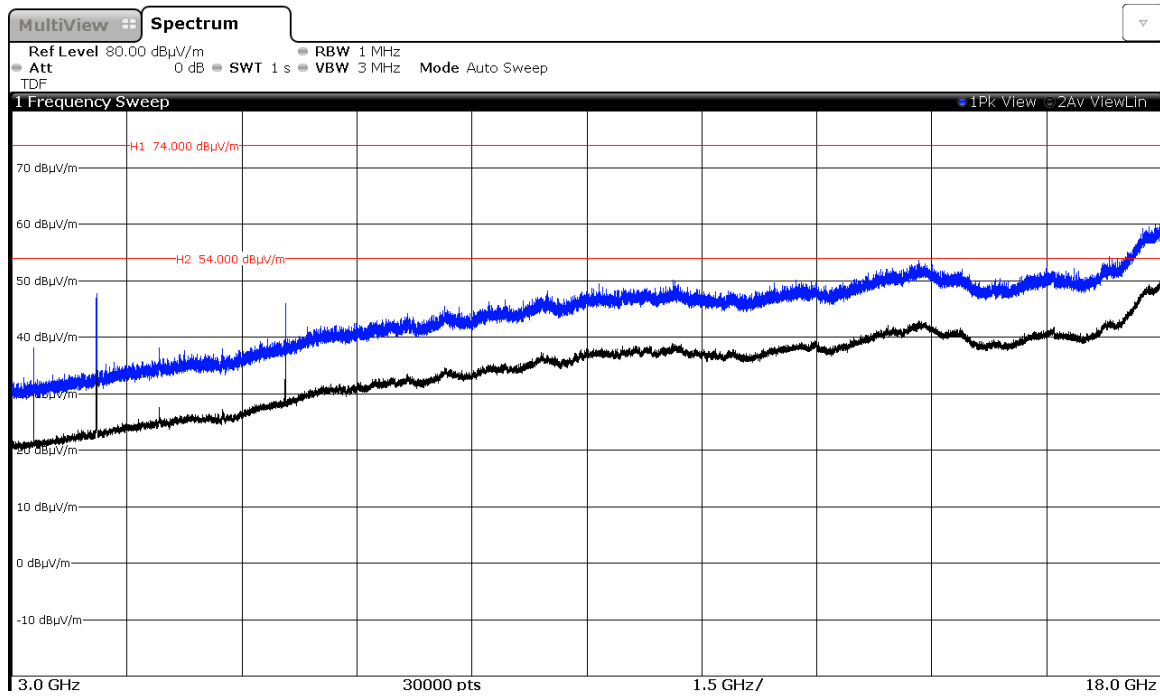
CHANNEL 1 (2412 MHz).



CHANNEL 6 (2437 MHz).



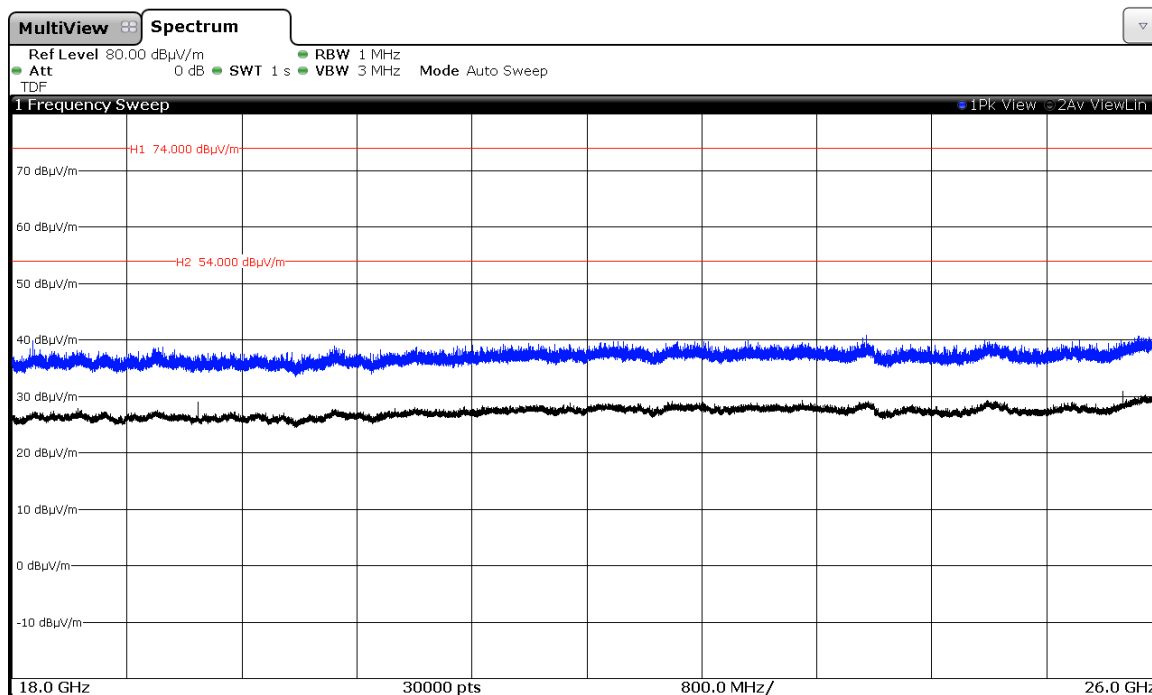
CHANNEL 11 (2462 MHz).



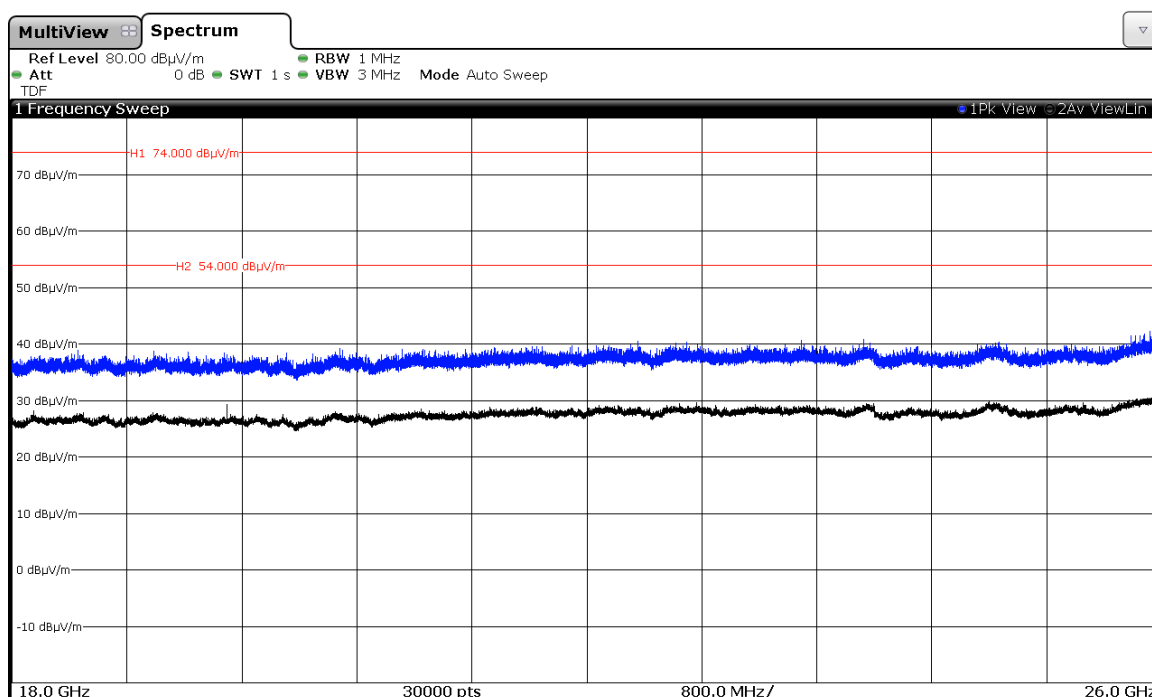
FREQUENCY RANGE 18 GHz to 26 GHz.

# 1. WiFi 2.4GHz 802.11 b mode

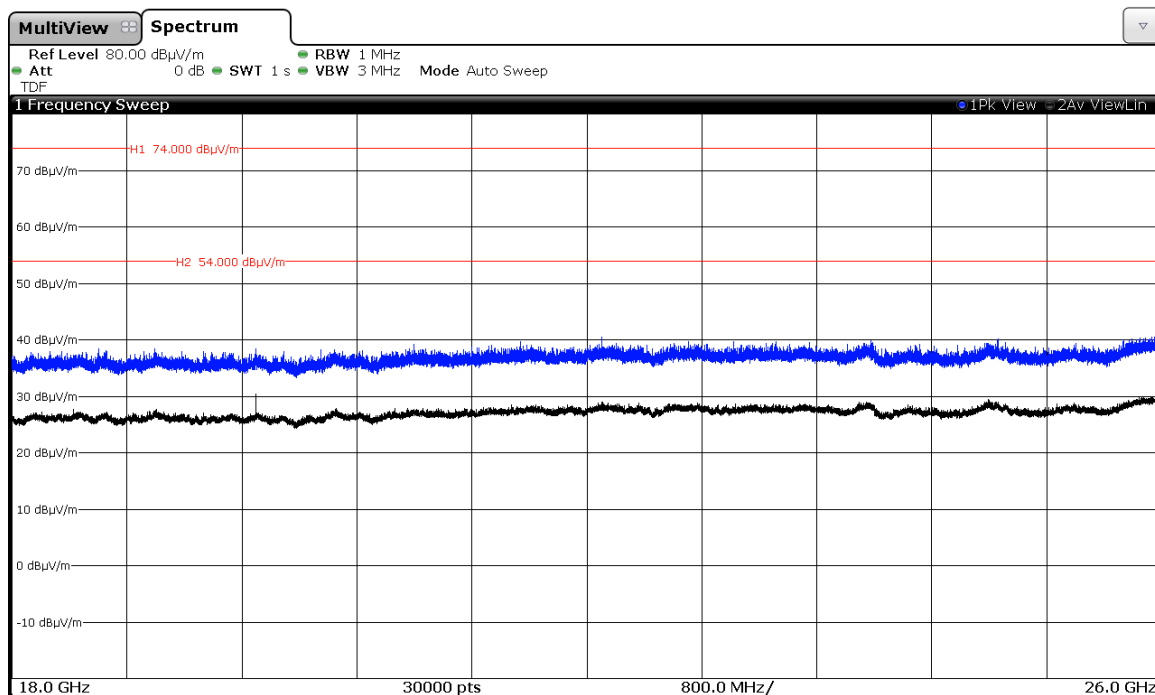
CHANNEL 1 (2412 MHz).



CHANNEL 6 (2437 MHz).

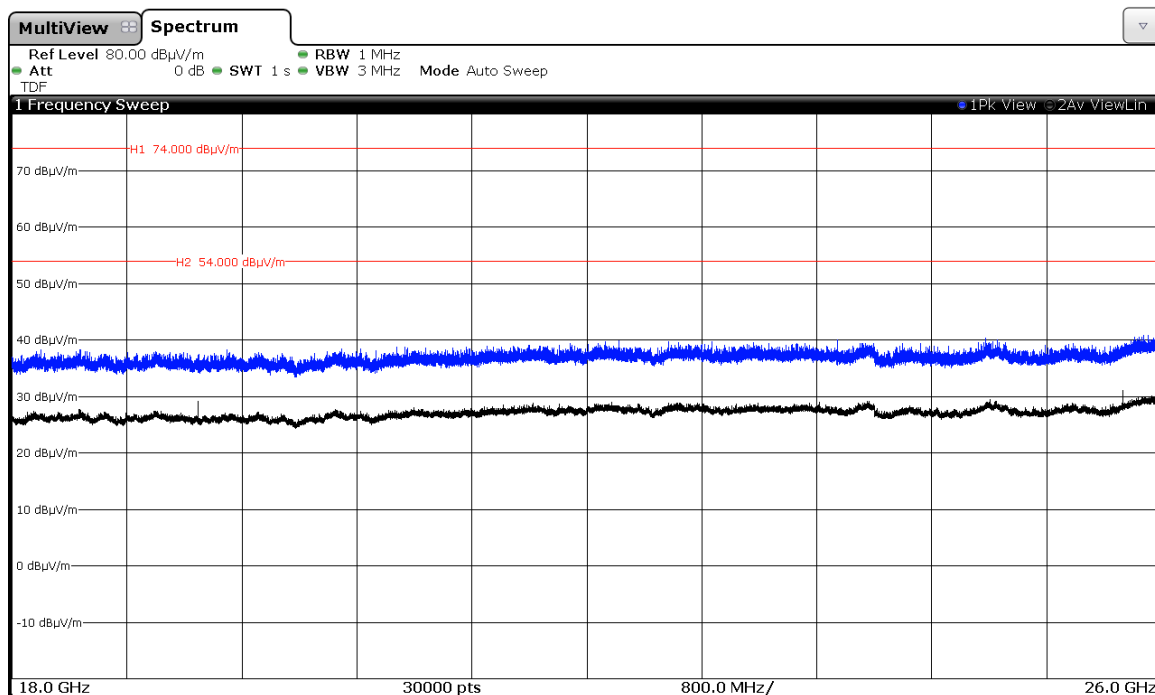


CHANNEL 11 (2462 MHz).

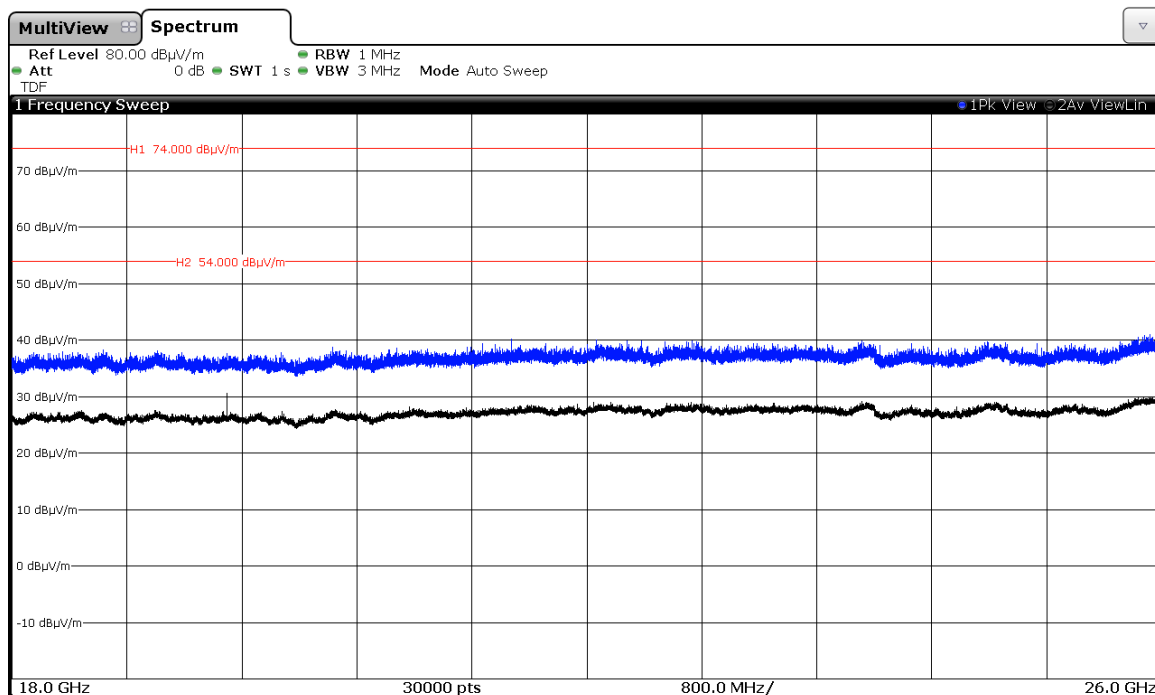


## 2. WiFi 2.4GHz 802.11 g mode

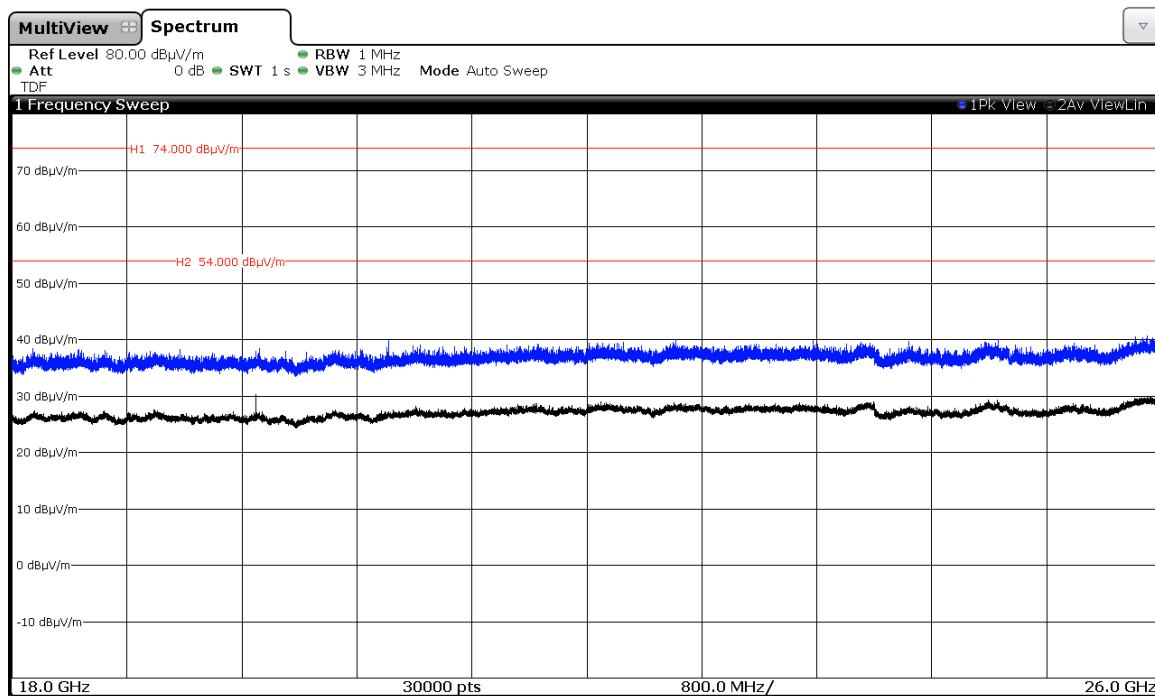
CHANNEL 1 (2412 MHz).



CHANNEL 6 (2437 MHz).

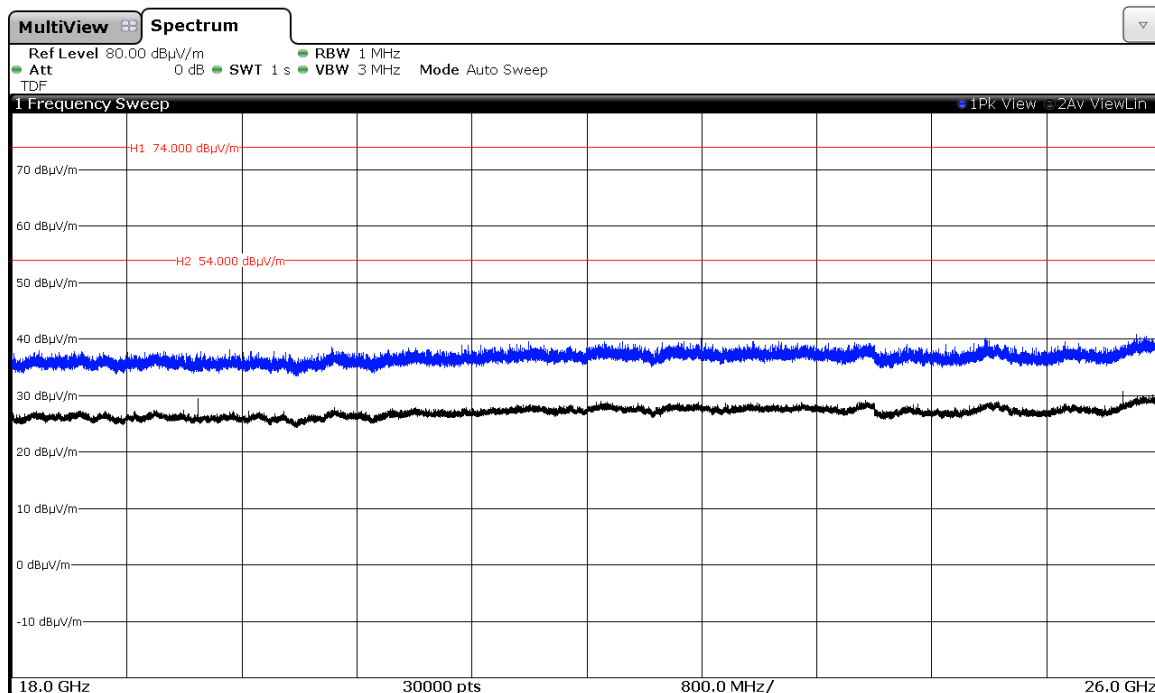


CHANNEL 11 (2462 MHz).

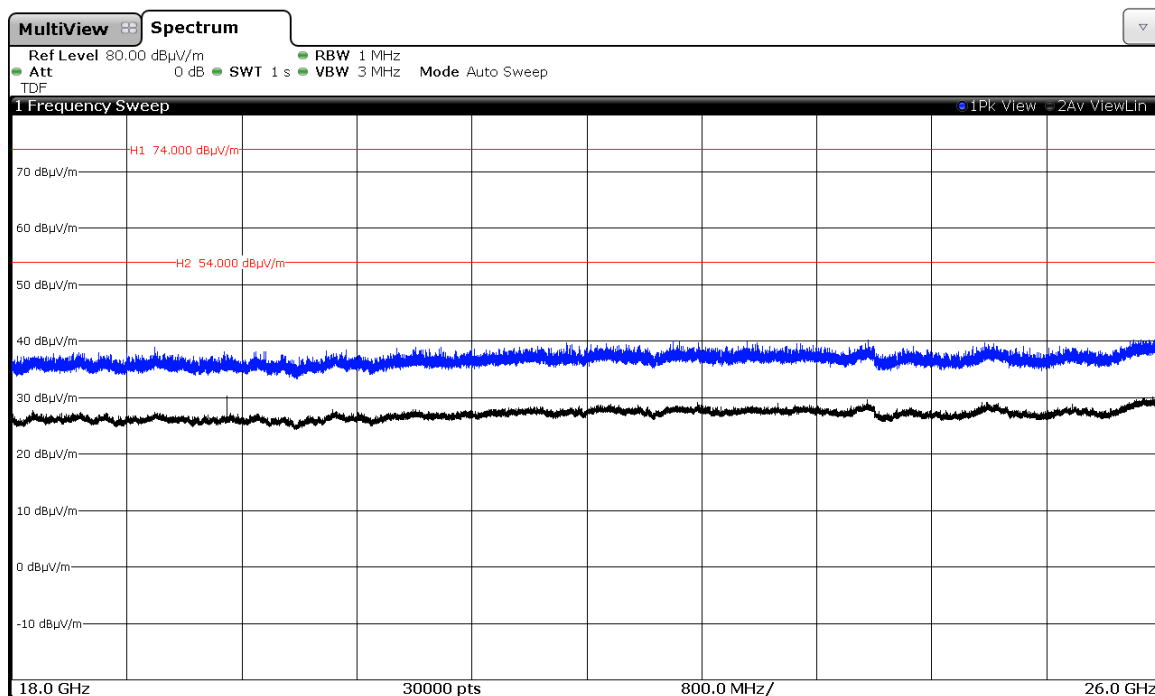


### 3. WiFi 2.4GHz 802.11 n20 mode

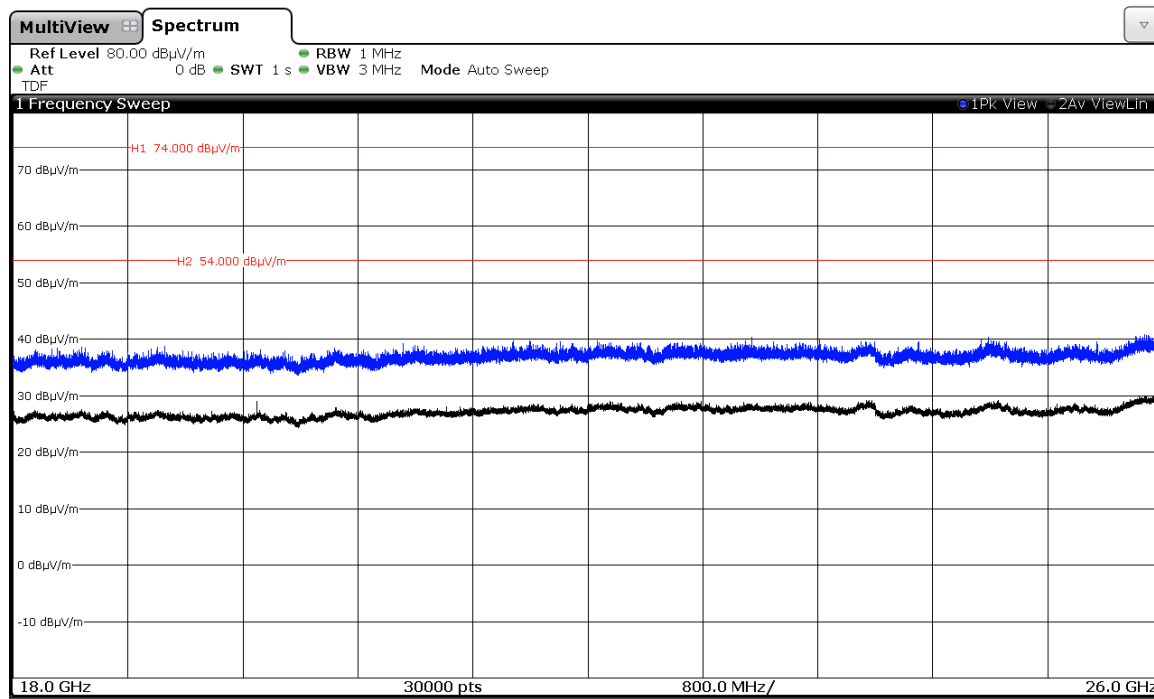
CHANNEL 1 (2412 MHz).



CHANNEL 6 (2437 MHz).



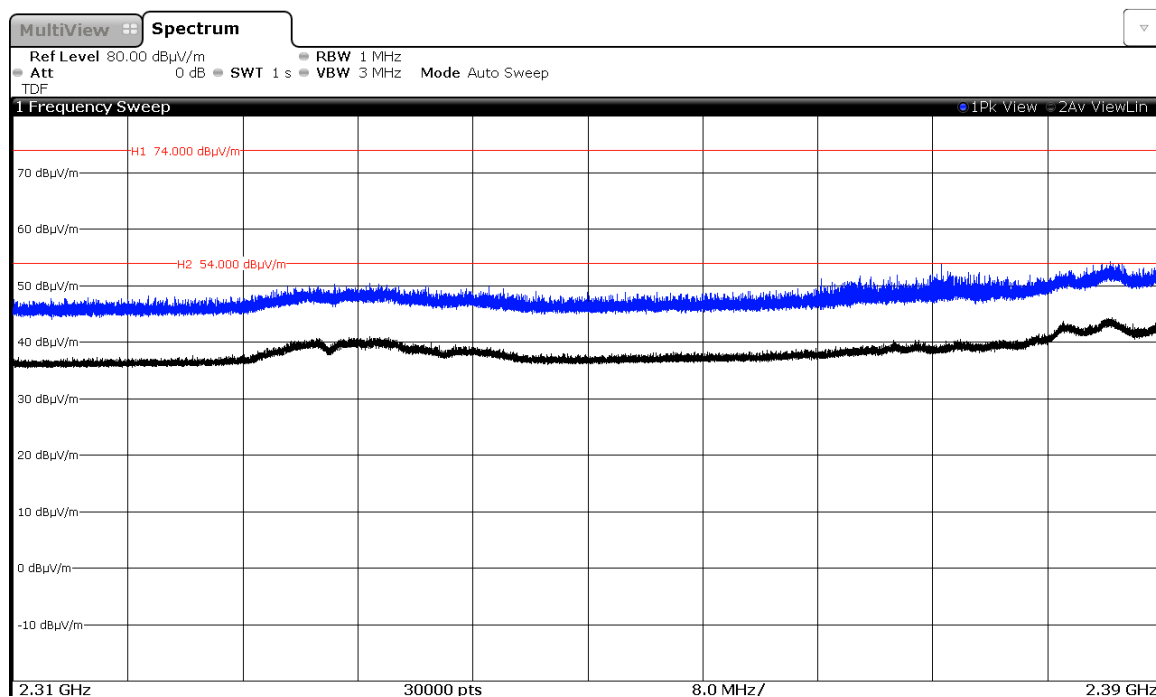
CHANNEL 11 (2462 MHz).



## FREQUENCY RANGE 2.31 GHz to 2.39 GHz. (RESTRICTED BAND)

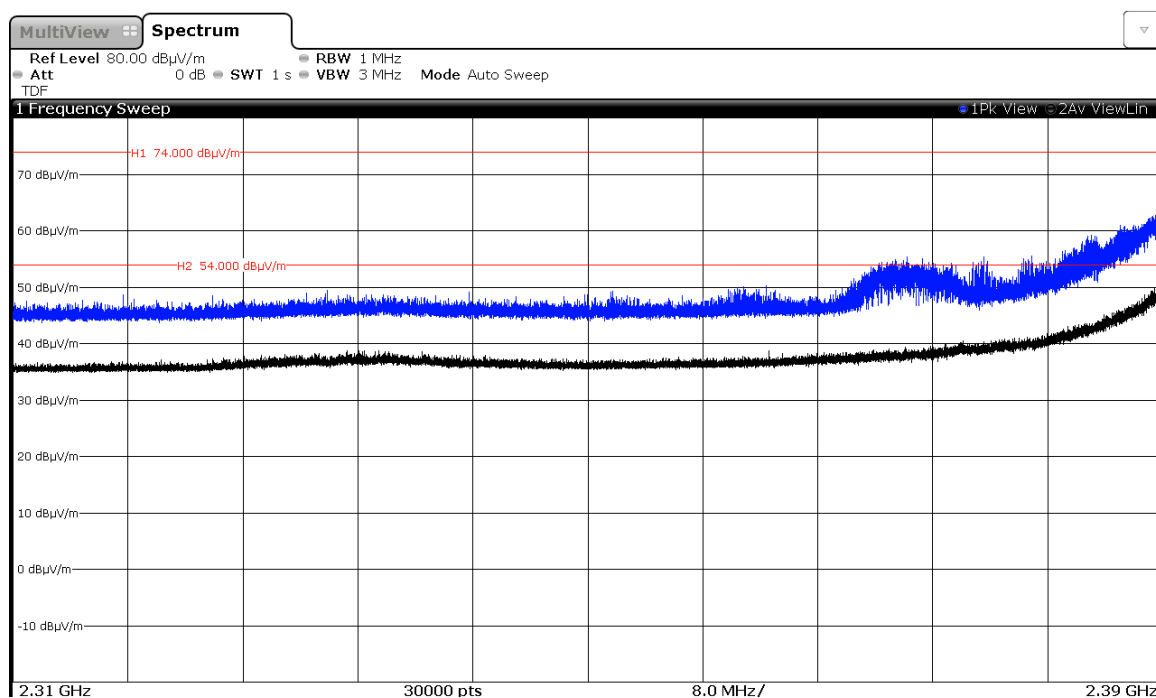
### 1. WiFi 2.4GHz 802.11 b mode

CHANNEL 1 (2412 MHz).



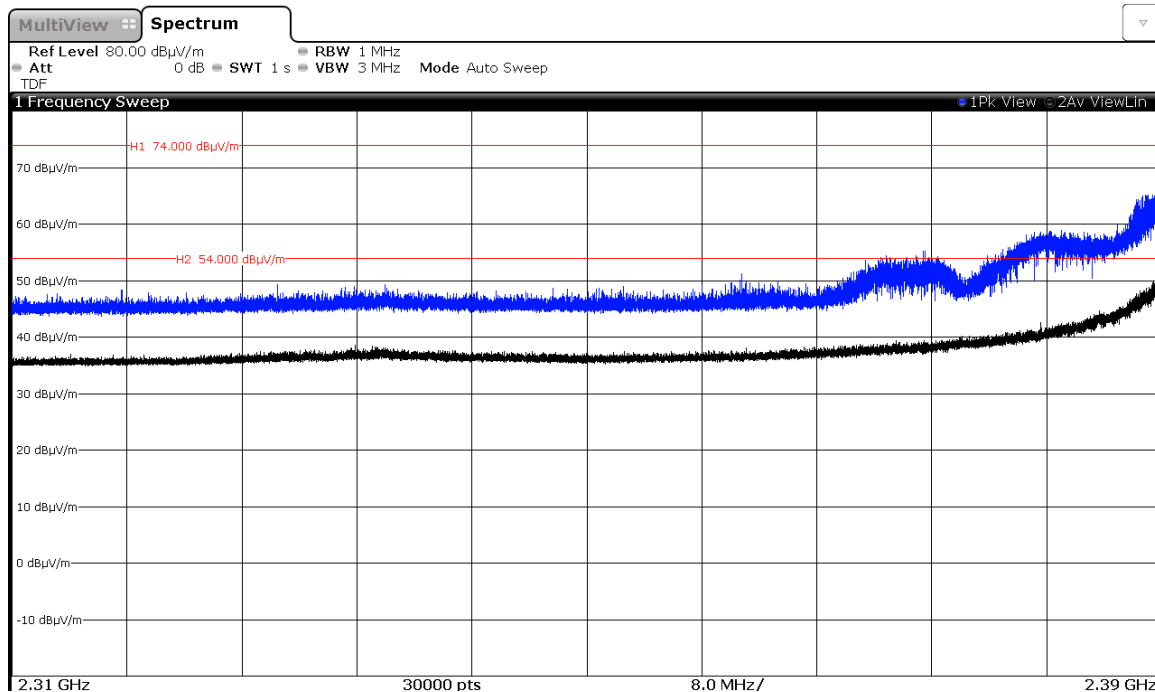
### 2. WiFi 2.4GHz 802.11 g mode

CHANNEL 1 (2412 MHz).



### 3. WiFi 2.4GHz 802.11 n20 mode

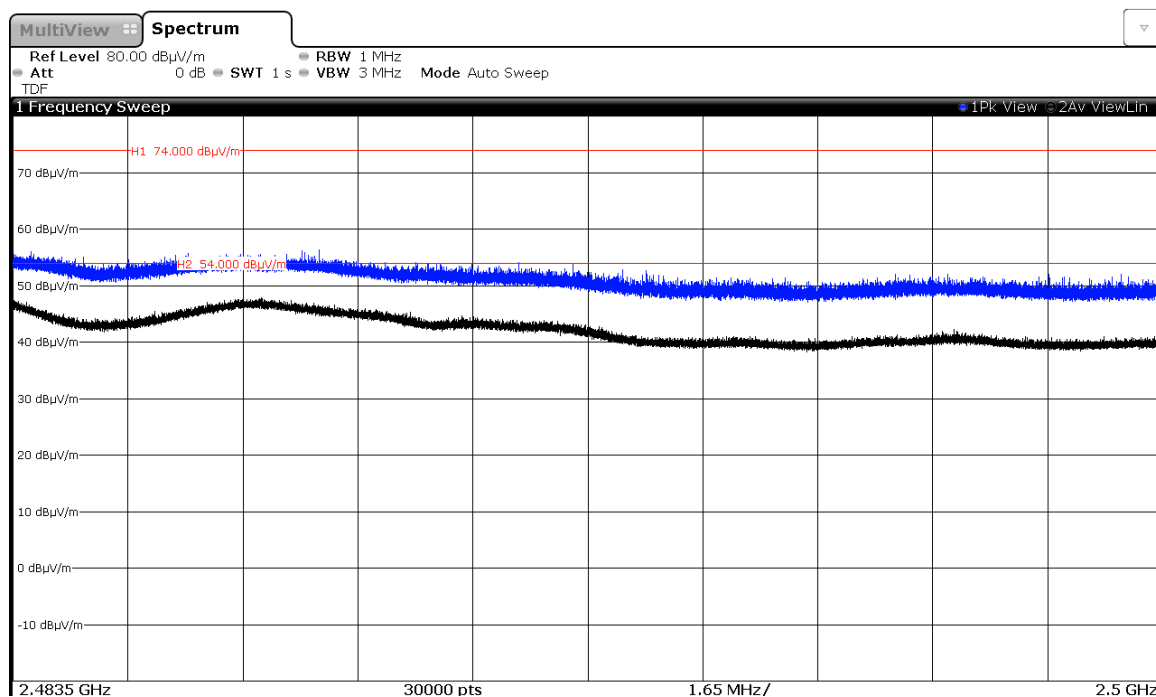
CHANNEL 1 (2412 MHz).



FREQUENCY RANGE 2.4835 GHz to 2.5 GHz. (RESTRICTED BAND)

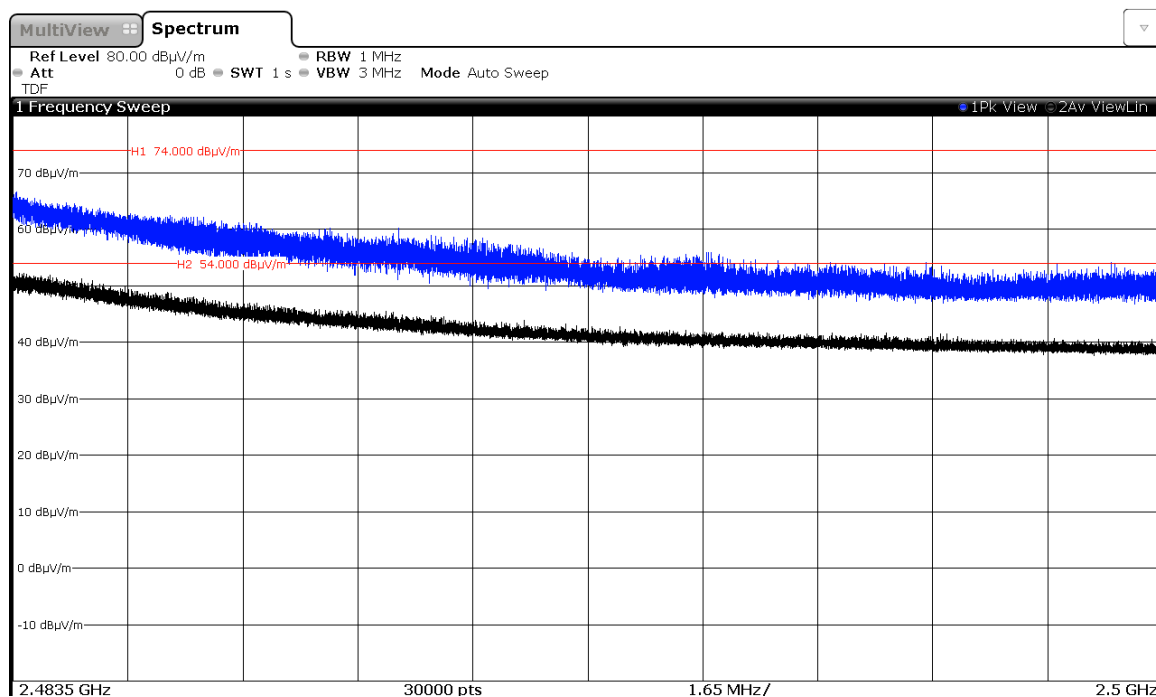
### 1. WiFi 2.4GHz 802.11 b mode

CHANNEL 11 (2462 MHz).



### 2. WiFi 2.4GHz 802.11 g mode

CHANNEL 11 (2462 MHz).



### 3. WiFi 2.4GHz 802.11 n20 mode

CHANNEL 11 (2462 MHz).

