

# Test report

**Number** T251-0152/25

Project file: C20242272

Date: 2025-03-24

Pages: 45

**Product:** **Charger System Wireless**  
**CS WSP STD 3300W, CS WSB STD 3300W (24V, 36 V and 48 V)**

**Type reference:** **EOE16010953, EOE16011067, EOE16011066, EOE16010871**

**Ratings:** WSB: Input: Pairing with WSP  
WSB: Output: 25 V d.c.; max 132 A  
37.5 V d.c.; max 88 A  
50 V d.c; max 66 A

**Trademark:**



**Applicant:** **Delta Energy Systems (Germany) GmbH**  
**Tscheulinstrasse 21, DE-79331 Teningen, Germany**

**Manufacturer:** Delta Energy Systems (Germany) GmbH  
Tscheulinstrasse 21, DE-79331 Teningen, Germany

**Place of manufacture:** Delta Energy Systems (Germany) GmbH  
Tscheulinstrasse 21, DE-79331 Teningen, Germany

## Summary of testing

**Testing method:** 47 CFR Part 15, Subpart C  
RSS-Gen (Issue 5), RSS-210 (Issue 11) last amended 2024-08-08 in  
conjunction with ANSI C63.10:2013

**Testing location:** SIQ Ljubljana  
Mašera-Spasičeva ulica 10, SI-1000 Ljubljana, Slovenia

**Remarks:** Date of receipt of test items: 2024-12-18  
Number of items tested: 1  
Date of performance of tests: 2025-01-15 – 2025-02-19  
The test results presented in this report relate only to the items tested.  
The test items were tested in the condition as received.  
The product complies with the requirements of the testing methods.

Tested by: Luka Cvajnar

Approved by: Marjan Mak

*The report shall not be reproduced except in full.*

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## 1 GENERAL

### History sheet

| Date       | Report No.   | Change                      | Revision |
|------------|--------------|-----------------------------|----------|
| 2025-03-24 | T251-0152/25 | Initial Test Report issued. | --       |

#### Environmental conditions:

Ambient temperature: 15°C to 35°C

Relative humidity: 30% to 60%

Atmospheric pressure: 860 mbar to 1060 mbar

### 1.1 Equipment under test

#### Charger System Wireless

CS WSP STD 3300W, CS WSB STD 3300W (24V, 36 V and 48 V)

Type: EOE16010953, EOE16011067, EOE16011066, EOE16010871

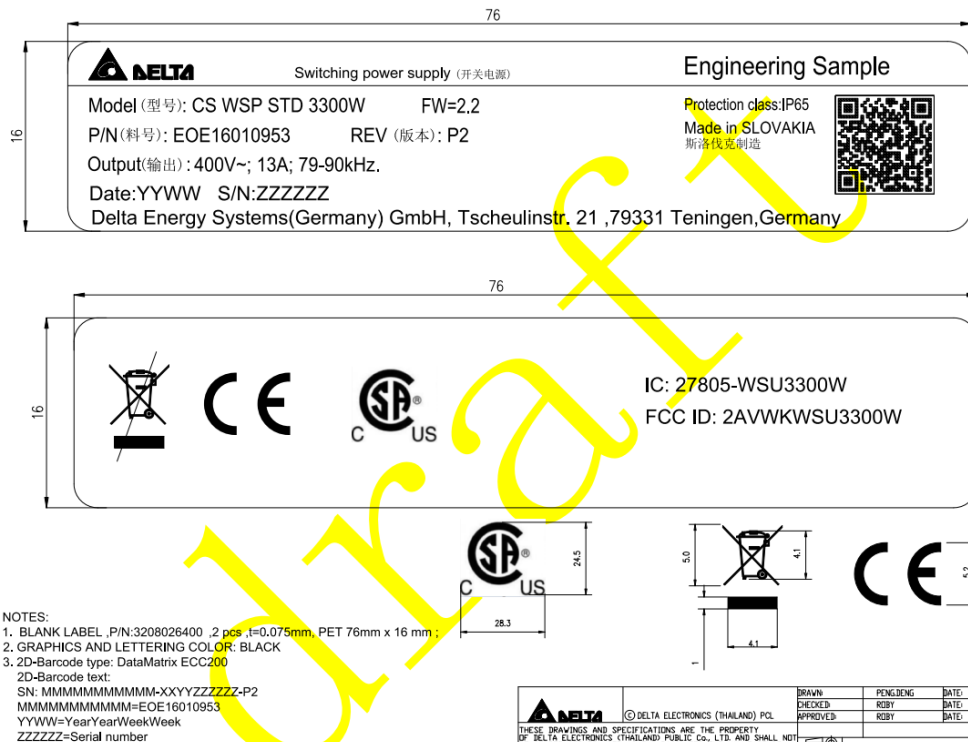
FCC ID: 2AVWKWSU3300W

IC: 27805-WSU3300W

#### Equipment marking plates:

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.

#### WSP:



Must meet Delta General Spec. 10000-0162

|                                                                                                                                                                                                                               |                                    |                       |           |              |            |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|-----------------------|-----------|--------------|------------|
| <b>DELTA</b>                                                                                                                                                                                                                  | © DELTA ELECTRONICS (THAILAND) PCL | DRAWN                 | PENG BENG | DATE:        | Apr-16-24  |
|                                                                                                                                                                                                                               |                                    | CHECKED               | RUBY      | DATE:        | Apr-16-24  |
|                                                                                                                                                                                                                               |                                    | APPROVED              | RUBY      | DATE:        | Apr-16-24  |
| THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF DELTA ELECTRONICS (THAILAND) PUBLIC CO., LTD. AND SHALL NOT BE REPRODUCED OR USED AS THE BASIS FOR THE MANUFACTURE OR SELL OF APPARATUS OR SERVICES WITHOUT PERMISSION. |                                    | Description WSP LABEL |           |              |            |
| Part NO.                                                                                                                                                                                                                      | GENERAL TOL.                       | Doc-Type              | A3        | Part No.     | 3265483700 |
| SCALE: 4:1                                                                                                                                                                                                                    | UNIT: MM                           | Used on: EOE16010953  | SIZE      | Sheet 2 of 2 | ECO_No.    |
|                                                                                                                                                                                                                               |                                    |                       |           |              | REV: 05    |

WSB 24V:

|                                                                                                                                                                                                                                                          |  |                               |  |                                                                                     |  |                                             |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-------------------------------|--|-------------------------------------------------------------------------------------|--|---------------------------------------------|--|
|                                                                                                                                                                         |  | Switching power supply (开关电源) |  | Engineering Sample                                                                  |  |                                             |  |
| Model (型号): CS WSB STD 3300W 24V FW=3.1                                                                                                                                                                                                                  |  | Protection class: IP65        |  |  |  |                                             |  |
| P/N (料号): EOE16011067 REV (版本): P2                                                                                                                                                                                                                       |  | Made in SLOVAKIA<br>斯洛伐克制造    |  |                                                                                     |  |                                             |  |
| Input (输入): 400V~; 13A; 79-90kHz.                                                                                                                                                                                                                        |  |                               |  |                                                                                     |  |                                             |  |
| Output (输出): 25V=; 132A max. Date: YYWW S/N: ZZZZZZ                                                                                                                                                                                                      |  |                               |  |                                                                                     |  |                                             |  |
| Delta Energy Systems (Germany) GmbH, Tscheulinstr. 21, 79331 Teningen, Germany                                                                                                                                                                           |  |                               |  |                                                                                     |  |                                             |  |
|       |  |                               |  |                                                                                     |  | IC: 27805-WSU3300W<br>FCC ID: 2AVWKWSU3300W |  |
|    |  |                               |  |                                                                                     |  |                                             |  |

NOTES:  
1. BLANK LABEL, P/N: 3208026400, 2 pcs, t=0.075mm, PET 76mm x 16 mm;  
2. GRAPHICS AND LETTERING COLOR: BLACK  
3. 2D-Barcode type: DataMatrix ECC200  
2D-Barcode text:  
SN: MMMMMMMMMM-XXYYZZZZZ-P2  
MMMMMMMMMM=EOE16011067  
YYWW=YearYearWeekWeek  
ZZZZZ=Serial number

Must meet Delta General Spec. 10000-0162

|                                                                                    |                                                                                                                                                                                                                               |               |                                 |                     |         |
|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------------------------|---------------------|---------|
|  | © DELTA ELECTRONICS (THAILAND) PCL                                                                                                                                                                                            |               | DRAWN: PONGJONG DATE: Apr-16-24 |                     |         |
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|                                                                                    | Plant HOC                                                                                                                                                                                                                     |               | APPROVED: ROBY DATE: Apr-16-24  |                     |         |
|                                                                                    | GENERAL TOL: ±0.2mm                                                                                                                                                                                                           |               | Description: WSB LABEL          |                     |         |
| SCALE: 4:1                                                                         | UNIT: MM                                                                                                                                                                                                                      | Doc-Type: 000 | A3                              | Part No: 3265719200 | REV: 04 |
| Used on: EOE16011067                                                               |                                                                                                                                                                                                                               | Sheet 2 of 2  |                                 | ECO_No:             |         |

WSB 36V:

|                                                                                                                                                                                                                                                                 |  |                               |  |                                                                                       |  |                                             |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-------------------------------|--|---------------------------------------------------------------------------------------|--|---------------------------------------------|--|
|                                                                                                                                                                              |  | Switching power supply (开关电源) |  | Engineering Sample                                                                    |  |                                             |  |
| Model (型号): CS WSB STD 3300W 36V FW=3.1                                                                                                                                                                                                                         |  | Protection class: IP65        |  |  |  |                                             |  |
| P/N (料号): EOE16011066 REV (版本): P2                                                                                                                                                                                                                              |  | Made in SLOVAKIA<br>斯洛伐克制造    |  |                                                                                       |  |                                             |  |
| Input (输入): 400V~; 13A; 79-90kHz.                                                                                                                                                                                                                               |  |                               |  |                                                                                       |  |                                             |  |
| Output (输出): 37.5V=; 88A max. Date: YYWW S/N: ZZZZZZ                                                                                                                                                                                                            |  |                               |  |                                                                                       |  |                                             |  |
| Delta Energy Systems (Germany) GmbH, Tscheulinstr. 21, 79331 Teningen, Germany                                                                                                                                                                                  |  |                               |  |                                                                                       |  |                                             |  |
|        |  |                               |  |                                                                                       |  | IC: 27805-WSU3300W<br>FCC ID: 2AVWKWSU3300W |  |
|    |  |                               |  |                                                                                       |  |                                             |  |

NOTES:  
1. BLANK LABEL, P/N: 3208026400, 2 pcs, t=0.075mm, PET 76mm x 16 mm;  
2. GRAPHICS AND LETTERING COLOR: BLACK  
3. 2D-Barcode type: DataMatrix ECC200  
2D-Barcode text:  
SN: MMMMMMMMMM-XXYYZZZZZ-P2  
MMMMMMMMMM=EOE16011066  
XXYY=YearYearWeekWeek  
ZZZZZ=Serial number

Must meet Delta General Spec. 10000-0162

|                                                                                     |                                                                                                                                                                                                                               |               |                                 |                     |         |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------------------------|---------------------|---------|
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|                                                                                     | Plant HOC                                                                                                                                                                                                                     |               | APPROVED: ROBY DATE: Apr-16-24  |                     |         |
|                                                                                     | GENERAL TOL: ±0.2mm                                                                                                                                                                                                           |               | Description: WSB LABEL          |                     |         |
| SCALE: 4:1                                                                          | UNIT: MM                                                                                                                                                                                                                      | Doc-Type: 000 | A3                              | Part No: 3265719100 | REV: 04 |
| Used on: EOE16011066                                                                |                                                                                                                                                                                                                               | Sheet 2 of 2  |                                 | ECO_No:             |         |

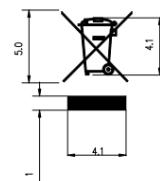
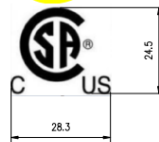
## WSB 48V:

|                                                                               |                                                                                   |                               |                                                                                     |
|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------|-------------------------------------------------------------------------------------|
| 16                                                                            |  | Switching power supply (开关电源) | Engineering Sample                                                                  |
|                                                                               | Model (型号): CS WSB STD 3300W 48V FW=3.1                                           |                               | Protection class: IP65                                                              |
|                                                                               | P/N (料号): EOE16010871 REV (版本): P2                                                |                               | Made in SLOVAKIA<br>斯洛伐克制造                                                          |
|                                                                               | Input (输入): 400V~; 13A; 79-90kHz.                                                 |                               |  |
|                                                                               | Output (输出): 50V=; 66A max. Date: YYWW S/N: ZZZZZZ                                |                               |                                                                                     |
| Delta Energy Systems(Germany) GmbH, Tscheulinstr. 21, 79331 Teningen, Germany |                                                                                   |                               |                                                                                     |

|    |                                                                                   |                                                                                   |                                                                                   |                       |
|----|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------|
| 16 |  |  |  | IC: 27805-WSU3300W    |
|    |                                                                                   |                                                                                   |                                                                                   | FCC ID: 2AVWKWSU3300W |

## NOTES:

1. BLANK LABEL ,P/N:3208026400 ,2 pcs ,t=0.075mm, PET 76mm x 16 mm ;
  2. GRAPHICS AND LETTERING COLOR: BLACK
  3. 2D-Barcode type: DataMatrix ECC200
- 2D-Barcode text:  
SN: MMMMMMMMMM-XXYYZZZZZ-P2  
MMMMMMMMMM=EOE16010871  
YYWW=YearYearWeekWeek  
ZZZZZ=Serial number



Must meet Delta General Spec. 10000-0162

|                                                                                                                                                                                                                                |                                    |  |             |           |       |                      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|--|-------------|-----------|-------|----------------------|
|                                                                                                                                             | © DELTA ELECTRONICS (THAILAND) PCL |  | DRAWN:      | PENG BENG | DATE: | Apr-16-24            |
|                                                                                                                                                                                                                                |                                    |  | CHECKED:    | ROBY      | DATE: | Apr-16-24            |
|                                                                                                                                                                                                                                |                                    |  | APPROVED:   | ROBY      | DATE: | Apr-16-24            |
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| Plant HDC                                                                                                                                                                                                                      |                                    |  | Part No.    |           |       | 3265483600           |
| GENERAL TOL: ±0.2mm                                                                                                                                                                                                            |                                    |  | Doc-Type    |           |       | 000                  |
| SCALE: 4:1                                                                                                                                                                                                                     |                                    |  | UNIT: MM    |           |       | Used on: EOE16010871 |
|                                                                                                                                                                                                                                |                                    |  | A3 SIZE     |           |       | Sheet 2 of 2         |
|                                                                                                                                                                                                                                |                                    |  | ECO_No:     |           |       | 05                   |

### 1.1.1 General product information

|                                      |                                                              |
|--------------------------------------|--------------------------------------------------------------|
| <b>Product</b>                       | Wireless charger                                             |
| <b>Type / Model</b>                  | Wireless Secondary Pad: WSP<br>Wireless Secondary Box: WSB   |
| <b>Supply voltage of transmitter</b> | 5 Vdc                                                        |
| <b>Operating frequency</b>           | 13.56 MHz                                                    |
| <b>Number of channels</b>            | 1                                                            |
| <b>Antenna type</b>                  | Rectangular planar antenna                                   |
| <b>Modulation type</b>               | ASK Modulation (100%)                                        |
| <b>Hardware version</b>              | Wireless Secondary Pad: P2.1<br>Wireless Secondary Box: P2.1 |
| <b>Software version</b>              | Wireless Secondary Pad: 2.2<br>Wireless Secondary Box: 3.1   |

#### General description of test item:

Device is a wireless charger for charging of batteries with BMS.

Device consists of 4 parts:

- Wireless Primary Box (EOE16010870): In short marked as »WPB«
- Wireless Primary Pad (EOE16010952). In short marked as »WPP«
- Wireless Secondary Pad (EOE16010953). In short marked as »WSP«
- Wireless Secondary Box that can be one of the following:
  - 24 Vdc output (EOE16011067) in short marked as »WSB 24V«
  - 36 Vdc output (EOE16011066) in short marked as »WSB 36V«
  - 48 Vdc output (EOE16010871) in short marked as »WSB 48V«

Wireless charging is being transmitted at frequency of 79-90 kHz. Primary and secondary pad are communicating at frequency of 13,56 MHz

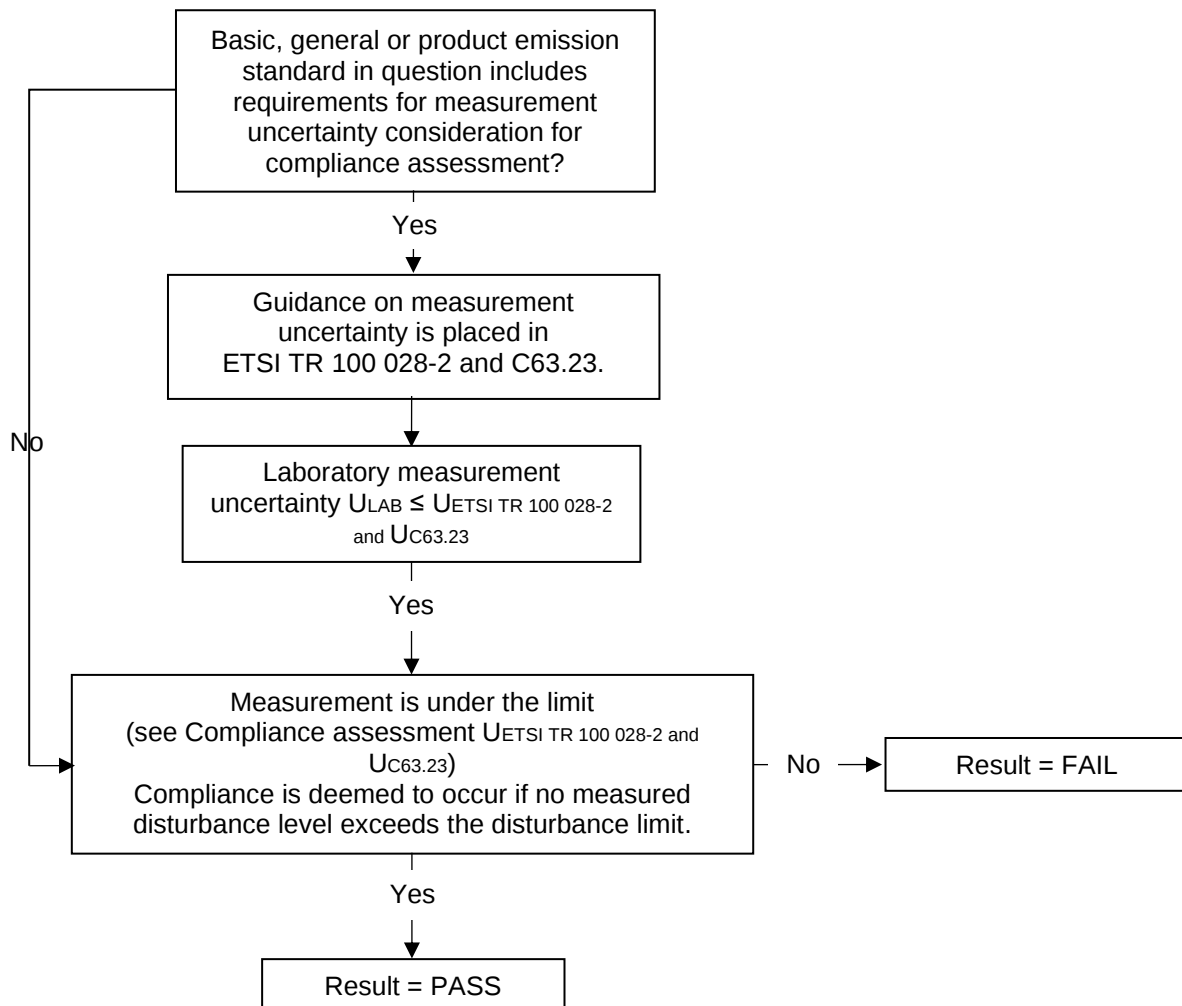
| Test mode | Description                                                                                                                             |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b>  | Secondary pad was activated and waiting for communication with primary pad                                                              |
| <b>2</b>  | Communication between primary pad and secondary pad was established. The secondary pad was set to declared distance to the primary pad. |

## 1.2 Application of decision rule

Application of decision rule and statement of conformity is defined in document TN023 Decision rule and measurement uncertainty.

As a general rule Pass/Fail decisions are based on simple acceptance rule and acceptance limits chosen based on simple acceptance ( $w = 0$ ,  $AL = TL$ ) except if a decision rule is governed by particular standard or guidance document.

Decision rule:



## 2 TEST EQUIPMENT

### 2.1 General information

| Equipment used                      |            |                  |                     |                  |                      |
|-------------------------------------|------------|------------------|---------------------|------------------|----------------------|
| Conducted measurements              |            |                  |                     |                  |                      |
| Equipment                           | Type       | Inventory number | Manufacturer        | Last calibration | Calibration due date |
| Spectrum analyser                   | FSV40      | 101848           | Rohde & Schwarz     | 2024-11-08       | 2026-11-08           |
| Temperature chamber                 | I-190 CK   | /                | Kambič              | N/A              | N/A                  |
| Radiated measurements               |            |                  |                     |                  |                      |
| EMI test receiver                   | ESW 44     |                  | R&S                 | 2024-09-26       | 2026-03-26           |
| Semi-anechoic chamber               | SAC 3m     | 109071           | Comtest engineering | 2022-04-14       | 2025-04-14           |
| Ultra-Broadband Antenna             | HL562E     | /                | Rohde & Schwarz     | 2023-09-26       | 2026-09-26           |
| Horn Antenna                        | HF907      | 102508           | Rohde & Schwarz     | 2023-08-22       | 2026-08-22           |
| Active loop antenna                 | FMZB 1519  |                  | Schwarzbeck         | 2024-09-18       | 2026-03-18           |
| Turn table (2 m diameter)           | TT 2.0 SI  | /                | Maturo              | N/A              |                      |
| Bore-sight antenna mast             | BAM-4.0-P  | /                | Maturo              | N/A              |                      |
| Multi-channel positioning equipment | Maturo NCD | /                | Maturo              | N/A              |                      |

### 2.2 Conversion factors and all other formulas

| Unit       | Conversion unit | Formula of conversion                         |
|------------|-----------------|-----------------------------------------------|
| dB $\mu$ V | dB $\mu$ V/m    | dB $\mu$ V/m = dB $\mu$ V + AF                |
| $\mu$ V/m  | dB $\mu$ V/m    | dB $\mu$ V/m = 20log(X( $\mu$ V/m)/1 $\mu$ V) |

| Test distance stated in standard | Test distance of measurement | Conversion factor          |
|----------------------------------|------------------------------|----------------------------|
| 3 m                              | 3 m                          | /                          |
| 10 m                             | 3 m                          | 20dB/decade (over 30 MHz)  |
|                                  |                              | 40dB/decade (under 30 MHz) |

### 3 TEST SUMMARY

| STANDARDS (details on first page)              | Tested                              |                          | Sample                              |                          |
|------------------------------------------------|-------------------------------------|--------------------------|-------------------------------------|--------------------------|
|                                                | yes                                 | no                       | pass                                | not pass                 |
| ANSI C63.10-2013;<br>47 CFR Part 15, Subpart C | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

| Test                                      | 47 CFR<br>Part 15 section | Section within<br>the report | Conclusion |
|-------------------------------------------|---------------------------|------------------------------|------------|
| Antenna requirements                      | 15.203                    | 5.1                          | PASS       |
| Restricted bands of operation             | 15.205                    | 5.2                          | PASS       |
| Conducted emission                        | 15.207                    | 5.3                          | PASS       |
| Radiated emission                         | 15.209                    | 5.4                          | PASS       |
| Bandwidth of the emission                 | 15.215                    | 5.5                          | PASS       |
| Spectrum mask                             | 15.225                    | 5.6                          | PASS       |
| Frequency tolerance of the carrier signal | 15.225                    | 5.7                          | PASS       |

#### 3.1 Operating voltages/frequencies used for testing

| Section | Test                                      | Operating conditions            |
|---------|-------------------------------------------|---------------------------------|
| 6.1     | Restricted bands of operation             | 24 V d.c.                       |
| 6.2     | Conducted emission                        | /                               |
| 6.3     | Radiated emission                         | 24 V d.c., 36 V d.c., 48 V d.c. |
| 6.4     | Bandwidth of the emission                 | 24 V d.c.                       |
| 6.5     | Spectrum mask                             | 24 V d.c.                       |
| 6.6     | Frequency tolerance of the carrier signal | 24 V d.c.                       |



## 4 TESTS RESULTS

### 4.1 Antenna requirements (§15.203)

#### Requirement

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

#### Conclusion:

PASS; EUT has internal PCB antenna.

## 4.2 Restricted bands of operation (§15.205)

### 4.2.1 Requirement

Except as shown in paragraph (d) of §15.205 only spurious emissions are permitted in any of the frequency bands listed below:

| MHz                      | MHz                 | MHz           | GHz              |
|--------------------------|---------------------|---------------|------------------|
| 0.090-0.110              | 16.42-16.423        | 399.9-410     | 4.5-5.15         |
| <sup>1</sup> 0.495-0.505 | 16.69475-16.69525   | 608-614       | 5.35-5.46        |
| 2.1735-2.1905            | 16.80425-16.80475   | 960-1240      | 7.25-7.75        |
| 4.125-4.128              | 25.5-25.67          | 1300-1427     | 8.025-8.5        |
| 4.17725-4.17775          | 37.5-38.25          | 1435-1626.5   | 9.0-9.2          |
| 4.20725-4.20775          | 73-74.6             | 1645.5-1646.5 | 9.3-9.5          |
| 6.215-6.218              | 74.8-75.2           | 1660-1710     | 10.6-12.7        |
| 6.26775-6.26825          | 108-121.94          | 1718.8-1722.2 | 13.25-13.4       |
| 6.31175-6.31225          | 123-138             | 2200-2300     | 14.47-14.5       |
| 8.291-8.294              | 149.9-150.05        | 2310-2390     | 15.35-16.2       |
| 8.362-8.366              | 156.52475-156.52525 | 2483.5-2500   | 17.7-21.4        |
| 8.37625-8.38675          | 156.7-156.9         | 2690-2900     | 22.01-23.12      |
| 8.41425-8.41475          | 162.0125-167.17     | 3260-3267     | 23.6-24.0        |
| 12.29-12.293             | 167.72-173.2        | 3332-3339     | 31.2-31.8        |
| 12.51975-12.52025        | 240-285             | 3345.8-3358   | 36.43-36.5       |
| 12.57675-12.57725        | 322-335.4           | 3600-4400     | ( <sup>2</sup> ) |
| 13.36-13.41              |                     |               |                  |

<sup>1</sup>Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup>Above 38.6

### 4.2.2 Test results

See Radiated emission results under 5.4. Radiated emission and 5.6 Spectrum mask.

### 4.3 Conducted emission measurement (§15.207)

#### 4.3.1 Requirement

| Frequency Range<br>(MHz) | Limits (dBµV) |          |
|--------------------------|---------------|----------|
|                          | Quasi-peak    | Average  |
| 0.15 to 0.5              | 66 – 56*      | 56 – 46* |
| 0.5 to 5.0               | 56            | 46       |
| 5.0 to 30.0              | 60            | 50       |

\* Decreases with the logarithm of the frequency.

The shown limits in table shall not apply to carrier current systems operating as intentional radiators on frequencies below 30 MHz. In lieu thereof, these carrier current systems shall be subject to the following standards:

- For carrier current systems containing their fundamental emission within the frequency band 535-1705 kHz and intended to be received using a standard AM broadcast receiver: no limit on conducted emissions.
- For all other carrier current systems: 1000 µV within the frequency band 535-1705 kHz, as measured using a 50 µH/50 ohms LISN.
- Carrier current systems operating below 30 MHz are also subject to the radiated emission limits as appropriate.

#### 4.3.2 Test procedure

- As per clause 6.2 from ANSI C63.10-2013.
- The EUT is placed on a non-conductive 0.8 meters high table, 0.4 meters from the vertical conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). LISN provide 50 Ohm / 50 µH + 5 Ohm of coupling impedance for the measuring instrument.
- Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition.
- AC power lines of EUT are checked for maximum conducted interference.
- The frequency range from 150 kHz to 30 MHz is searched using PEAK, QUASI-PEAK and AVERAGE function of the receiver to determine compliance with Section 15.207 limits outside the transmitter's fundamental emission band. Bandwidth is set to 9 kHz.
- Measurement repeated with a dummy load in lieu of the antenna to determine compliance with Section 15.207 limits within the transmitter's fundamental emission band.

#### 4.3.3 Test results

N/A - Device connected to battery.

## 4.4 Radiated emission measurement (§15.209)

### 4.4.1 Requirement

| Frequency Range (MHz) | Limits (dBμV/m)                      | Test distance (m) |
|-----------------------|--------------------------------------|-------------------|
| 0.009 to 0.490        | $20 \cdot \log(2400/F(\text{kHz}))$  | 300               |
| 0.490 to 1.705        | $20 \cdot \log(24000/F(\text{kHz}))$ | 30                |
| 1.705 to 30.0         | 30                                   | 30                |
| 30 to 88              | 40**                                 | 3                 |
| 88 to 216             | 43.5**                               | 3                 |
| 216 to 960            | 46**                                 | 3                 |
| Above 960             | 54                                   | 3                 |

\*\* Except as provided in paragraph below, fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz.

Perimeter protection systems may operate in the 54-72 MHz and 76-88 MHz bands under the provisions of this section. The use of such perimeter protection systems is limited to industrial, business and commercial applications

### 4.4.2 Test procedure

#### Measurements from 9 kHz to 30 MHz

1. As per clause 6.4 from ANSI C63.10-2013
2. Radiated emission in the frequency range 9 kHz to 30 MHz are measured Active loop Antenna.
3. First preliminary measurements were performed in Semi-anechoic chamber at a distance of 3 m using active loop antenna.
4. The EUT was placed on the top of a rotating table 0.8 meters above the ground in an Anechoic Chamber. The table and antenna was rotated 360 degrees to determine the position of the highest radiation.
5. Final measurements were done at a distance of 10 m at Open Area Test Site due to low emissions measured during preliminary measurements acc. to the clauses from Part 15, Sections 15.31(d) and 15.31(f)(2). Test results were extrapolated by using the square of an inverse linear distance extrapolation factor (40 dB/decade).

#### Measurements from 30 MHz to 1 GHz

6. As per clause 6.5 from ANSI C63.10-2013
7. The EUT was placed on the top of a rotating table 0.8 meters above the ground in an Anechoic Chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
8. The EUT was set 3 m away from the interference-receiving antenna, which was mounted on the top of variable-height antenna tower.
9. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
10. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the turn table was turned from 0 degrees to 360 degrees to find the maximum reading.
11. The test-receiver system was set to PEAK and QUAS-PEAK Detect Function and Specified Bandwidth with Maximum Hold Mode.
12. The highest points would be re-tested one by one using the quasi-peak method.

### 4.4.3 Test results

Device passed the requirements stated in 47 CFR Part 15, Subpart C, Section 15.209

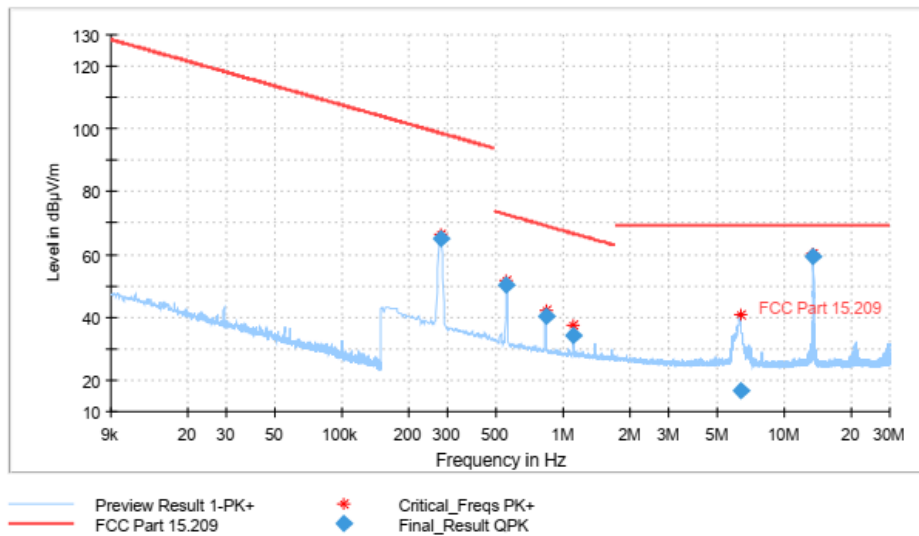
Preliminary measurements at 3 m:

Only secondary pad with 24 Vdc secondary box active, antenna in X orientation:

#### EUT Information

|                       |                            |
|-----------------------|----------------------------|
| EUT:                  | WSP+ WSB 24V               |
| Operating conditions: | Uin: 24 Vdc                |
| Operating mode:       | PPL Mode; Module turned on |
| Antenna polarization: | X                          |

#### Full Spectrum



#### Final Result

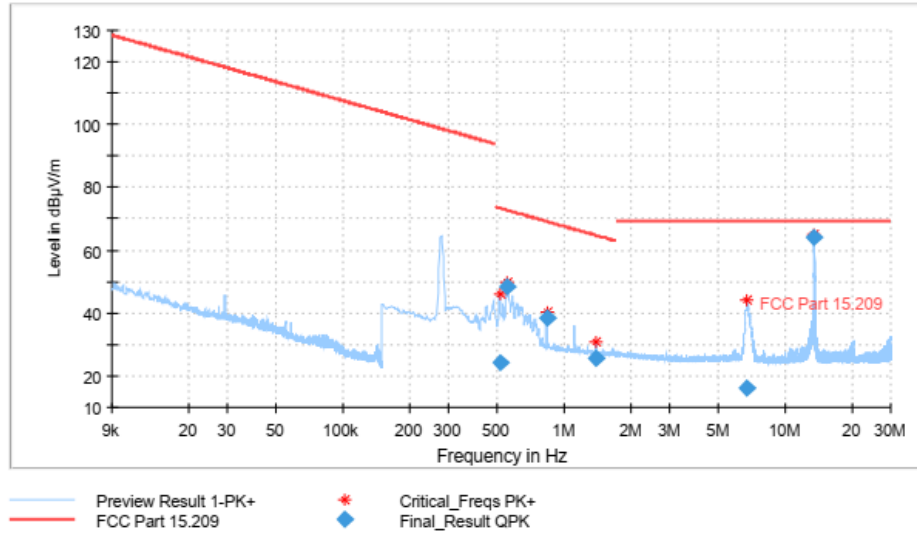
| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 13.560000       | 59.45              | 69.50          | 10.05       | 1000.0          | 9.000           | 100.0       | H   | 0.0           | 17.1         |
| 0.555000        | 50.43              | 72.72          | 22.29       | 1000.0          | 9.000           | 100.0       | H   | 74.0          | 16.9         |
| 0.834000        | 40.17              | 69.19          | 29.03       | 1000.0          | 9.000           | 100.0       | H   | 74.0          | 16.9         |
| 1.113000        | 34.19              | 66.69          | 32.50       | 1000.0          | 9.000           | 100.0       | H   | 74.0          | 16.9         |
| 0.278250        | 65.14              | 98.71          | 33.58       | 1000.0          | 9.000           | 100.0       | H   | 74.0          | 16.9         |
| 6.315000        | 16.56              | 69.50          | 52.94       | 1000.0          | 9.000           | 100.0       | H   | 311.0         | 16.9         |

Only secondary pad with 24 Vdc secondary box active, antenna in Y orientation:

## EUT Information

EUT: WSP+ WSB 24V  
Operating conditions: Uin: 24 Vdc  
Operating mode: PPL Mode; Module turned on  
Antenna polarization: Y

## Full Spectrum



## Final Result

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth h (deg) | Corr. (dB/m) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|-----------------|--------------|
| 13.560000       | 64.04              | 69.50          | 5.46        | 1000.0          | 9.000           | 100.0       | H   | 260.0           | 17.1         |
| 0.555000        | 48.51              | 72.72          | 24.21       | 1000.0          | 9.000           | 100.0       | H   | 18.0            | 16.9         |
| 0.834000        | 38.47              | 69.19          | 30.72       | 1000.0          | 9.000           | 100.0       | H   | 18.0            | 16.9         |
| 1.389750        | 25.50              | 64.77          | 39.28       | 1000.0          | 9.000           | 100.0       | H   | 38.0            | 16.9         |
| 0.512250        | 24.19              | 73.42          | 49.22       | 1000.0          | 9.000           | 100.0       | H   | 108.0           | 16.8         |
| 6.706500        | 16.31              | 69.50          | 53.19       | 1000.0          | 9.000           | 100.0       | H   | 119.0           | 16.9         |



Only Vdc secondary pad with 36 Vdc secondary box active, antenna in X orientation:

EUT Information

EUT:

Operating conditions:

Operating mode:

Antenna polarization:

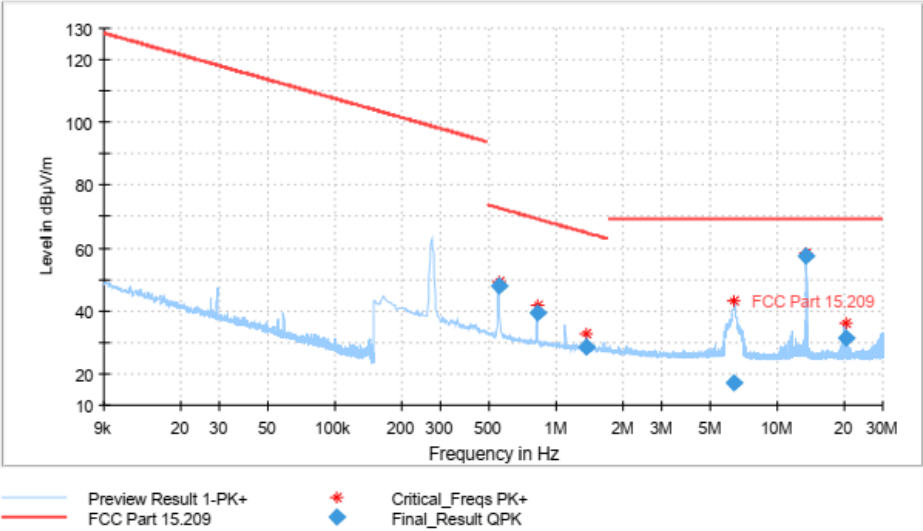
WSP+ WSB 36V

Uin: 36 Vdc

PPL Mode; Module turned on

X

Full Spectrum



Final Result

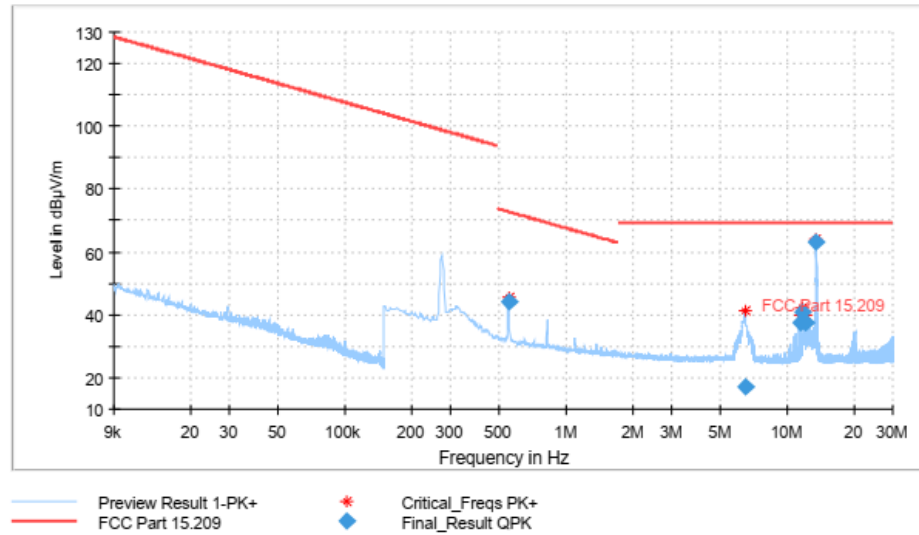
| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth h (deg) | Corr. (dB/m) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|-----------------|--------------|
| 13.560000       | 57.46              | 69.50          | 12.04       | 1000.0          | 9.000           | 100.0       | H   | 6.0             | 17.1         |
| 0.548250        | 48.01              | 72.83          | 24.82       | 1000.0          | 9.000           | 100.0       | H   | 0.0             | 16.9         |
| 0.822750        | 39.30              | 69.31          | 30.01       | 1000.0          | 9.000           | 100.0       | H   | 2.0             | 16.9         |
| 1.369500        | 28.43              | 64.90          | 36.46       | 1000.0          | 9.000           | 100.0       | H   | 6.0             | 16.9         |
| 20.274000       | 31.50              | 69.50          | 38.00       | 1000.0          | 9.000           | 100.0       | H   | 358.0           | 17.4         |
| 6.373500        | 17.34              | 69.50          | 52.16       | 1000.0          | 9.000           | 100.0       | H   | 322.0           | 16.9         |

Only secondary pad with 36 Vdc secondary box active, antenna in Y orientation:

## EUT Information

EUT: WSP+ WSB 36V  
Operating conditions: Uin: 36 Vdc  
Operating mode: PPL Mode; Module turned on  
Antenna polarization: Y

## Full Spectrum



## Final Result

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 13.560000       | 63.22              | 69.50          | 6.28        | 1000.0          | 9.000           | 100.0       | H   | 111.0         | 17.1         |
| 0.548250        | 43.98              | 72.83          | 28.85       | 1000.0          | 9.000           | 100.0       | H   | 52.0          | 16.9         |
| 11.780250       | 40.64              | 69.50          | 28.86       | 1000.0          | 9.000           | 100.0       | H   | 182.0         | 17.0         |
| 11.508000       | 37.64              | 69.50          | 31.86       | 1000.0          | 9.000           | 100.0       | H   | 158.0         | 17.0         |
| 12.057000       | 37.63              | 69.50          | 31.87       | 1000.0          | 9.000           | 100.0       | H   | 182.0         | 17.0         |
| 6.409500        | 17.32              | 69.50          | 52.18       | 1000.0          | 9.000           | 100.0       | H   | 158.0         | 16.9         |



Only secondary pad with 48 Vdc secondary box active, antenna in X orientation:

EUT Information

EUT:

Operating conditions:

Operating mode:

Antenna polarization:

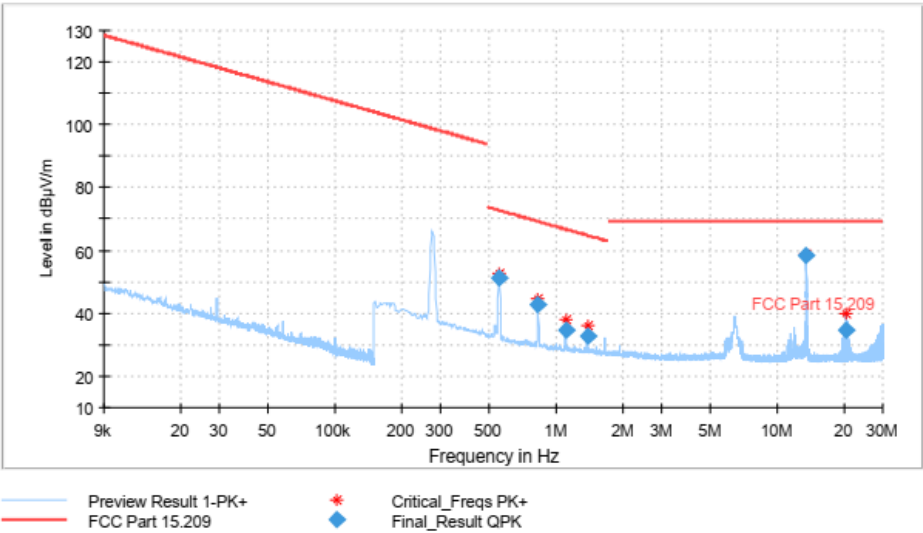
WSP+ WSB 48 V

Uin: 48 Vdc

PPL Mode; Module turned on

X

Full Spectrum



Final Result

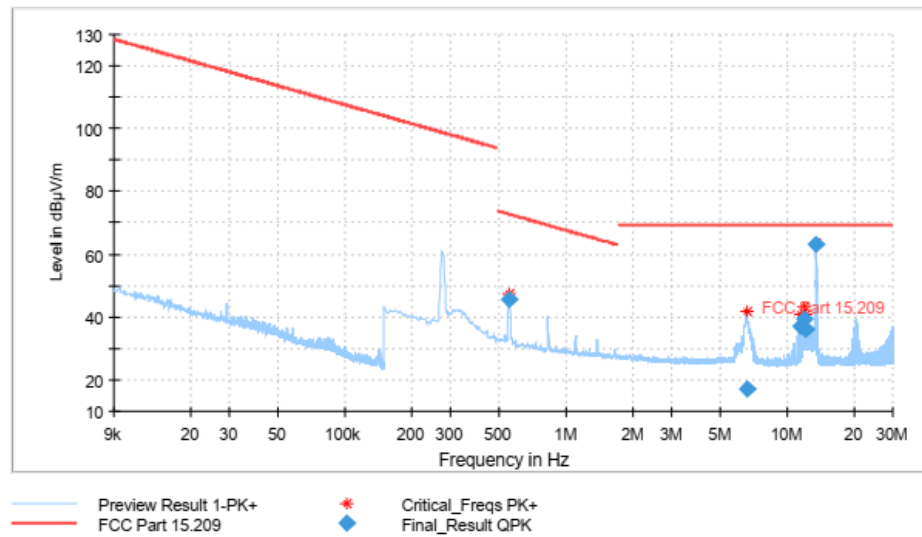
| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth h (deg) | Corr. (dB/m) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|-----------------|--------------|
| 13.560000       | 58.19              | 69.50          | 11.31       | 1000.0          | 9.000           | 100.0       | H   | 6.0             | 17.1         |
| 0.552750        | 51.25              | 72.76          | 21.51       | 1000.0          | 9.000           | 100.0       | H   | 0.0             | 16.9         |
| 0.827250        | 42.81              | 69.26          | 26.45       | 1000.0          | 9.000           | 100.0       | H   | 358.0           | 16.9         |
| 1.380750        | 32.82              | 64.83          | 32.01       | 1000.0          | 9.000           | 100.0       | H   | 358.0           | 16.9         |
| 1.104000        | 34.63              | 66.76          | 32.14       | 1000.0          | 9.000           | 100.0       | H   | 342.0           | 16.9         |
| 20.404500       | 34.82              | 69.50          | 34.68       | 1000.0          | 9.000           | 100.0       | H   | 299.0           | 17.4         |

Only secondary pad with 48 Vdc secondary box active, antenna in Y orientation:

## EUT Information

EUT: WSP+ WSB 48 V  
Operating conditions: Uin: 48 Vdc  
Operating mode: PPL Mode; Module turned on  
Antenna polarization: Y

## Full Spectrum



## Final Result

| Frequency (MHz) | QuasiPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 13.560000       | 62.92              | 69.50          | 6.58        | 1000.0          | 9.000           | 100.0       | H   | 99.0          | 17.1         |
| 0.550500        | 45.54              | 72.79          | 27.25       | 1000.0          | 9.000           | 100.0       | H   | 286.0         | 16.9         |
| 11.861250       | 39.45              | 69.50          | 30.05       | 1000.0          | 9.000           | 100.0       | H   | 205.0         | 17.0         |
| 11.580000       | 37.13              | 69.50          | 32.37       | 1000.0          | 9.000           | 100.0       | H   | 181.0         | 17.0         |
| 12.138000       | 36.23              | 69.50          | 33.27       | 1000.0          | 9.000           | 100.0       | H   | 146.0         | 17.0         |
| 6.524250        | 17.27              | 69.50          | 52.23       | 1000.0          | 9.000           | 100.0       | H   | 274.0         | 16.9         |



Primary and secondary pad with 24 Vdc secondary box active, antenna in X orientation:

EUT Information

EUT:

Operating conditions:

Operating mode:

Antenna polarization:

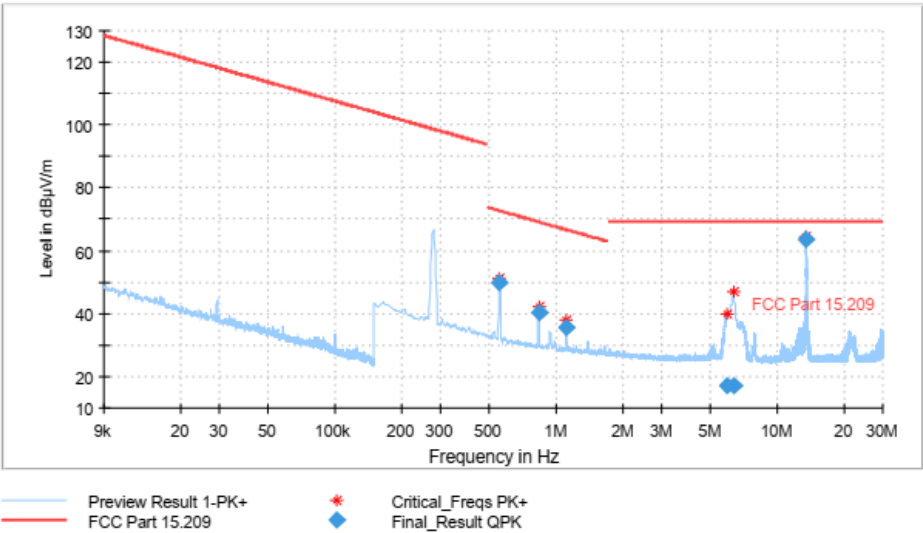
WPB + WPP; WSP+ WSB 24V

Uin: 240 V, 60 Hz

PPL Mode; Communication established

X

Full Spectrum



Final Result

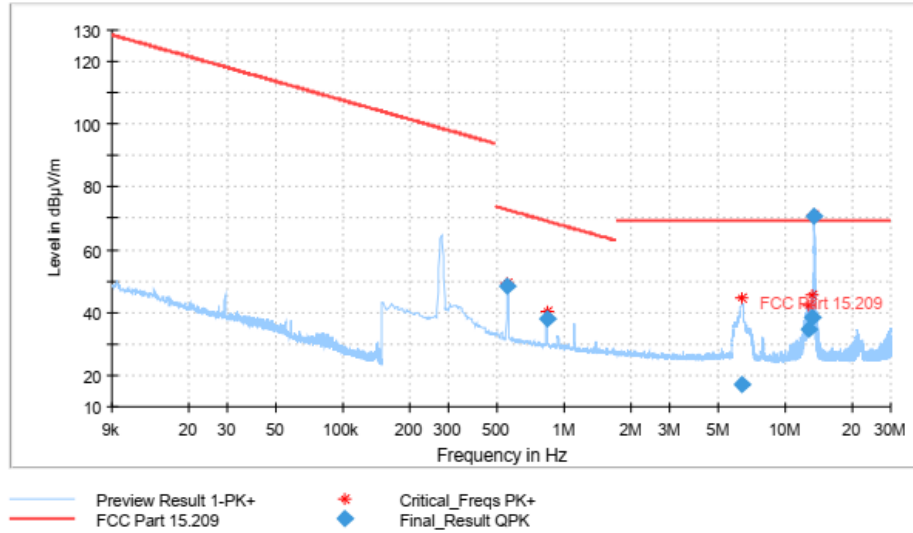
| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 13.560000       | 63.56              | 69.50          | 5.94        | 1000.0          | 9.000           | 100.0       | H   | 321.0         | 17.1         |
| 0.555000        | 49.69              | 72.72          | 23.03       | 1000.0          | 9.000           | 100.0       | H   | 321.0         | 16.9         |
| 0.834000        | 40.27              | 69.19          | 28.92       | 1000.0          | 9.000           | 100.0       | H   | 334.0         | 16.9         |
| 1.110750        | 35.50              | 66.71          | 31.21       | 1000.0          | 9.000           | 100.0       | H   | 334.0         | 16.9         |
| 5.912250        | 17.28              | 69.50          | 52.22       | 1000.0          | 9.000           | 100.0       | H   | 158.0         | 16.9         |
| 6.310500        | 17.13              | 69.50          | 52.37       | 1000.0          | 9.000           | 100.0       | H   | 158.0         | 16.9         |

Primary and secondary pad with 24 Vdc secondary box active, antenna in Y orientation:

## EUT Information

EUT: WPB + WPP; WSP+ WSB 24V  
Operating conditions: Uin: 240 V, 60 Hz  
Operating mode: PPL Mode; Communication established  
Antenna polarization: Y

## Full Spectrum



## Final Result

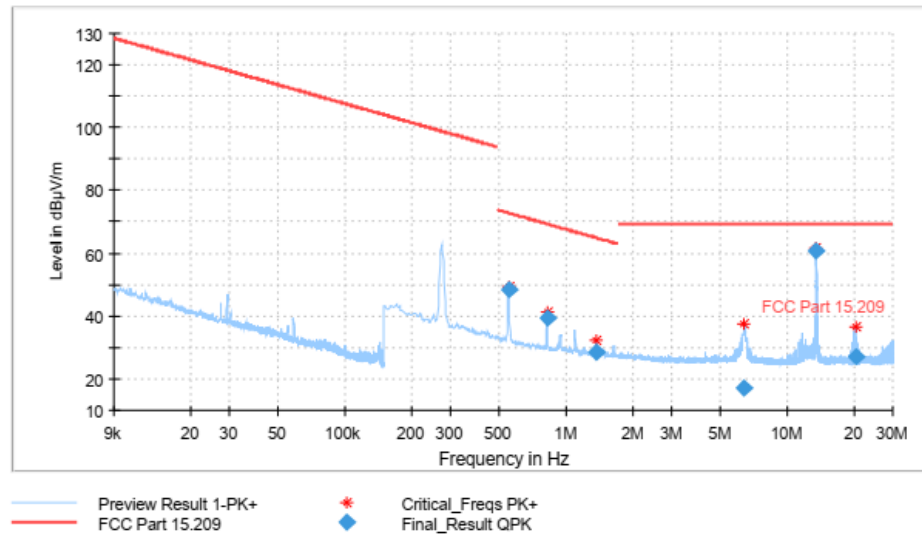
| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 13.560000       | 70.56              | 69.50          | -1.06       | 1000.0          | 9.000           | 100.0       | H   | 51.0          | 17.1         |
| 0.555000        | 48.46              | 72.72          | 24.26       | 1000.0          | 9.000           | 100.0       | H   | 29.0          | 16.9         |
| 13.301250       | 38.33              | 69.50          | 31.17       | 1000.0          | 9.000           | 100.0       | H   | 51.0          | 17.1         |
| 0.834000        | 37.99              | 69.19          | 31.20       | 1000.0          | 9.000           | 100.0       | H   | 19.0          | 16.9         |
| 12.781500       | 34.71              | 69.50          | 34.79       | 1000.0          | 9.000           | 100.0       | H   | 229.0         | 17.1         |
| 6.369000        | 17.10              | 69.50          | 52.40       | 1000.0          | 9.000           | 100.0       | H   | 310.0         | 16.9         |

Primary and secondary pad with 36 Vdc secondary box active, antenna in X orientation:

### EUT Information

|                       |                                     |
|-----------------------|-------------------------------------|
| EUT:                  | WPB + WPP; WSP+ WSB 36V             |
| Operating conditions: | Uin: 240 V, 60 Hz                   |
| Operating mode:       | PPL Mode; Communication established |
| Antenna polarization: | X                                   |

### Full Spectrum



### Final Result

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 13.560000       | 60.78              | 69.50          | 8.72        | 1000.0          | 9.000           | 100.0       | H   | 319.0         | 17.1         |
| 0.548250        | 48.19              | 72.83          | 24.64       | 1000.0          | 9.000           | 100.0       | H   | 6.0           | 16.9         |
| 0.822750        | 39.52              | 69.31          | 29.79       | 1000.0          | 9.000           | 100.0       | H   | 2.0           | 16.9         |
| 1.369500        | 28.39              | 64.90          | 36.51       | 1000.0          | 9.000           | 100.0       | H   | 0.0           | 16.9         |
| 20.280750       | 27.31              | 69.50          | 42.19       | 1000.0          | 9.000           | 100.0       | H   | 0.0           | 17.4         |
| 6.380250        | 17.24              | 69.50          | 52.26       | 1000.0          | 9.000           | 100.0       | H   | 248.0         | 16.9         |

Primary and secondary pad with 36 Vdc secondary box active, antenna in Y orientation:

## EUT Information

EUT:

Operating conditions:

Operating mode:

Antenna polarization:

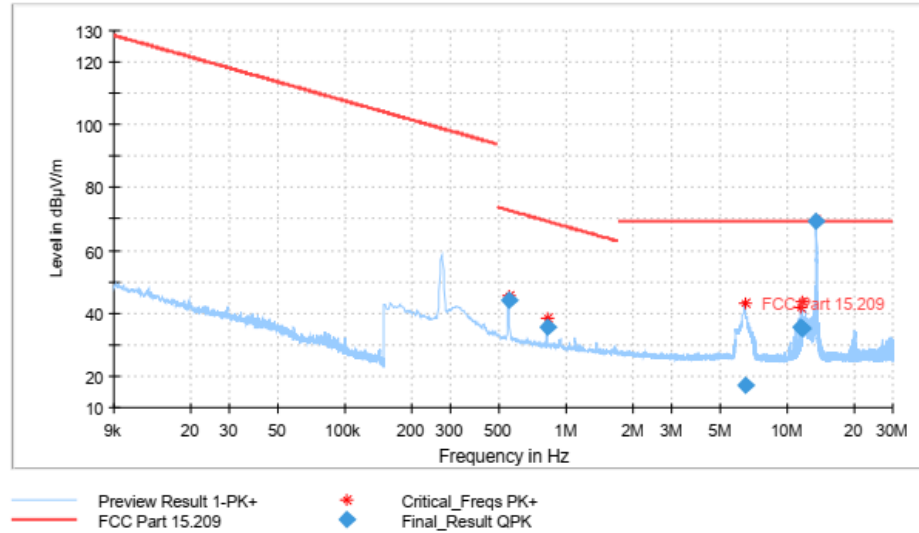
WPB + WPP; WSP+ WSB 36V

Uin: 240 V, 60 Hz

PPL Mode; Communication established

Y

## Full Spectrum



## Final Result

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 13.560000       | 69.18              | 69.50          | 0.32        | 1000.0          | 9.000           | 100.0       | H   | 74.0          | 17.1         |
| 0.548250        | 43.98              | 72.83          | 28.85       | 1000.0          | 9.000           | 100.0       | H   | 74.0          | 16.9         |
| 0.822750        | 35.78              | 69.31          | 33.53       | 1000.0          | 9.000           | 100.0       | H   | 62.0          | 16.9         |
| 11.514750       | 35.84              | 69.50          | 33.66       | 1000.0          | 9.000           | 100.0       | H   | 194.0         | 17.0         |
| 11.791500       | 35.11              | 69.50          | 34.39       | 1000.0          | 9.000           | 100.0       | H   | 194.0         | 17.0         |
| 6.420750        | 17.34              | 69.50          | 52.16       | 1000.0          | 9.000           | 100.0       | H   | 290.0         | 16.9         |



Primary and secondary pad with 48 Vdc secondary box active, antenna in X orientation:

EUT Information

EUT:

Operating conditions:

Operating mode:

Antenna polarization:

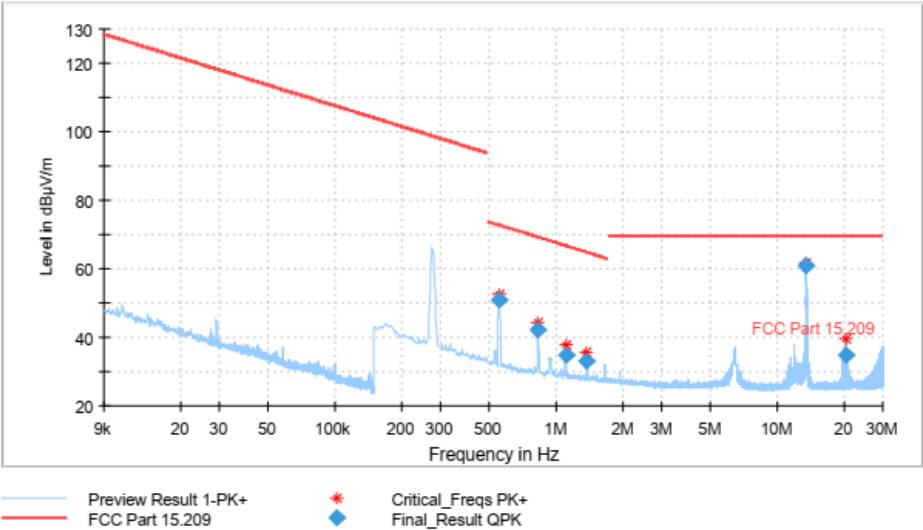
WPB + WPP; WSP+ WSB 48V

Uin: 240 V, 60 Hz

PPL Mode; Communication established

X

Full Spectrum



Final Result

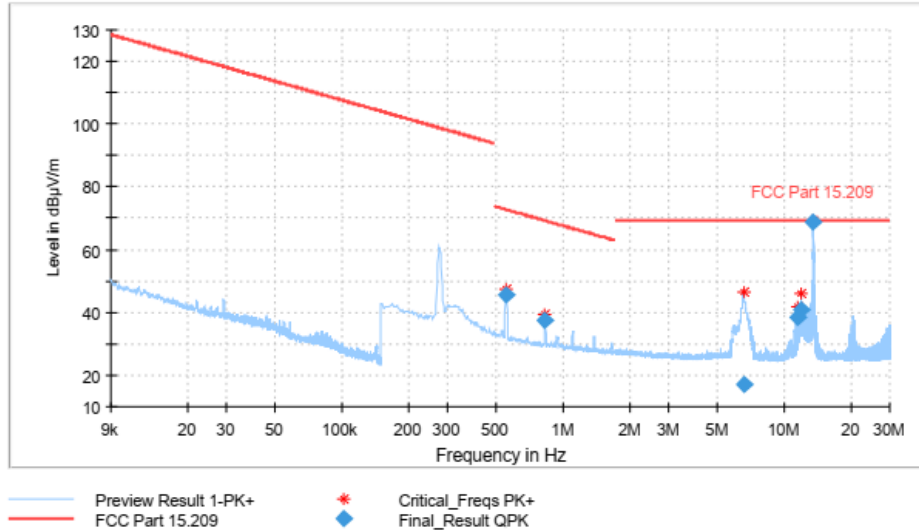
| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 13.560000       | 60.92              | 69.50          | 8.58        | 1000.0          | 9.000           | 100.0       | H   | 319.0         | 17.1         |
| 0.550500        | 50.92              | 72.79          | 21.87       | 1000.0          | 9.000           | 100.0       | H   | 354.0         | 16.9         |
| 0.827250        | 42.29              | 69.26          | 26.98       | 1000.0          | 9.000           | 100.0       | H   | 358.0         | 16.9         |
| 1.104000        | 34.86              | 66.76          | 31.91       | 1000.0          | 9.000           | 100.0       | H   | 354.0         | 16.9         |
| 1.378500        | 32.84              | 64.84          | 32.00       | 1000.0          | 9.000           | 100.0       | H   | 0.0           | 16.9         |
| 20.402250       | 34.82              | 69.50          | 34.68       | 1000.0          | 9.000           | 100.0       | H   | 0.0           | 17.4         |

Primary and secondary pad with 48 Vdc secondary box active, antenna in Y orientation:

## EUT Information

EUT: WPB + WPP; WSP+ WSB 48V  
Operating conditions: Uin: 240 V, 60 Hz  
Operating mode: PPL Mode; Communication established  
Antenna polarization: Y

## Full Spectrum



## Final Result

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 13.560000       | 68.64              | 69.50          | 0.86        | 1000.0          | 9.000           | 100.0       | H   | 74.0          | 17.1         |
| 0.552750        | 45.52              | 72.76          | 27.23       | 1000.0          | 9.000           | 100.0       | H   | 40.0          | 16.9         |
| 11.861250       | 40.81              | 69.50          | 28.69       | 1000.0          | 9.000           | 100.0       | H   | 192.0         | 17.0         |
| 11.582250       | 38.26              | 69.50          | 31.24       | 1000.0          | 9.000           | 100.0       | H   | 157.0         | 17.0         |
| 0.827250        | 37.29              | 69.26          | 31.98       | 1000.0          | 9.000           | 100.0       | H   | 51.0          | 16.9         |
| 6.531000        | 17.26              | 69.50          | 52.24       | 1000.0          | 9.000           | 100.0       | H   | 252.0         | 16.9         |

**Final measurement at 10 m on OATS**

| Results with measuring distance of 10 m |                 |                               |                      |             |
|-----------------------------------------|-----------------|-------------------------------|----------------------|-------------|
| Operating Mode                          | Frequency (MHz) | Measured value (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Margin (dB) |
| Secondary pad                           | 13.56           | 43.43                         | 103                  | 59.67       |
| Primary + secondary pad                 | 13.56           | 46.00                         | 103                  | 57.00       |

| Calculated value from 10 m to 30 m |                 |                                       |                                          |                                         |                              |             |
|------------------------------------|-----------------|---------------------------------------|------------------------------------------|-----------------------------------------|------------------------------|-------------|
| Operating Mode                     | Frequency (MHz) | Measured value at 10 m (dB $\mu$ V/m) | Correction factor from 10 m to 30 m (dB) | Calculated value at 30 m (dB $\mu$ V/m) | Limit at 30 m (dB $\mu$ V/m) | Margin (dB) |
| Secondary pad                      | 13.56           | 43.43                                 | 19                                       | 24.43                                   | 84.00                        | 59.67       |
| Primary + secondary pad            | 13.56           | 46.00                                 | 19                                       | 27.00                                   | 84.00                        | 57.00       |

**NOTE:** Antenna factor and cable loss are included in measurement correction.

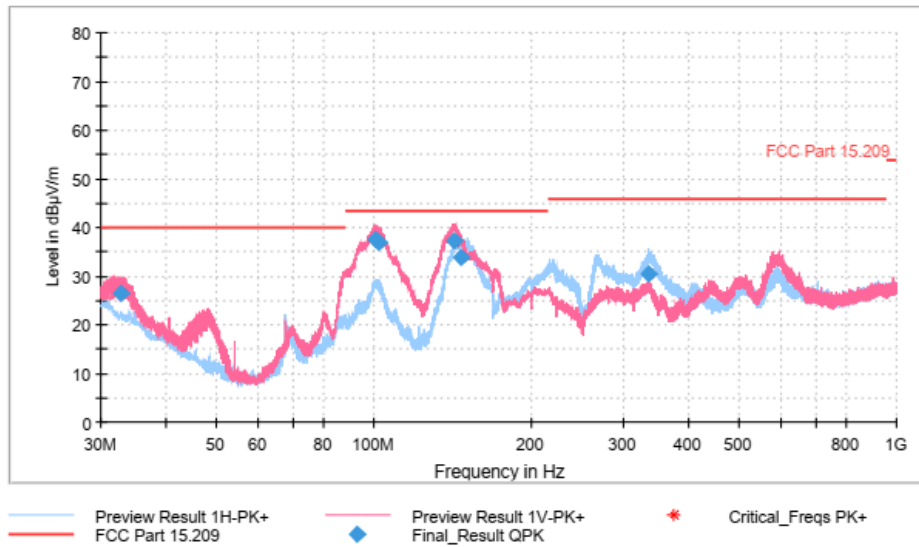
## Final measurements from 30 MHz to 1 GHz

Only secondary pad with 24 Vdc secondary box active:

### EUT Information

EUT: WSP+ WSB 24V  
Operating conditions: Uin: 24 Vdc  
Operating mode: PPL Mode; Module turned on

### Full Spectrum



### Final Result

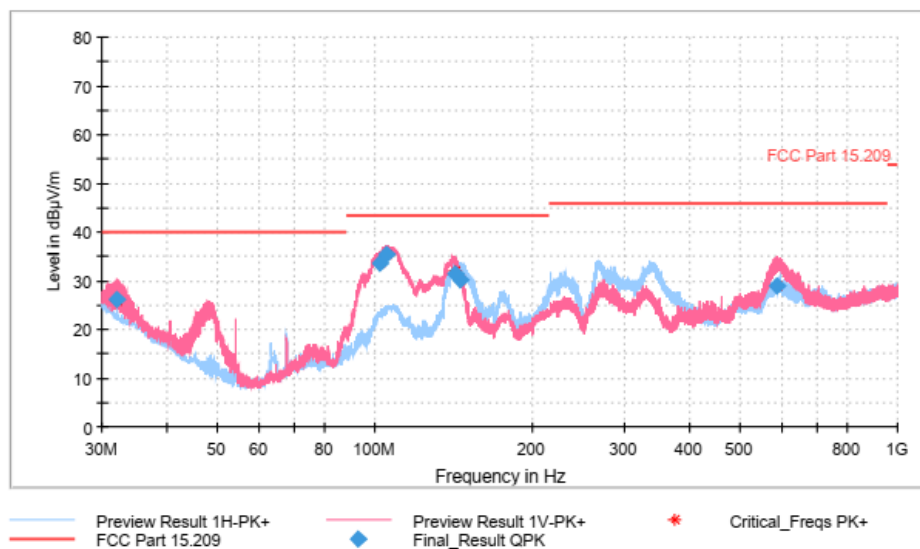
| Frequency (MHz) | QuasiPeak (dBuV/m) | DET 2 (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) |
|-----------------|--------------------|----------------|----------------|-------------|-------------|-----|---------------|
| 100.770000      | 37.47              | ---            | 43.50          | 6.03        | 142.0       | V   | 0.0           |
| 142.020000      | 37.15              | ---            | 43.50          | 6.35        | 100.0       | V   | 14.0          |
| 102.480000      | 36.92              | ---            | 43.50          | 6.58        | 150.0       | V   | 14.0          |
| 146.700000      | 33.82              | ---            | 43.50          | 9.68        | 100.0       | V   | 94.0          |
| 32.760000       | 26.40              | ---            | 40.00          | 13.60       | 100.0       | V   | 0.0           |
| 335.910000      | 30.56              | ---            | 46.00          | 15.44       | 100.0       | H   | 334.0         |

Only secondary pad with 36 Vdc secondary box active:

## EUT Information

EUT: WSP+ WSB 36V  
 Operating conditions: Uin: 36 Vdc  
 Operating mode: PPL Mode; Module turned on

## Full Spectrum



## Final Result

| Frequency (MHz) | QuasiPeak (dBuV/m) | DET 2 (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) |
|-----------------|--------------------|----------------|----------------|-------------|-------------|-----|---------------|
| 105.480000      | 35.41              | ---            | 43.50          | 8.09        | 150.0       | V   | 351.0         |
| 101.910000      | 33.58              | ---            | 43.50          | 9.92        | 115.0       | V   | 0.0           |
| 142.470000      | 31.53              | ---            | 43.50          | 11.97       | 100.0       | V   | 59.0          |
| 146.100000      | 30.27              | ---            | 43.50          | 13.23       | 193.0       | H   | 327.0         |
| 32.070000       | 26.09              | ---            | 40.00          | 13.91       | 100.0       | V   | 351.0         |
| 588.150000      | 28.97              | ---            | 46.00          | 17.03       | 100.0       | V   | 351.0         |

Only secondary pad with 48 Vdc secondary box active:

## EUT Information

EUT:

Operating conditions:

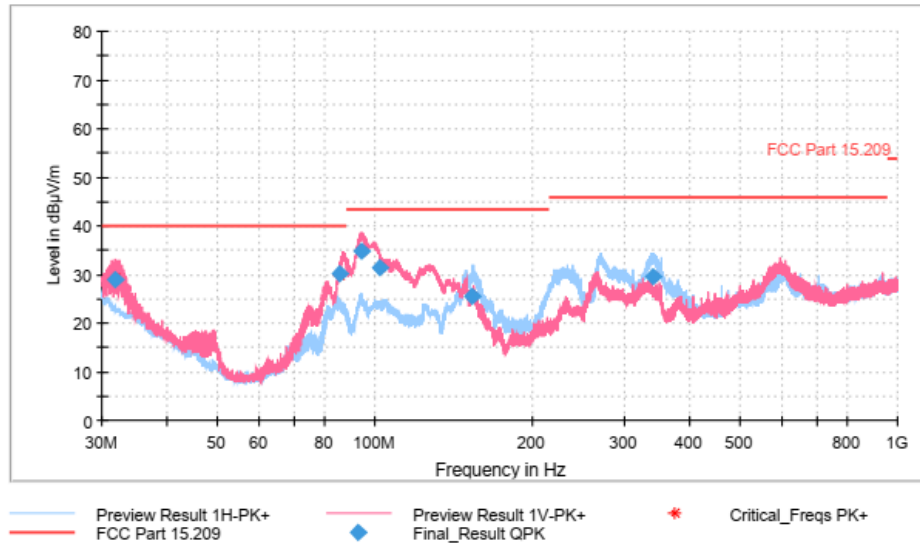
Operating mode:

WPB + WPP; WSP+ WSB 48V

Uin: 48 Vdc

PPL Mode; Module turned on

## Full Spectrum



## Final Result

| Frequency (MHz) | QuasiPeak (dBuV/m) | DET 2 (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) |
|-----------------|--------------------|----------------|----------------|-------------|-------------|-----|---------------|
| 31.740000       | 28.95              | ---            | 40.00          | 11.05       | 102.0       | V   | 10.0          |
| 85.710000       | 30.24              | ---            | 40.00          | 9.76        | 115.0       | V   | 343.0         |
| 94.020000       | 34.83              | ---            | 43.50          | 8.67        | 104.0       | V   | 327.0         |
| 102.390000      | 31.34              | ---            | 43.50          | 12.16       | 115.0       | V   | 354.0         |
| 153.480000      | 25.59              | ---            | 43.50          | 17.91       | 181.0       | H   | 174.0         |
| 340.800000      | 29.50              | ---            | 46.00          | 16.50       | 100.0       | H   | 325.0         |

Primary and secondary pad with 24 Vdc secondary box active:

### EUT Information

EUT:

Operating conditions:

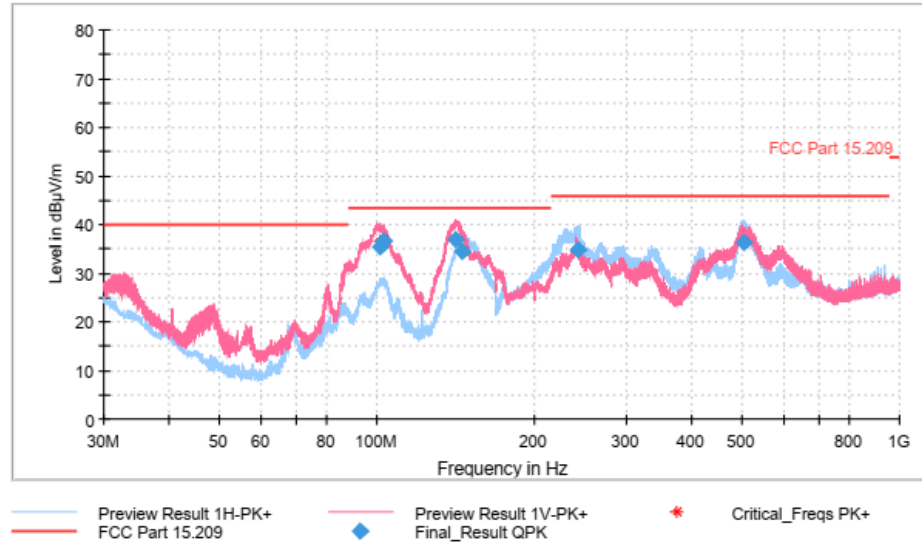
Operating mode:

WPB + WPP; WSP+ WSB 24V

Uin: 240 V, 60 Hz

PPL Mode; Communication established

### Full Spectrum



### Final Result

| Frequency (MHz) | QuasiPeak (dBuV/m) | DET 2 (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) |
|-----------------|--------------------|----------------|----------------|-------------|-------------|-----|---------------|
| 141.450000      | 36.77              | ---            | 43.50          | 6.73        | 100.0       | V   | 0.0           |
| 102.750000      | 36.49              | ---            | 43.50          | 7.01        | 147.0       | V   | 353.0         |
| 101.190000      | 35.32              | ---            | 43.50          | 8.18        | 143.0       | V   | 353.0         |
| 145.620000      | 34.41              | ---            | 43.50          | 9.09        | 100.0       | V   | 0.0           |
| 503.520000      | 36.34              | ---            | 46.00          | 9.66        | 141.0       | H   | 308.0         |
| 241.500000      | 34.67              | ---            | 46.00          | 11.33       | 100.0       | H   | 175.0         |

Primary and secondary pad with 36 Vdc secondary box active:

## EUT Information

EUT:

WPB + WPP; WSP+ WSB 36V

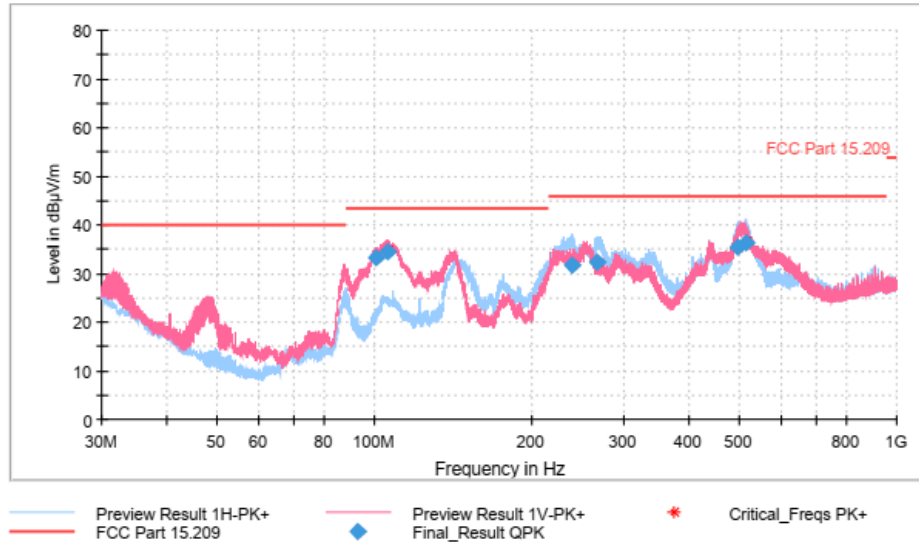
Operating conditions:

Uin: 240 V, 60 Hz

Operating mode:

PPL Mode; Communication established

## Full Spectrum



## Final Result

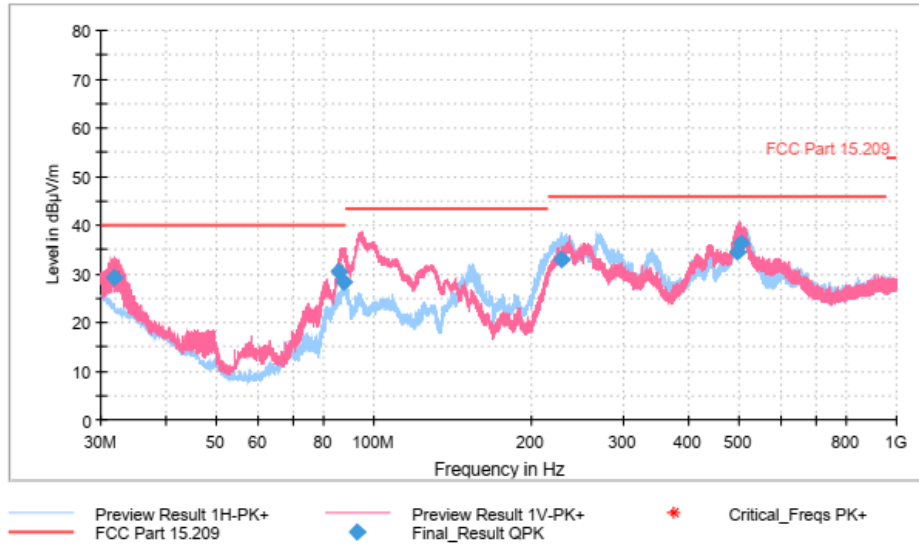
| Frequency (MHz) | QuasiPeak (dBuV/m) | DET 2 (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) |
|-----------------|--------------------|----------------|----------------|-------------|-------------|-----|---------------|
| 105.750000      | 34.48              | ---            | 43.50          | 9.02        | 143.0       | V   | 310.0         |
| 513.900000      | 36.37              | ---            | 46.00          | 9.63        | 135.0       | H   | 315.0         |
| 100.800000      | 33.10              | ---            | 43.50          | 10.40       | 102.0       | V   | 0.0           |
| 494.160000      | 35.31              | ---            | 46.00          | 10.69       | 148.0       | H   | 315.0         |
| 267.540000      | 32.43              | ---            | 46.00          | 13.57       | 100.0       | H   | 6.0           |
| 238.140000      | 31.77              | ---            | 46.00          | 14.23       | 109.0       | H   | 238.0         |

Primary and secondary pad with 48 Vdc secondary box active:

### EUT Information

EUT: WPB + WPP; WSP+ WSB 48V  
 Operating conditions: Uin: 240 V, 60 Hz  
 Operating mode: PPL Mode; Communication established

### Full Spectrum



### Final Result

| Frequency (MHz) | QuasiPeak (dBuV/m) | DET 2 (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) |
|-----------------|--------------------|----------------|----------------|-------------|-------------|-----|---------------|
| 85.830000       | 30.34              | ---            | 40.00          | 9.66        | 102.0       | V   | 7.0           |
| 501.720000      | 36.26              | ---            | 46.00          | 9.74        | 100.0       | V   | 272.0         |
| 31.710000       | 29.35              | ---            | 40.00          | 10.65       | 102.0       | V   | 42.0          |
| 495.780000      | 34.51              | ---            | 46.00          | 11.49       | 141.0       | H   | 293.0         |
| 87.720000       | 28.29              | ---            | 40.00          | 11.71       | 124.0       | V   | 183.0         |
| 228.570000      | 33.02              | ---            | 46.00          | 12.98       | 100.0       | H   | 295.0         |

## **4.5 Bandwidth of the emission (§15.215)**

### **4.5.1 Requirements**

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §15.217 through 15.257 and in subpart E of FCC Part 15, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

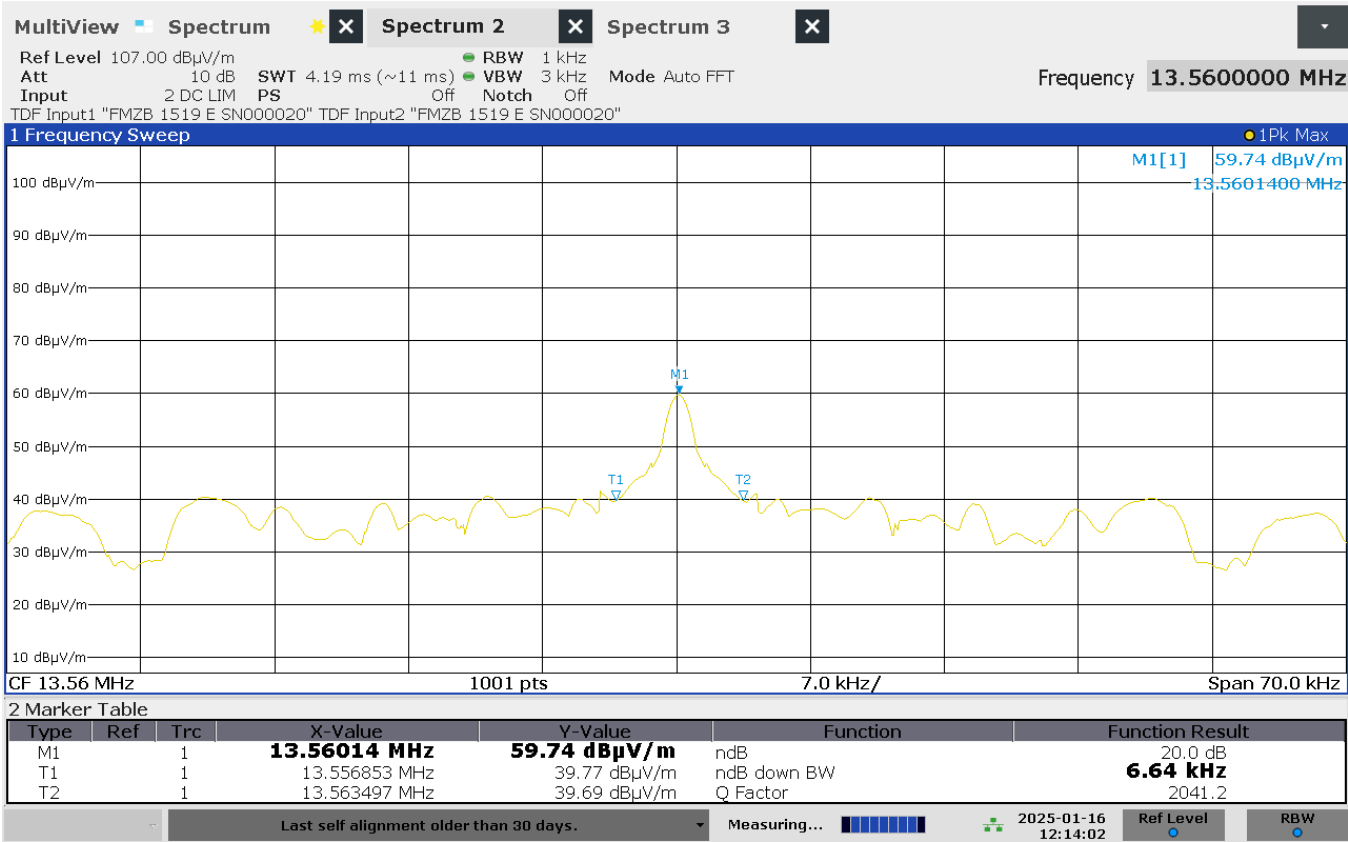
### **4.5.2 Test procedure**

1. As per Clause 6.9.2 from ANSI C63.10-2013
2. The EUT is placed on the top of a rotating table 0.8 meters above the ground in an Anechoic Chamber. The table is rotated 360 degrees to determine the position of the highest radiation.
3. The EUT is set 3 m away from the interference-receiving antenna.
4. Resolution bandwidth is set to a value greater than 5% of the allowed bandwidth.

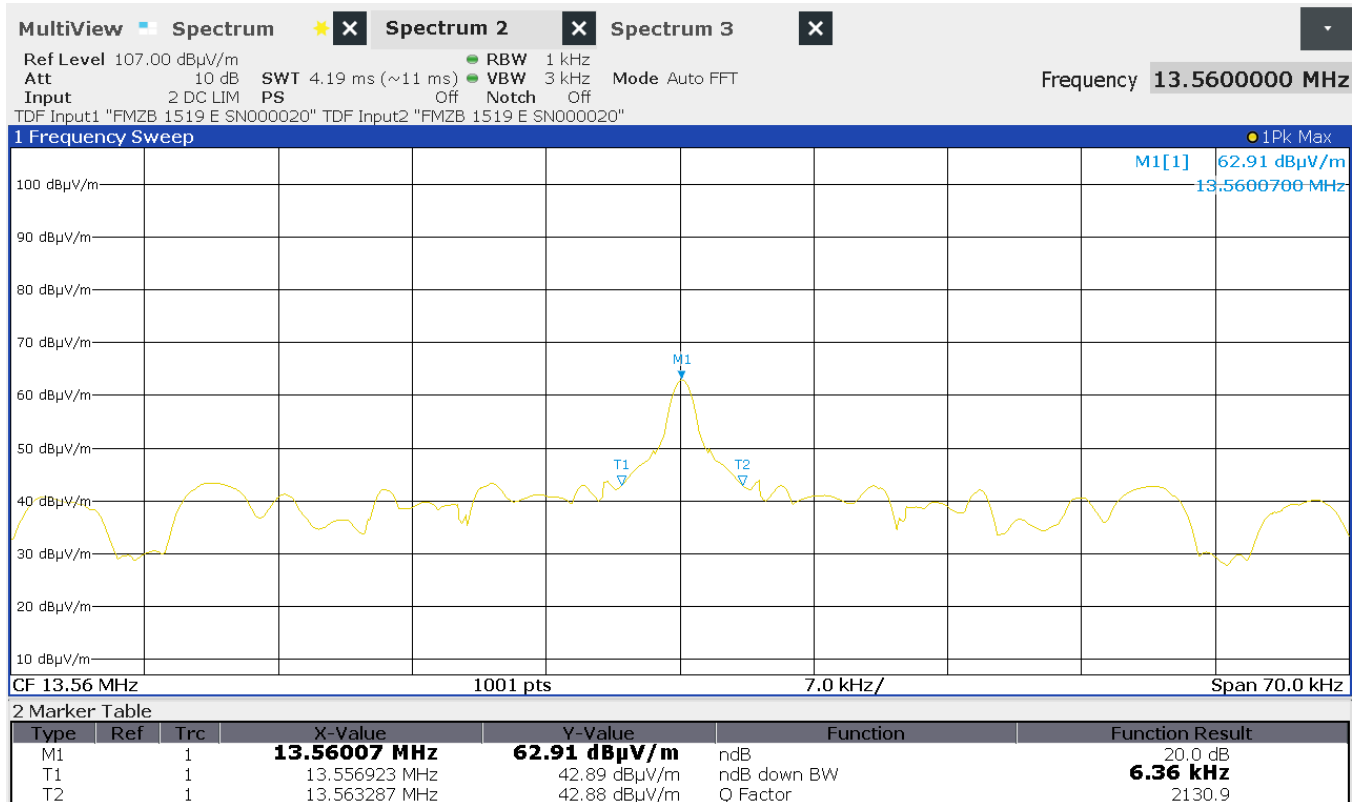


4.5.3 Test results  
Device passed the requirements stated in 47 CFR Part 15, Subpart C, Section 15.215

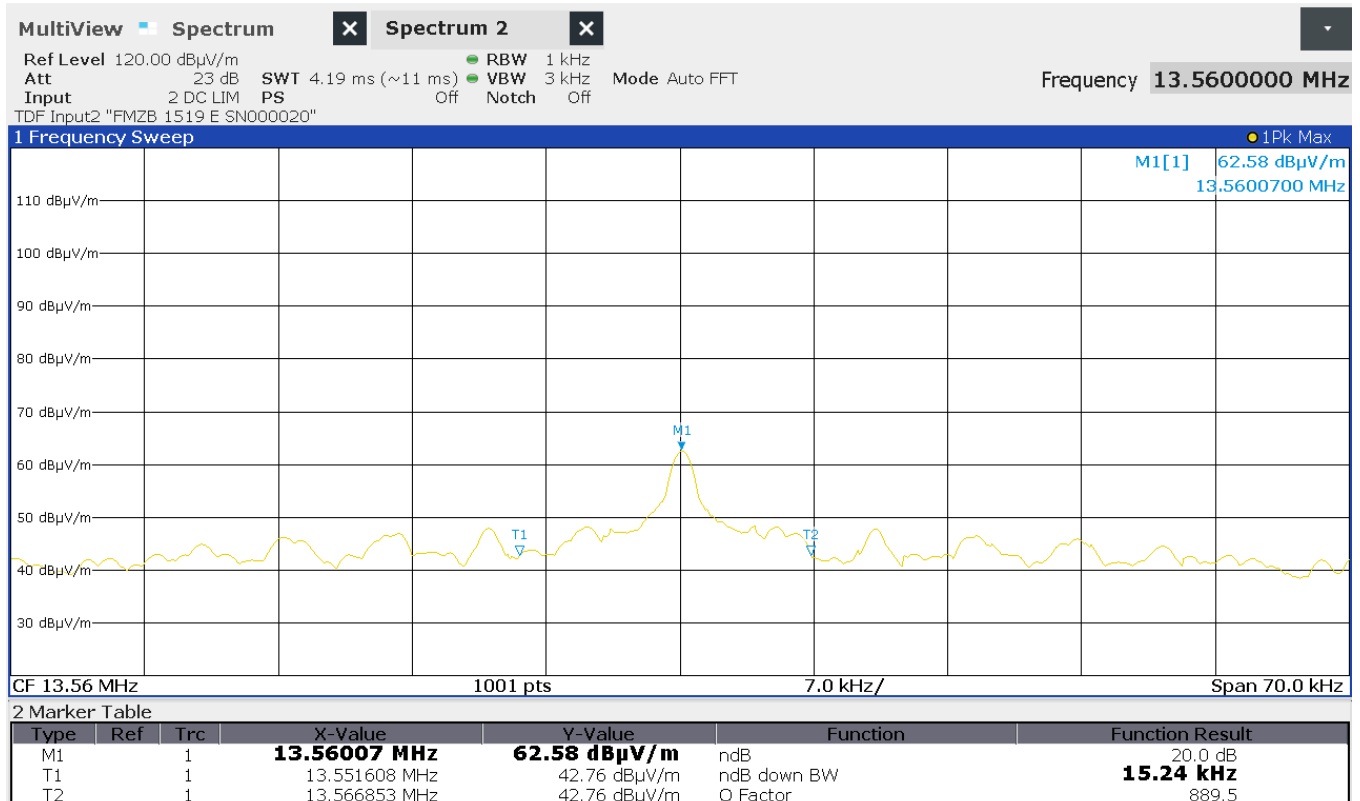
Only secondary pad active with 24 Vdc secondary box active, antenna at 0 deg:



Only secondary pad active with 24 Vdc secondary box active, antenna at 90 deg:

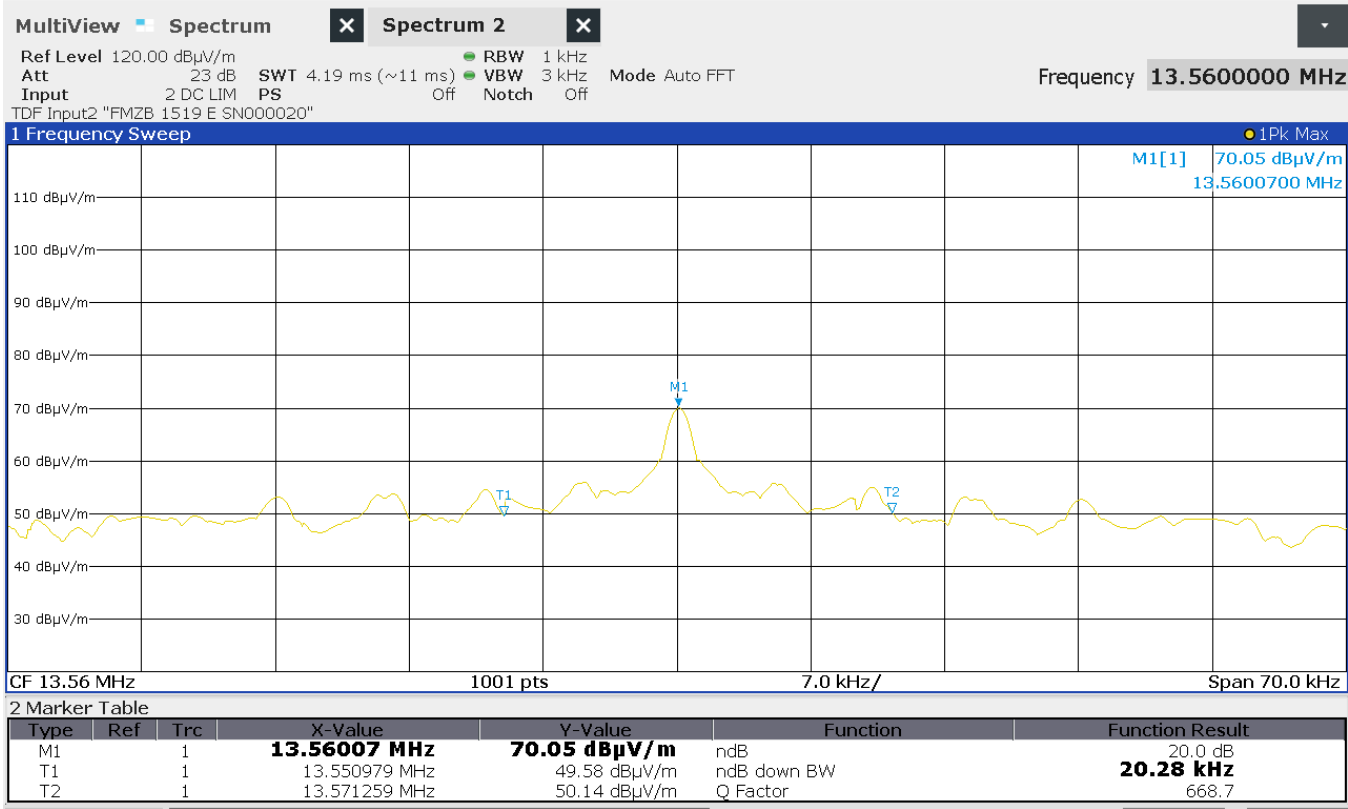


Primary and secondary pad with 24 Vdc secondary box active, antenna at 0 deg:





Primary and secondary pad with 24 Vdc secondary box active, antenna at 90 deg:



| Frequency (MHz) | Permitted frequency band (MHz) | 20 dB bandwidth (kHz) | PASS/FAIL |
|-----------------|--------------------------------|-----------------------|-----------|
| 13.56           | 13.110 – 14.010                | 6.36                  | PASS      |

## **4.6 Spectrum mask (§15.225 (a)-(d))**

### **4.6.1 Requirements**

The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters. Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters. Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters. The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in §15.209.

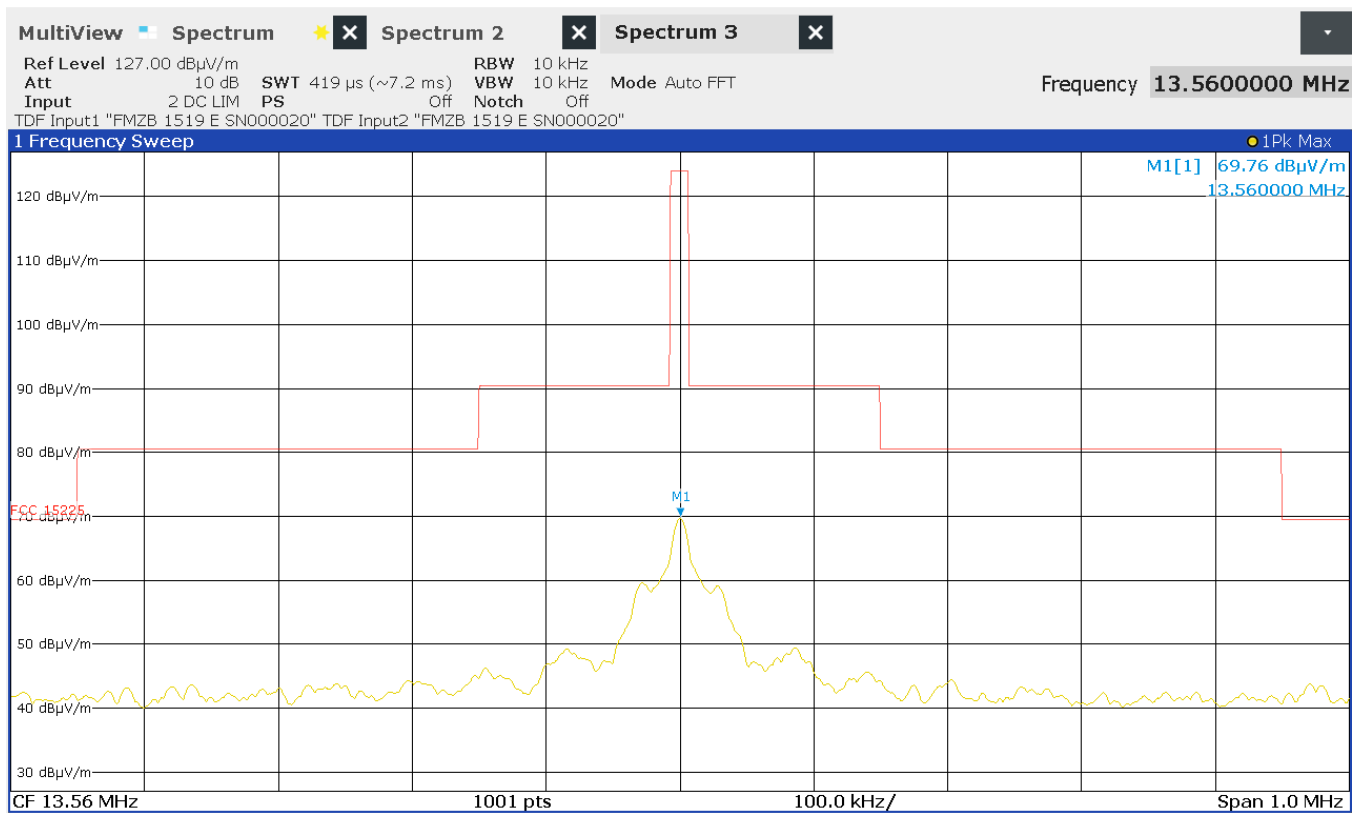
### **4.6.2 Test procedure**

1. As per clause 6.4 from ANSI C63.10-2013
2. The EUT was placed on the top of a rotating table 0.8 meters above the ground in an Anechoic Chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
3. The EUT was set 3 m away from the interference-receiving antenna.
4. Frequencies with maximum emission were retested on OATS.
5. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the turn table was turned from 0 degrees to 360 degrees to find the maximum reading.

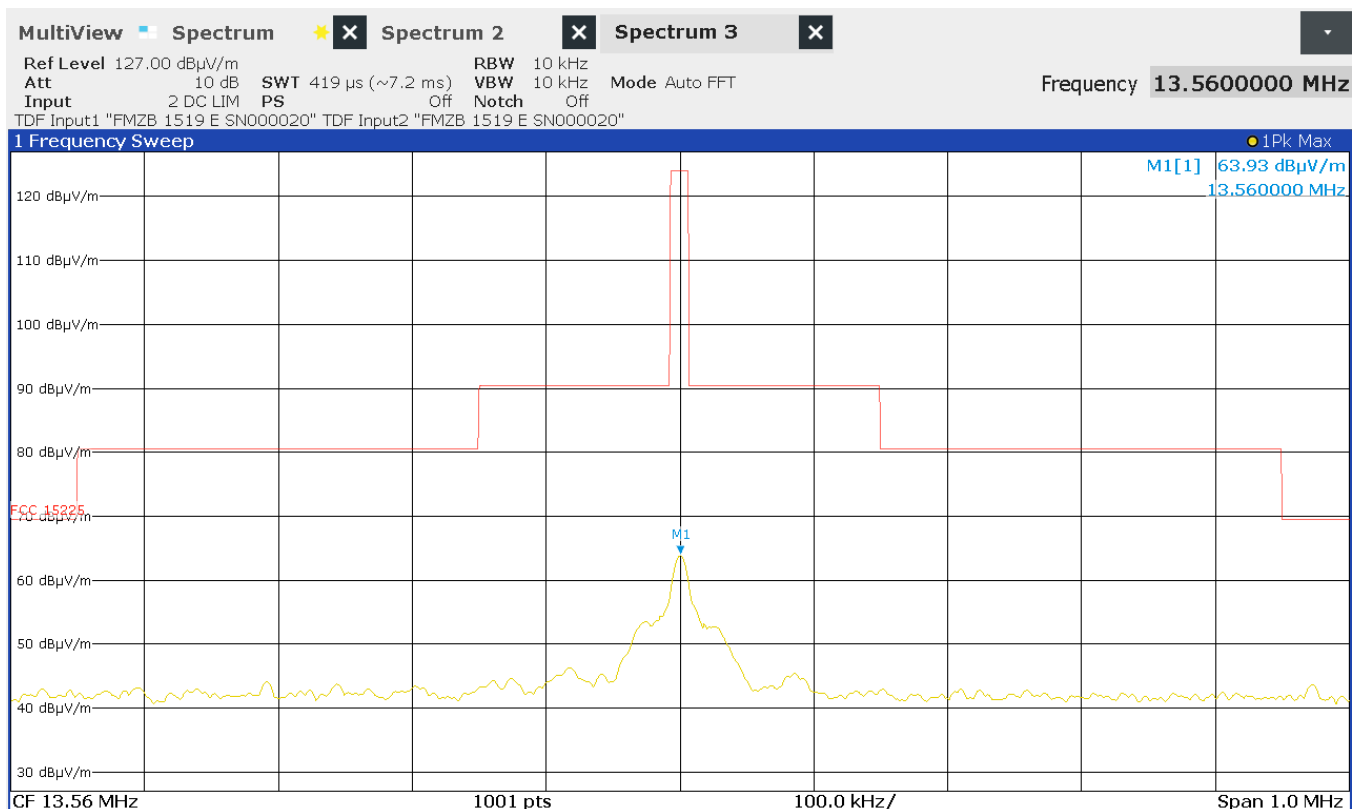
### 4.6.3 Test results

Device passed the requirements stated in 47 CFR Part 15, Subpart C, Section 15.225

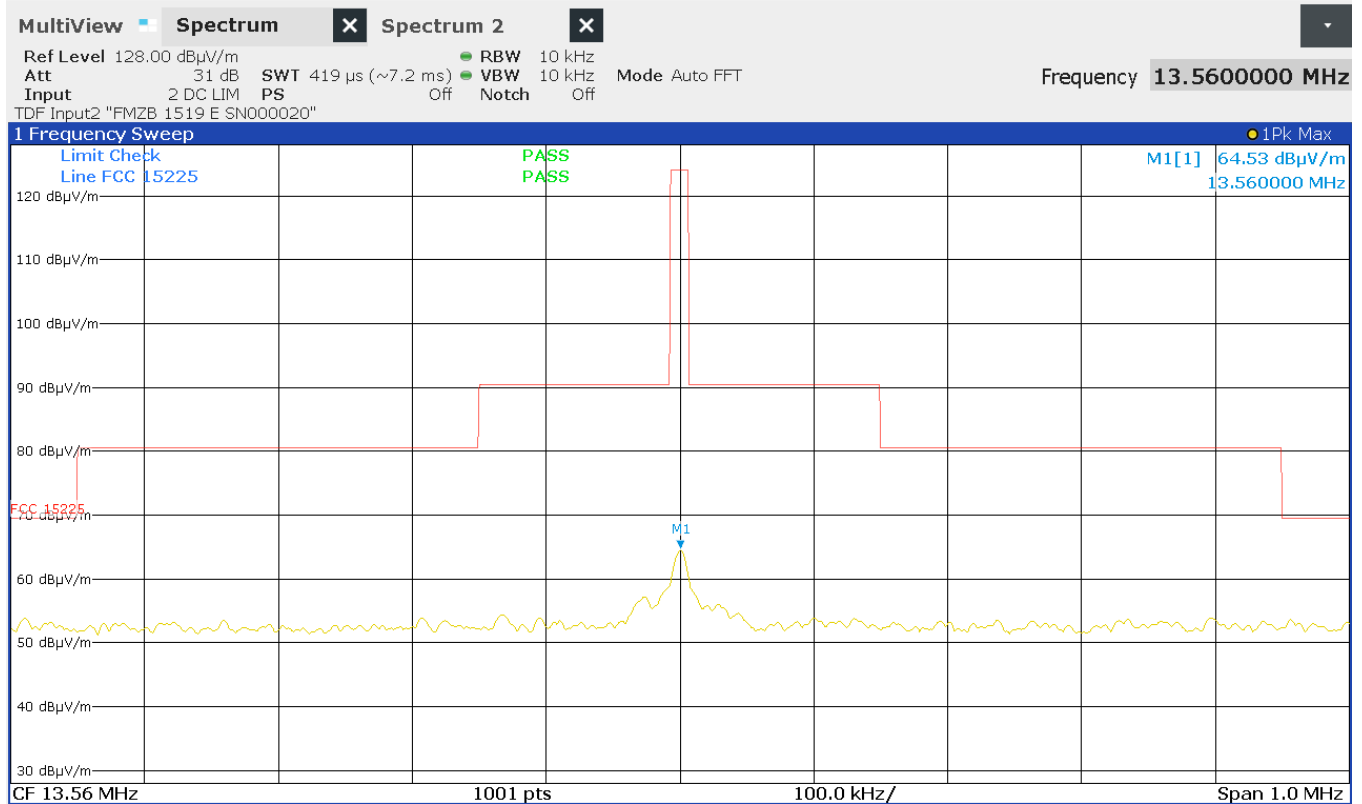
Only secondary pad active with 24 Vdc secondary box active, antenna at 0 deg:



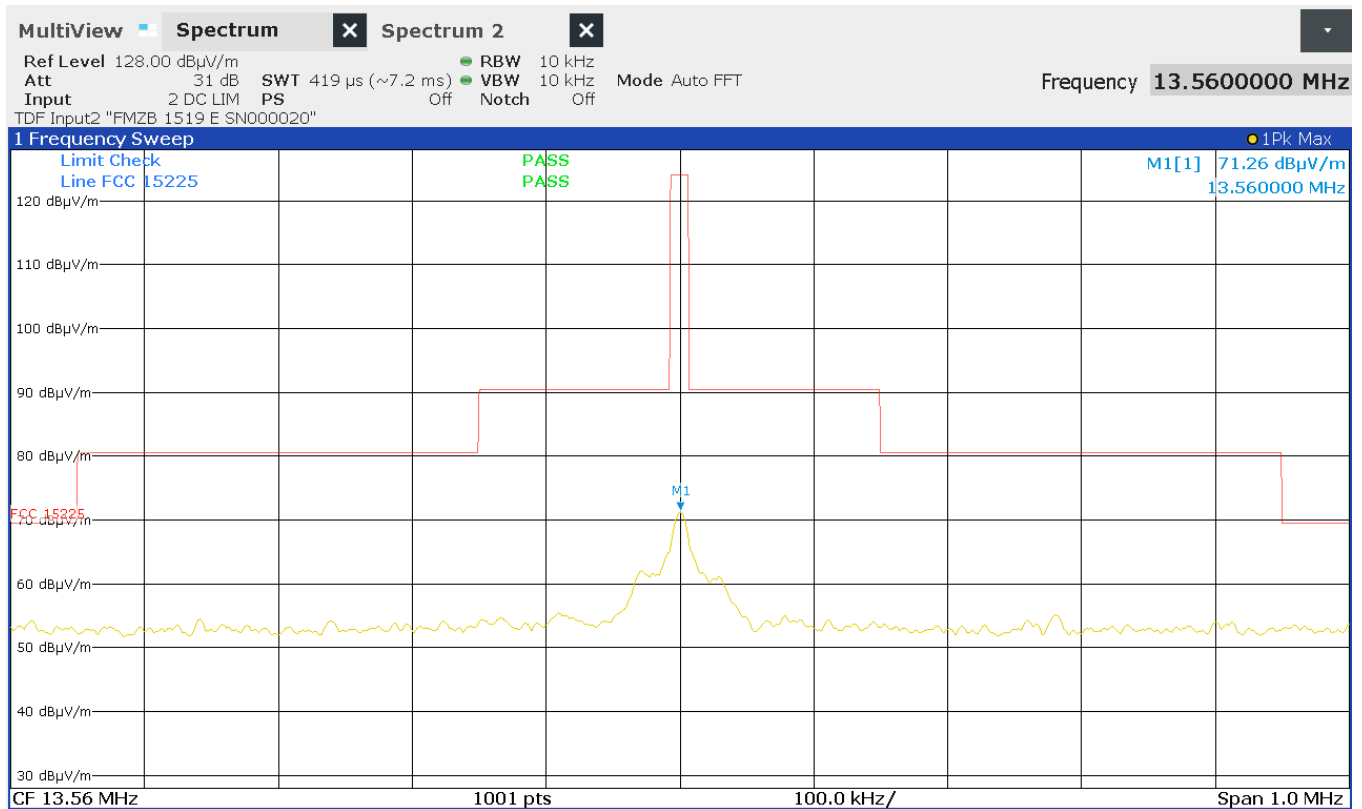
Only secondary pad active with 24 Vdc secondary box active, antenna at 90 deg:



# Primary and secondary pad with 24 Vdc secondary box active, antenna at 0 deg:



# Primary and secondary pad with 24 Vdc secondary box active, antenna at 90 deg:



## **4.7 Frequency tolerance of the carrier signal (§15.225 (e))**

### **4.7.1 Requirement**

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

### **4.7.2 Test procedure**

1. As per clause 6.8 from ANSI C63.10-2013.
2. The frequency tolerance of the carrier signal is measured over a temperature variation of -20 °C to +50 °C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 °C.
3. If the EUT provides an antenna connector the spectrum analyzer is connected to this port. In cases where the EUT does not provide an antenna connector a test fixture is used.
4. The peak detector of the spectrum analyzer is selected and the resolution bandwidth as well as the video bandwidth is set to values appropriate to the shape of the spectrum of the EUT.
5. While maintaining a constant temperature inside the environmental chamber, turn the EUT ON and record the operating frequency at startup, and at 2 minutes, 5 minutes, and 10 minutes after the EUT is energized.

### 4.7.3 Test results

Device passed the requirements stated in of FCC 47 CFR 15, Subpart C, Section 15.225

| FREQUENCY STABILITY |                    |                         |                          |                         |                    |        |
|---------------------|--------------------|-------------------------|--------------------------|-------------------------|--------------------|--------|
| Temperature         | Supply voltage (V) | Minutes after switch on | Measured Frequency (MHz) | Allowed tolerance (kHz) | Measured tolerance | RESULT |
| 50                  | 24                 | 0                       | 13.560101                | Fref±1.356 kHz          | 0.000000           | PASS   |
|                     | 24                 | 2                       | 13.560072                | Fref±1.356 kHz          | -0.000029          | PASS   |
|                     | 24                 | 5                       | 13.560058                | Fref±1.356 kHz          | -0.000043          | PASS   |
|                     | 24                 | 10                      | 13.560043                | Fref±1.356 kHz          | -0.000058          | PASS   |
| 40                  | 24                 | 0                       | 13.560116                | Fref±1.356 kHz          | 0.000015           | PASS   |
|                     | 24                 | 2                       | 13.560101                | Fref±1.356 kHz          | 0.000000           | PASS   |
|                     | 24                 | 5                       | 13.560072                | Fref±1.356 kHz          | -0.000029          | PASS   |
|                     | 24                 | 10                      | 13.560072                | Fref±1.356 kHz          | -0.000029          | PASS   |
| 30                  | 24                 | 0                       | 13.560130                | Fref±1.356 kHz          | 0.000029           | PASS   |
|                     | 24                 | 2                       | 13.560101                | Fref±1.356 kHz          | 0.000000           | PASS   |
|                     | 24                 | 5                       | 13.560101                | Fref±1.356 kHz          | 0.000000           | PASS   |
|                     | 24                 | 10                      | 13.560087                | Fref±1.356 kHz          | -0.000014          | PASS   |
| 20                  | 27,6               | 0                       | 13.560101                | Fref±1.356 kHz          | 0.000000           | PASS   |
|                     | 27,6               | 2                       | 13.560101                | Fref±1.356 kHz          | 0.000000           | PASS   |
|                     | 27,6               | 5                       | 13.560101                | Fref±1.356 kHz          | 0.000000           | PASS   |
|                     | 27,6               | 10                      | 13.560087                | Fref±1.356 kHz          | -0.000014          | PASS   |
| 20                  | 24                 | 0                       | 13.560145                | Fref±1.356 kHz          | 0.000044           | PASS   |
|                     | 24                 | 2                       | 13.560116                | Fref±1.356 kHz          | 0.000015           | PASS   |
|                     | 24                 | 5                       | 13.560101                | Fref±1.356 kHz          | 0.000000           | PASS   |
|                     | 24                 | 10                      | 13.560101                | Fref                    | 0.000000           | PASS   |
| 20                  | 20,4               | 0                       | 13.560101                | Fref±1.356 kHz          | 0.000000           | PASS   |
|                     | 20,4               | 2                       | 13.560101                | Fref±1.356 kHz          | 0.000000           | PASS   |
|                     | 20,4               | 5                       | 13.560101                | Fref±1.356 kHz          | 0.000000           | PASS   |
|                     | 20,4               | 10                      | 13.560101                | Fref±1.356 kHz          | 0.000000           | PASS   |
| 10                  | 24                 | 0                       | 13.560087                | Fref±1.356 kHz          | -0.000014          | PASS   |
|                     | 24                 | 2                       | 13.560072                | Fref±1.356 kHz          | -0.000029          | PASS   |
|                     | 24                 | 5                       | 13.560072                | Fref±1.356 kHz          | -0.000029          | PASS   |
|                     | 24                 | 10                      | 13.560072                | Fref±1.356 kHz          | -0.000029          | PASS   |
| 0                   | 24                 | 0                       | 13.560087                | Fref±1.356 kHz          | -0.000014          | PASS   |
|                     | 24                 | 2                       | 13.560087                | Fref±1.356 kHz          | -0.000014          | PASS   |
|                     | 24                 | 5                       | 13.560087                | Fref±1.356 kHz          | -0.000014          | PASS   |
|                     | 24                 | 10                      | 13.560101                | Fref±1.356 kHz          | 0.000000           | PASS   |
| -10                 | 24                 | 0                       | 13.560159                | Fref±1.356 kHz          | 0.000058           | PASS   |
|                     | 24                 | 2                       | 13.560145                | Fref±1.356 kHz          | 0.000044           | PASS   |
|                     | 24                 | 5                       | 13.560130                | Fref±1.356 kHz          | 0.000029           | PASS   |
|                     | 24                 | 10                      | 13.560145                | Fref±1.356 kHz          | 0.000044           | PASS   |
| -20                 | 24                 | 0                       | 13.560188                | Fref±1.356 kHz          | 0.000087           | PASS   |
|                     | 24                 | 2                       | 13.560174                | Fref±1.356 kHz          | 0.000073           | PASS   |
|                     | 24                 | 5                       | 13.560174                | Fref±1.356 kHz          | 0.000073           | PASS   |
|                     | 24                 | 10                      | 13.560174                | Fref±1.356 kHz          | 0.000073           | PASS   |

## 5 Annex I – Additional data

| Cross-reference table                                                                                                         |                            |                                                                              |                           |            |
|-------------------------------------------------------------------------------------------------------------------------------|----------------------------|------------------------------------------------------------------------------|---------------------------|------------|
| Test                                                                                                                          | 47 CFR Part 15 section     | IC requirements                                                              | Section within the report | Conclusion |
| Antenna requirements                                                                                                          | 15.203                     | RSS-Gen Issue 5 §6.8                                                         | 5.1                       | PASS       |
| Restricted bands of operation                                                                                                 | 15.205                     | RSS-Gen Issue 5 §8.10*                                                       | 5.2                       | PASS       |
| Conducted emission                                                                                                            | 15.207                     | RSS-Gen Issue 5 §8.8                                                         | 5.3                       | PASS       |
| Radiated emission                                                                                                             | 15.205<br>15.209<br>15.225 | RSS-Gen Issue 5 §8.9*<br>RSS-Gen Issue 5 §8.10*<br>RSS-210 Issue 3 Annex B.6 | 5.4                       | PASS       |
| Bandwidth of the emission                                                                                                     | 15.215                     | RSS-210 Issue 3 Annex B.6                                                    | 5.5                       | PASS       |
| Spectrum mask                                                                                                                 | 15.225                     | RSS-210 Issue 3 Annex B.6                                                    | 5.6                       | PASS       |
| Frequency tolerance of the carrier signal                                                                                     | 15.225                     | RSS-210 Issue 3 Annex B.6                                                    | 5.7                       | PASS       |
| *Note: Radiated measurements performed in laboratory recognized by ISED Canada:<br>– CAB identifier: SI0001<br>– ISED#: 21434 |                            |                                                                              |                           |            |

## 5.1 Occupied bandwidth (99% emission bandwidth)

The occupied bandwidth or the “99% emission bandwidth” is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained.

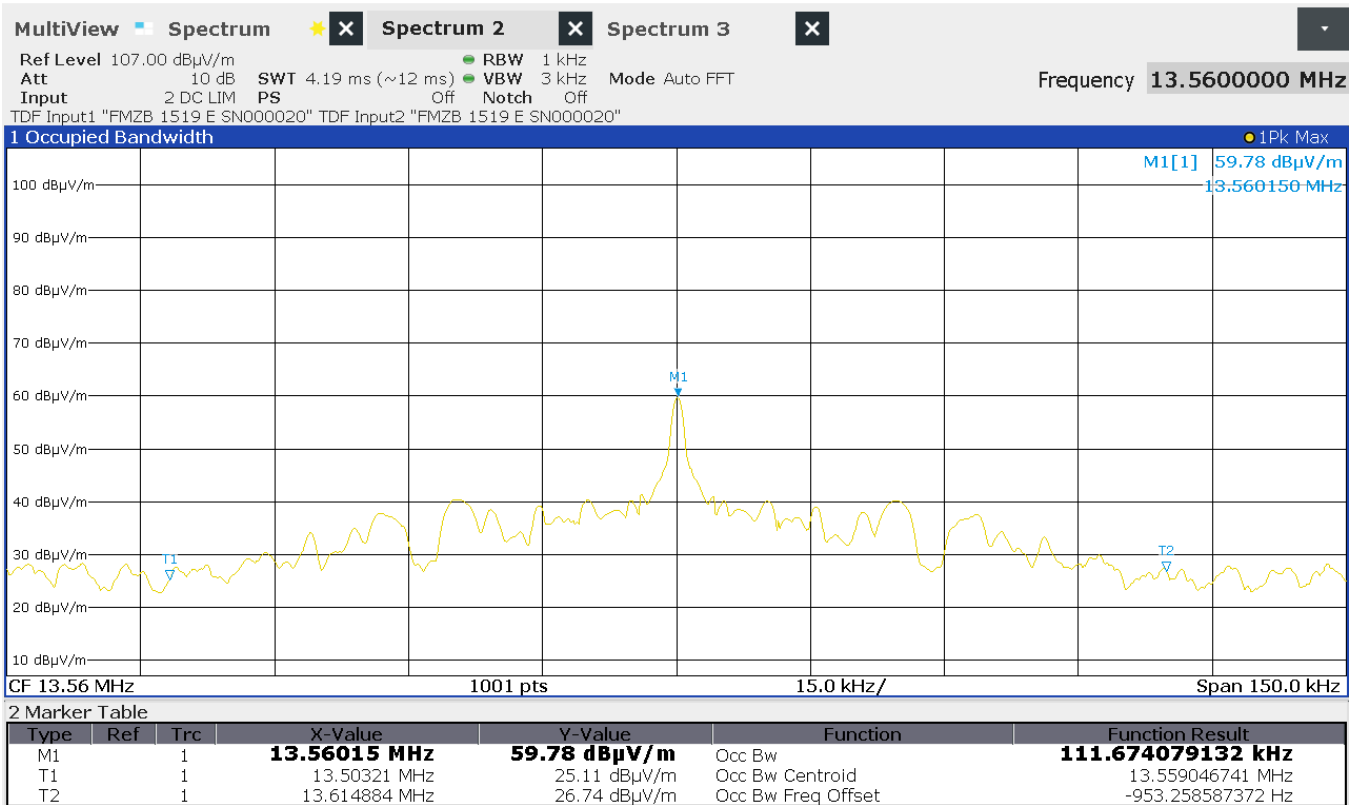
### 5.1.1 Test procedure

According ANSI C63.10-2013:

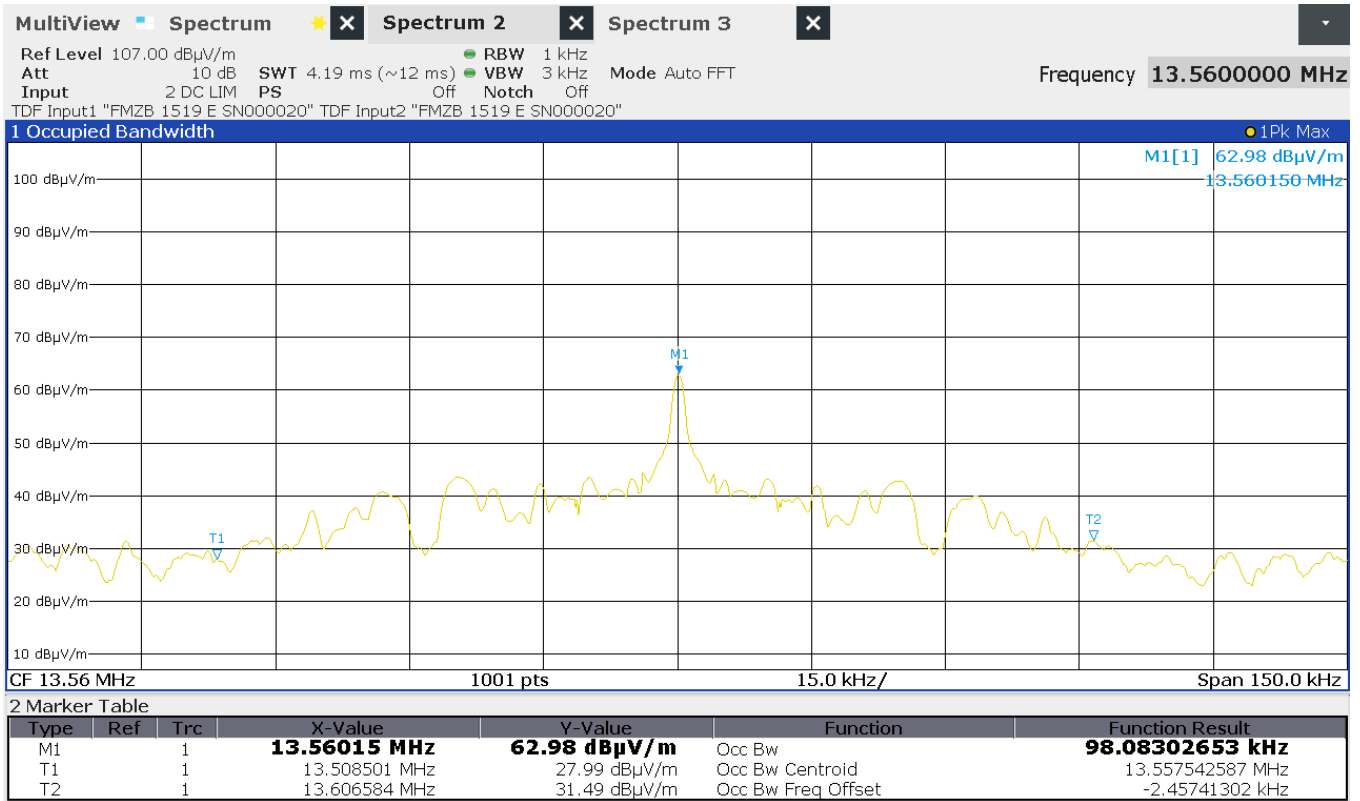
- a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the EMI receiver or spectrum analyzer shall be between two times and five times the OBW.
- b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth (VBW) shall be approximately three times RBW, unless otherwise specified by the applicable requirement.
- c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than  $[10 \log (\text{OBW}/\text{RBW})]$  below the reference level. Specific guidance is given in 4.1.5.2.
- d) Steps a) through c) might require iteration to adjust within the specified tolerances.
- e) The dynamic range of the instrument at the selected RBW shall be more than 10 dB below the target “-xx dB down” requirement; that is, if the requirement calls for measuring the -20 dB OBW, the instrument noise floor at the selected RBW shall be at least 30 dB below the reference value.
- f) Set detection mode to peak and trace mode to max hold.
- g) Determine the reference value: Set the EUT to transmit an unmodulated carrier or modulated signal, as applicable. Allow the trace to stabilize. Set the spectrum analyser marker to the highest level of the displayed trace (this is the reference value).
- h) Determine the “-xx dB down amplitude” using  $[(\text{reference value}) - \text{xx}]$ . Alternatively, this calculation may be made by using the marker-delta function of the instrument.
- i) If the reference value is determined by an unmodulated carrier, then turn the EUT modulation ON, and either clear the existing trace or start a new trace on the spectrum analyser and allow the new trace to stabilize. Otherwise, the trace from step g) shall be used for step j).
- j) Place two markers, one at the lowest frequency and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the “-xx dB down amplitude” determined in step h). If a marker is below this “-xx dB down amplitude” value, then it shall be as close as possible to this value. The occupied bandwidth is the frequency difference between the two markers. Alternatively, set a marker at the lowest frequency of the envelope of the spectral display, such that the marker is at or slightly below the “-xx dB down amplitude” determined in step h). Reset the marker-delta function and move the marker to the other side of the emission until the delta marker amplitude is at the same level as the reference marker amplitude. The marker-delta frequency reading at this point is the specified emission bandwidth.
- k) The occupied bandwidth shall be reported by providing plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s).



Secondary pad active, antenna at 0 deg:

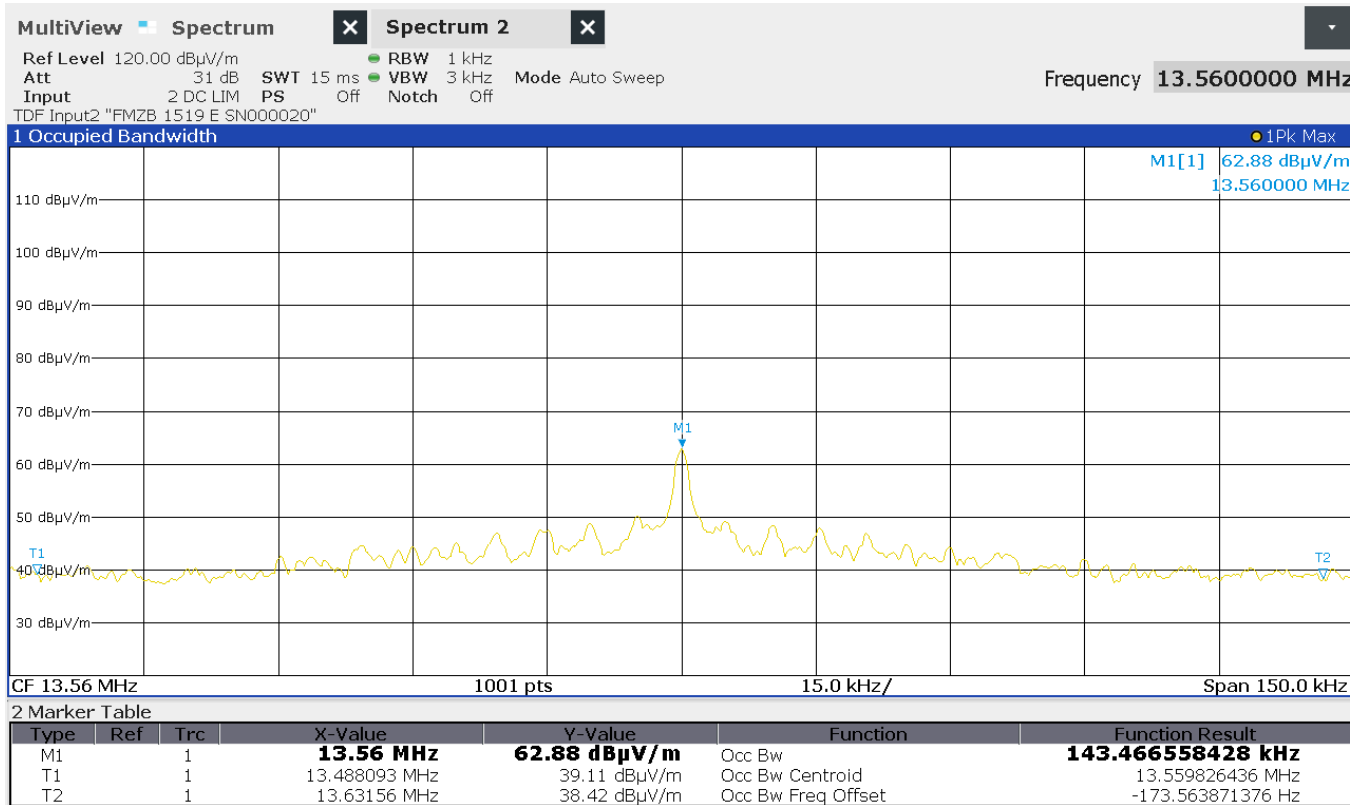


Secondary pad active, antenna at 90 deg:

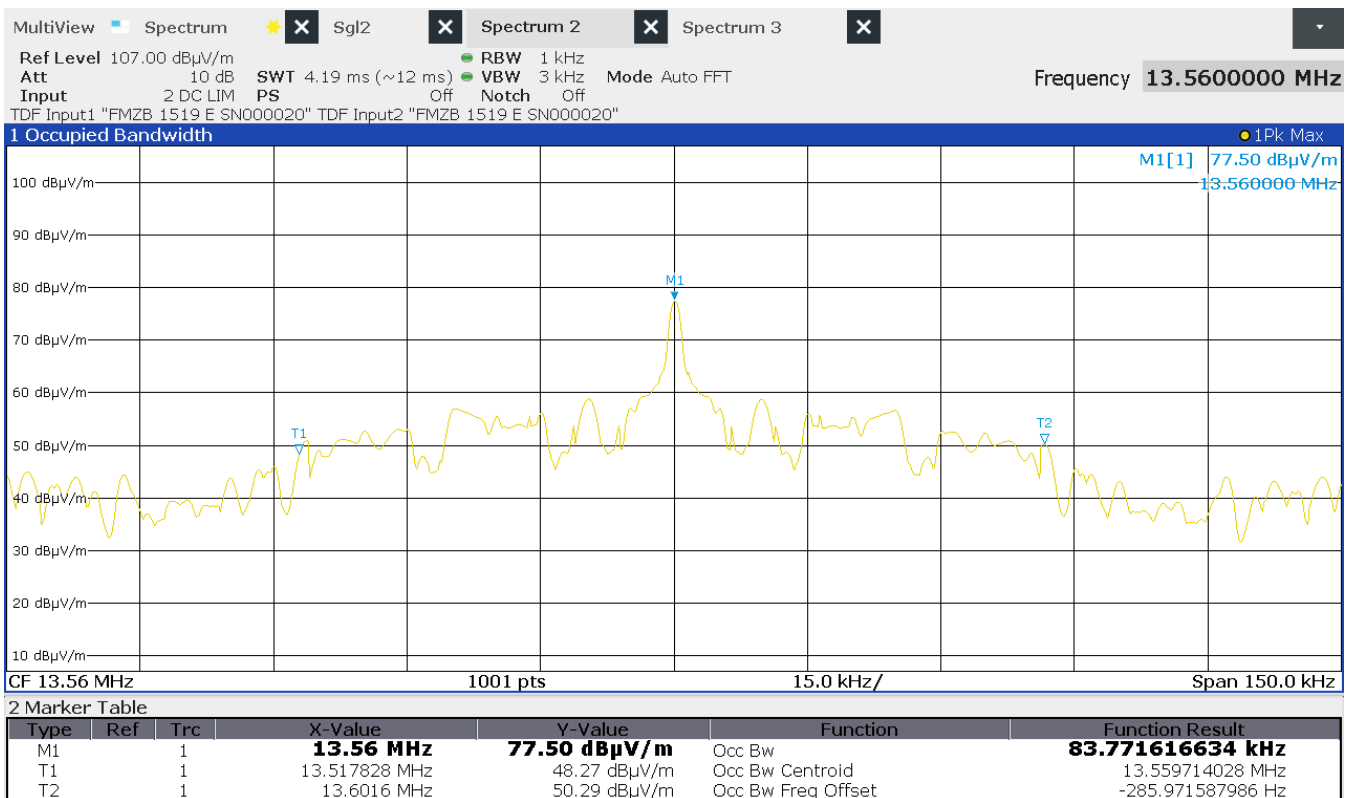




## Primary and secondary pad active, antenna at 0 deg:



## Primary and secondary pad active, antenna at 90 deg:



-----END OF TEST REPORT-----