# FCC Test Report

**For:**
Rohde & Schwarz

**Model:**
QAR50

**Product Description:**
QAR50 Quality Automotive Radome Tester

**FCC ID:** KVW-QAR50

**Applied Rules and Standards:**
47 CFR Parts: 18

**REPORT #:** EMC_ROHDE-003-22001_FCC_18_Rev1

**DATE:** 2022-06-21

A2LA Accredited

IC recognized #
3462B


***CETECOM* Inc.**
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# 1 Assessment

The following device as further described in section 3 of this report was evaluated against the applicable criteria specified in the Code of Federal Regulations Title 47 part 18

No deficiencies were ascertained.

| Company | Description | Model # |
|---|---|---|
| Rohde & Schwarz | QAR50 Quality Automotive Radome Tester | QAR50 |

**Responsible for Testing Laboratory:**

| Date | Section | Name | Signature |
|---|---|---|---|
| 2022-06-21 | Compliance | Kevin Wang (EMC Lab Manager) | kevin Wang Digitally signed by: kevin.wang@cetecom.com DN: CN = kevin.wang@cetecom.com Date: 2022.06.21 11:56:33 -07'00' |

**Responsible for the Report:**

| Date | Section | Name | Signature |
|---|---|---|---|
| 2022-06-21 | Compliance | Cheng Song (EMC Engineer) | cheng.song@cetecom.com Digitally signed by: cheng.song@cetecom.com DN: CN = cheng.song@cetecom.com Date: 2022.06.21 12:00:13 -07'00' |

# 2 Administrative Data

## 2.1 Identification of the Testing Laboratory Issuing the EMC Test Report

| | |
|---|---|
| **Company Name:** | CETECOM Inc. |
| **Department:** | Compliance |
| **Street Address:** | 411 Dixon Landing Road |
| **City/Zip Code** | Milpitas, CA 95035 |
| **Country** | USA |
| **Telephone:** | +1 (408) 586 6200 |
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| **EMC Lab Manager:** | Kevin Wang |
| **Responsible Project Leader:** | Cheng Song |

## 2.2 Identification of the Client

| | |
|---|---|
| **Client Firm/Name:** | Rohde & Schwarz GmbH & Co. KG |
| **Street Address:** | Muehldorfstrasse 15 |
| **City/Zip Code** | Munich / 81671 |
| **Country** | Germany |

## 2.3 Identification of the Manufacturer

| | |
|---|---|
| **Manufacturer's Name:** | Same as Client |
| **Manufacturers Address:** | ---------- |
| **City/Zip Code** | ---------- |
| **Country** | ---------- |

# 3 Equipment Under Test (EUT)

## 3.1 EUT Specifications

| | |
|---|---|
| **Model No** | QAR50 |
| **HW Version** | 02.10 |
| **SW Version** | 11.0.2.0 |
| **FCC-ID** | KVW-QAR50 |
| **Operating Voltage Range** | 100 – 240VAC / 50/60Hz |
| **Operating Temperature Range** | Tmin: 5 °C / Tmax: 40 °C |
| **Radios included in the device** | Operation frequency range depends on the operation modes listed as below:<br>Default Operation: 76-81GHz, 128 frequencies, ~2.5s cycle time<br>K10 option: 72-82GHz, 256 frequencies, ~2.5s cycle time |
| **Sample Revision** | ☐Prototype ■Production ☐ Pre-Production |
| **EUT Dimensions** | QAR50 base device: 12.83*39.46*56.42 in |
| **Weight** | QAR50 base device: 78kg |

## 3.2 EUT Sample details

| EUT # | Serial Number | HW Version | SW Version | Comments |
|---|---|---|---|---|
| **1** | 1343.0099K02-102001-in | 02.10 | 11.0.2.0 | ---------- |

### 3.3 Accessory Equipment (AE) details

| AE # | Type | Model | Manufacturer | Serial Number |
|---|---|---|---|---|
| 1 | - | - | - | - |

### 3.4 Support Equipment (SE) details

| SE # | Type | Model | Manufacturer | Serial Number |
|---|---|---|---|---|
| 1 | - | - | - | - |

### 3.5 Test Sample Configuration

| Set-up # | EUT / AE used for set-up | Comments |
|---|---|---|
| 1 | K10 option with 256 frequencies | K10 option is chosen as worst case, since K10 option has the widest operating frequency range and maximum operating frequency points |
| 2 | K10 option with single frequency | - |

# 4 Subject of Investigation

The objective of the measurements done by CETECOM Inc. was to evaluate the compliance of the EUT against the relevant requirements specified in the Code of Federal Regulations Title 47 parts 18.

# 5 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus, with 95% confidence interval (in dB delta to result), based on a coverage factor k=1.

Radiated measurement

| | |
|---|---|
| 9 kHz to 30MHz | ±2.5 dB (Magnetic Loop Antenna) |
| 30 MHz to 1000 MHz | ±2.0 dB (Biconilog Antenna) |
| 1 GHz to 40 GHz | ±2.3 dB (Horn Antenna) |

Conducted measurement

| | |
|---|---|
| 150 kHz to 30 MHz | ±0.7 dB (LISN) |
| RF conducted measurement | ±0.5 dB |

## 5.1 Environmental Conditions during Testing:

The following environmental conditions were maintained during the course of testing:

- Ambient Temperature: 20-25°C
- Relative humidity: 40-60%

Deviating test conditions are indicated at individual test description where applicable.

## 5.2 Date of Testing:

05/16/2022 – 06/08/2022

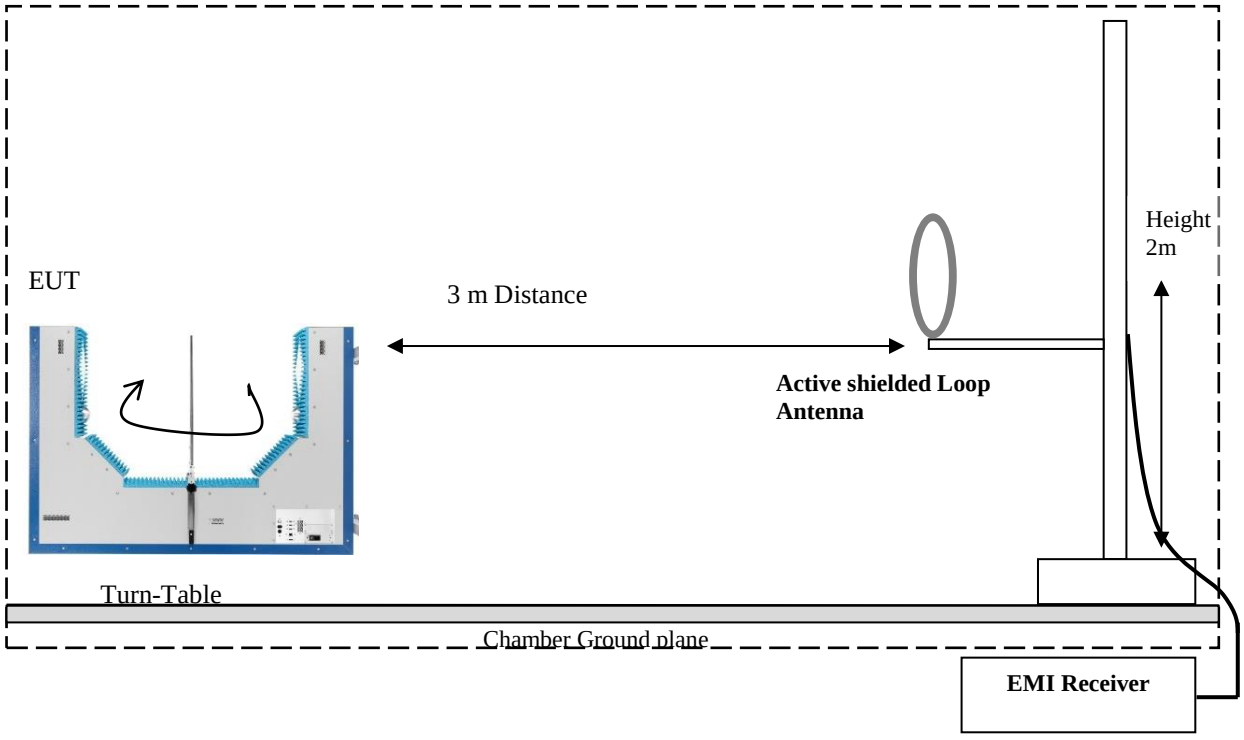
# 6 Measurement Procedures

Testing is performed according to the guidelines provided in FCC MP-5, “FCC Methods of Measurements of Radio Noise Emissions from Industrial, Scientific, and Medical equipment”

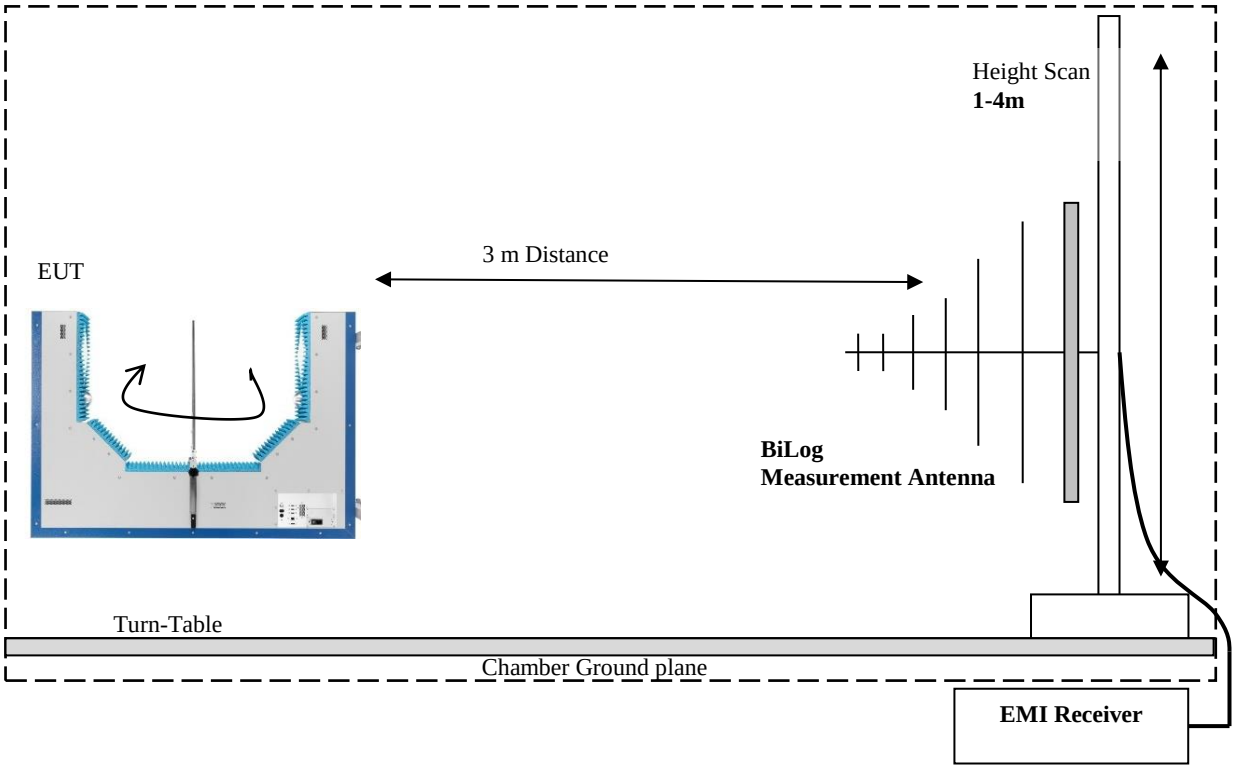
## 6.1 Radiated Measurement of below 40GHz

- Measurements below 40 GHz are split to five frequency ranges using appropriate antennas and EUT configuration. Active shielded loop antenna is used for up to 30 MHz measurement; Biconilog antenna is used from 30 MHz to 1 GHz; and three different horn antennas are used to cover frequencies up to 40 GHz.
- Exploratory measurements are performed with the EUT rotated from 0° to 360°, the loop antenna is set at around 2 meters, the other antennas height are varied from 1 and 4 meters, the height scans apply fro both horizontal and vertical polarization.
- Using the orientation and equipment arrangement of the EUT, based on the measurement results found during the exploratory measurement, the EUT arrangement, appropriate modulation, and modes of operation that produce the emissions that have the highest amplitude relative to the limit are selected for the final measurement.
- In case there are no emissions above noise floor, only the maximum trace is reported as described above.
- Measuring distance between the measuring set antenna and EUT is measured from the closest point of the EUT, and determined by the boundary defined by an imaginary straight line periphery describing a simple geometric configuration enclosing the EUT system

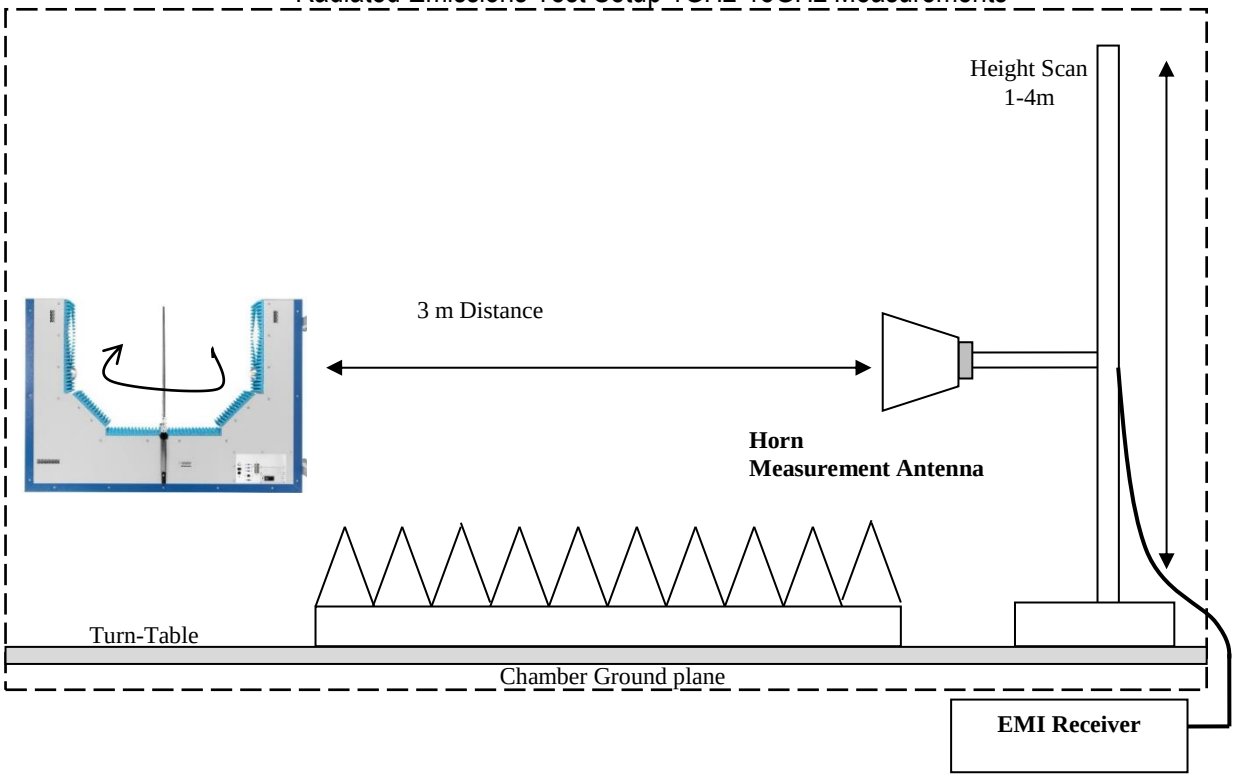
Radiated Emissions Test Setup below 30MHz Measurements



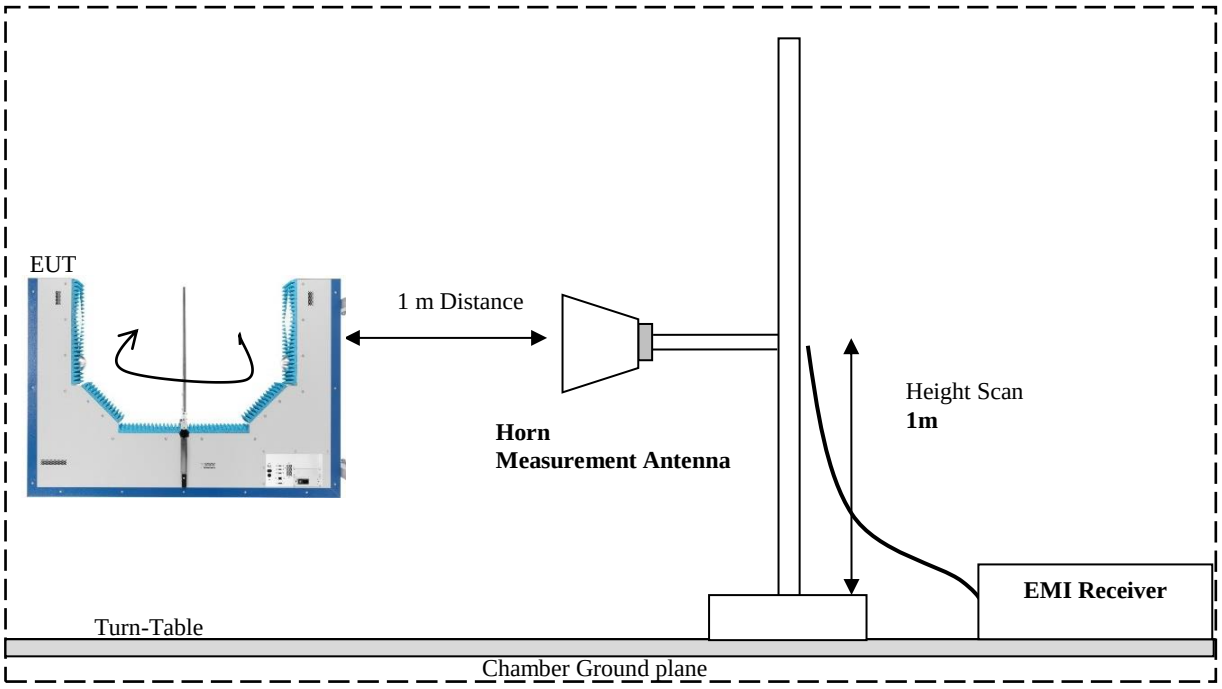
Radiated Emissions Test Setup 30MHz-1GHz Measurements




Radiated Emissions Test Setup 1GHz-18GHz Measurements



Radiated Emissions Test Setup 18GHz-40GHz Measurements




## 6.2 Radiated Measurement of above 40GHz

- Measurements above 40 GHz are split to 5 frequency ranges using R&S external mixers and appropriate antennas as follow:

| | |
|---|---|
| 40-60 GHz | FS-Z60 + 261U-25 |
| 60-90 GHz | FS-Z90 + 261E-25 |
| 90-140 GHz | FS-Z140 + 261F-25 |
| 140-220 GHz | FS-Z220 + 261G-25 |
| 220-325 GHz | FS-Z325 + 32240-20 |

- Exploratory measurements are performed with the EUT rotated from 0° to 360°, measuring set antennas are moved around the EUT to find the position produces highest emissions. The exploratory measurements are repeated with horizontal and vertical antenna polarization.
- Final measurement is performed on the certain position where the maximum emission was found during exploratory measurement.
- Measuring distance between the measuring set antenna and EUT is measured from the closest point of the EUT, and determined by the boundary defined by an imaginary straight line periphery describing a simple geometric configuration enclosing the EUT system.
- The largest diameter of the transmit antenna on the panel is 3mm, the far field distance is determined as below:

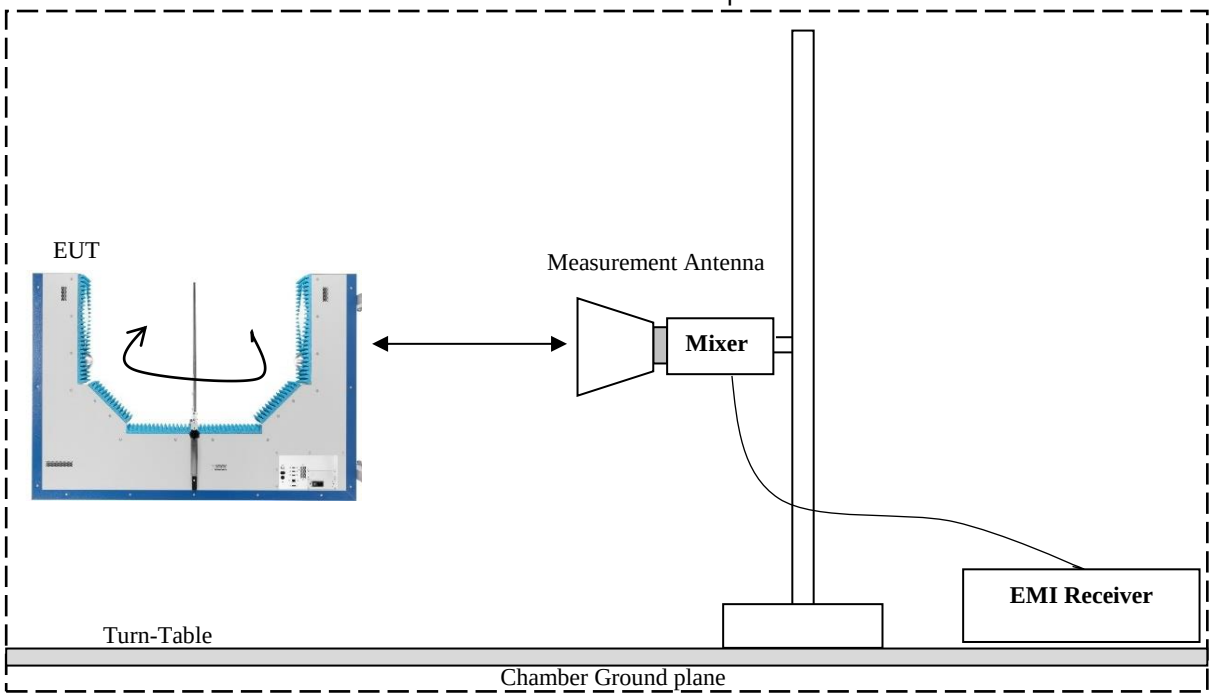
  Far field boundary Calculation:
  R far field = (2*D^2)/λ
  Where: D = largest antenna dimension
  λ = wavelength in meters

| Frequency Range (GHz) | Far field distance of K10 mode (m) |
|---|---|
| 40-60 | 0.0036 |
| 60-90 | 0.0054 |
| 90-140 | 0.0084 |
| 140-220 | 0.0132 |
| 220-325 | 0.02 |

Note: The far field distance is the distance from the aperture of the transmitter antenna to the measurement antenna
Far field distance = measuring distance + distance from the transmitter antenna to the imaginary boundary of EUT

To ensure far field test condition are met, as well as there are enough margin between noise floor and the emission limits, 0.5m measuring distance is used from 40GHz to 90GHz, 0.2m measuring distance is used from 90GHz to 140GHz, 0.1m measuring distance is used for above 140GHz;

Radiated Emissions Test Setup above 40 GHz



### 6.3 Sample Calculations for Field Strength Measurements

Field Strength is calculated from the Spectrum Analyzer/ Receiver readings, taking into account the following parameters:

- Measured reading in dBµV
- Cable Loss between the receiving antenna and SA in dB and
- Antenna Factor in dB/m

All radiated measurement plots in this report are taken from a test SW that calculates the Field Strength based on the following equation:

FS (dBµV/m) = Measured Value on SA (dBµV) + Cable Loss (dB) + Antenna Factor (dB/m)

Example:

| Frequency (MHz) | Measured SA (dBµV) | Cable Loss (dB) | Antenna Factor Correction (dB) | Field Strength Result (dBµV/m) |
|---|---|---|---|---|
| 1000 | 80.5 | 3.5 | 14 | 98.0 |

## 7 Measurement Results Summary

| Test Specification | Test Case | Temperature and Voltage Conditions | Set-up # | Pass | Fail | NA | NP | Result |
|---|---|---|---|---|---|---|---|---|
| FCC §18.305 | Radiated Emissions | Nominal | 1&2 | ■ | ☐ | ☐ | ☐ | Complies |
| FCC §18.307 | AC power line Conducted Emissions | Nominal | 1&2 | ■ | ☐ | ☐ | ☐ | Complies |

**Note 1:** NA= Not Applicable; NP= Not Performed.

# 8 Test Result Data

## 8.1 Radiated Emissions Measurement according to CFR 47 Part 18.305

| Spectrum Analyzer settings | | |
|---|---|---|
| **Sweep Frequency Range** | 30 MHz – 1 GHz | >1 GHz |
| **Resolution Bandwidth** | 100 kHz | 1 MHz |
| **Detector (Exploratory Measurements)** | Peak | Peak |
| **Detector (Final Measurements)** | Average | Average |
| **Trace Mode** | Max Hold | Max Hold |
| **Step Size** | 40 kHz | 500 kHz |
| **Measurement Time (Exploratory Measurements)** | 2 ms | 2 ms |
| **Measurement Time (Final Measurements)** | 100 ms | 100 ms |

### 8.1.1 Limits:

| Equipment | Operating frequency | RF Power generated by equipment (watts) | Field strength limit (uV/m) | Distance (meters) |
|---|---|---|---|---|
| Any type unless otherwise specified (miscellaneous) | Any ISM frequency | Below 500<br>500 or more | 25<br>25 × SQRT(power/500) | 300<br>[1]300 |
| | Any non-ISM frequency | Below 500<br>500 or more | 15<br>15 × SQRT(power/500) | 300<br>[1]300 |
| Industrial heaters and RF stabilized arc welders | On or below 5,725 MHz<br>Above 5,725 MHz | Any<br>Any | 10<br>([2]) | 1,600<br>([2]) |
| Medical diathermy | Any ISM frequency<br>Any non-ISM frequency | Any<br>Any | 25<br>15 | 300<br>300 |
| Ultrasonic | Below 490 kHz | Below 500<br>500 or more | 2,400/F(kHz)<br>2,400/F(kHz) × SQRT(power/500) | 300<br>[3]300 |
| | 490 to 1,600 kHz<br>Above 1,600 kHz | Any<br>Any | 24,000/F(kHz)<br>15 | 30<br>30 |
| Induction cooking ranges | Below 90 kHz<br>On or above 90 kHz | Any<br>Any | 1,500<br>300 | [4]30<br>[4]30 |

Note1: EUT belong to miscellaneous equipment with non-ISM frequency
Note2: Limit 3m(dBuV/m) = Limit 300m(dBuV/m) + 40*log(300/3) for below 30MHz
Note3: Limit 3m(dBuV/m) = Limit 300m(dBuV/m) + 20*log(300/3) for above 30MHz

**Limit Calculation:**
Field Strength Limit @ 3m(dBuV/m) = 63.52dBuV/m
➔ EIRP Limit = -31.71dBm
40-220 GHz limit on SA is based on the following formula:
$Limit_{SA} = Limit_{actual}$ + Ant Gain – FSPL
For 40-60GHz, the measurement distance is 50cm.
For 60-90GHz, the measurement distance is 45.5cm.
For 90-140GHz, the measurement distance is 20cm.
For 140-325GHz, the measurement distance is 10cm.

Then the EIRP limit on the SA will be the following table.

| Freq/GHz | limit on SA | Freq/GHz | limit on SA | Freq/GHz | limit on SA | Freq/GHz | limit on SA |
|---|---|---|---|---|---|---|---|
| 40 | -65.17 | 93 | -64.54 | 146 | -62.44 | 199 | -65.13 |
| 41 | -65.39 | 94 | -64.63 | 147 | -62.50 | 200 | -65.17 |
| 42 | -65.59 | 95 | -64.73 | 148 | -62.56 | 201 | -65.21 |
| 43 | -65.80 | 96 | -64.82 | 149 | -62.61 | 202 | -65.26 |
| 44 | -66.00 | 97 | -64.91 | 150 | -62.67 | 203 | -65.30 |
| 45 | -66.19 | 98 | -65.00 | 151 | -62.73 | 204 | -65.34 |
| 46 | -66.38 | 99 | -65.08 | 152 | -62.79 | 205 | -65.39 |
| 47 | -66.57 | 100 | -65.17 | 153 | -62.84 | 206 | -65.43 |
| 48 | -66.75 | 101 | -65.26 | 154 | -62.90 | 207 | -65.47 |
| 49 | -66.93 | 102 | -65.34 | 155 | -62.96 | 208 | -65.51 |
| 50 | -67.11 | 103 | -65.43 | 156 | -63.01 | 209 | -65.55 |
| 51 | -67.28 | 104 | -65.51 | 157 | -63.07 | 210 | -65.59 |
| 52 | -67.45 | 105 | -65.59 | 158 | -63.12 | 211 | -65.64 |
| 53 | -67.61 | 106 | -65.68 | 159 | -63.18 | 212 | -65.68 |
| 54 | -67.78 | 107 | -65.76 | 160 | -63.23 | 213 | -65.72 |
| 55 | -67.94 | 108 | -65.84 | 161 | -63.29 | 214 | -65.76 |
| 56 | -68.09 | 109 | -65.92 | 162 | -63.34 | 215 | -65.80 |
| 57 | -68.25 | 110 | -66.00 | 163 | -63.39 | 216 | -65.84 |
| 58 | -68.40 | 111 | -66.08 | 164 | -63.45 | 217 | -65.88 |
| 59 | -68.55 | 112 | -66.15 | 165 | -63.50 | 218 | -65.92 |
| 60 | -67.87 | 113 | -66.23 | 166 | -63.55 | 219 | -65.96 |
| 61 | -68.02 | 114 | -66.31 | 167 | -63.60 | 220 | -66.00 |
| 62 | -68.16 | 115 | -66.38 | 168 | -63.66 | 224 | -71.15 |
| 63 | -68.30 | 116 | -66.46 | 169 | -63.71 | 228 | -71.31 |
| 64 | -68.43 | 117 | -66.53 | 170 | -63.76 | 232 | -71.46 |
| 65 | -68.57 | 118 | -66.61 | 171 | -63.81 | 236 | -71.61 |
| 66 | -68.70 | 119 | -66.68 | 172 | -63.86 | 240 | -71.75 |
| 67 | -68.83 | 120 | -66.75 | 173 | -63.91 | 244 | -71.90 |
| 68 | -68.96 | 121 | -66.83 | 174 | -63.96 | 248 | -72.04 |
| 69 | -69.09 | 122 | -66.90 | 175 | -64.01 | 252 | -72.18 |
| 70 | -69.21 | 123 | -66.97 | 176 | -64.06 | 256 | -72.31 |
| 71 | -69.34 | 124 | -67.04 | 177 | -64.11 | 260 | -72.45 |
| 72 | -69.46 | 125 | -67.11 | 178 | -64.16 | 264 | -72.58 |
| 73 | -69.58 | 126 | -67.18 | 179 | -64.21 | 268 | -72.71 |
| 74 | -69.69 | 127 | -67.25 | 180 | -64.26 | 272 | -72.84 |
| 75 | -69.81 | 128 | -67.31 | 181 | -64.30 | 276 | -72.97 |
| 76 | -69.93 | 129 | -67.38 | 182 | -64.35 | 280 | -73.09 |
| 77 | -70.04 | 130 | -67.45 | 183 | -64.40 | 284 | -73.22 |
| 78 | -70.15 | 131 | -67.52 | 184 | -64.45 | 288 | -73.34 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 79 | -70.26 | 132 | -67.58 | 185 | -64.49 | 292 | -73.46 |
| 80 | -70.37 | 133 | -67.65 | 186 | -64.54 | 296 | -73.58 |
| 81 | -70.48 | 134 | -67.71 | 187 | -64.59 | 300 | -73.69 |
| 82 | -70.59 | 135 | -67.78 | 188 | -64.63 | 304 | -73.81 |
| 83 | -70.69 | 136 | -67.84 | 189 | -64.68 | 308 | -73.92 |
| 84 | -70.80 | 137 | -67.91 | 190 | -64.73 | 312 | -74.03 |
| 85 | -70.90 | 138 | -67.97 | 191 | -64.77 | 316 | -74.14 |
| 86 | -71.00 | 139 | -68.03 | 192 | -64.82 | 320 | -74.25 |
| 87 | -71.10 | 140 | -68.09 | 193 | -64.86 | 324 | -74.36 |
| 88 | -71.20 | 141 | -62.13 | 194 | -64.91 | | |
| 89 | -71.30 | 142 | -62.20 | 195 | -64.95 | | |
| 90 | -71.40 | 143 | -62.26 | 196 | -65.00 | | |
| 91 | -64.35 | 144 | -62.32 | 197 | -65.04 | | |
| 92 | -64.45 | 145 | -62.38 | 198 | -65.08 | | |

### 8.1.2 Test Summary:

| Environmental Conditions | |
|---|---|
| Ambient Temperature: | 23°C |
| Relative Humidity: | 45.1% |
| Atmospheric Pressure: | 1010 mbar |

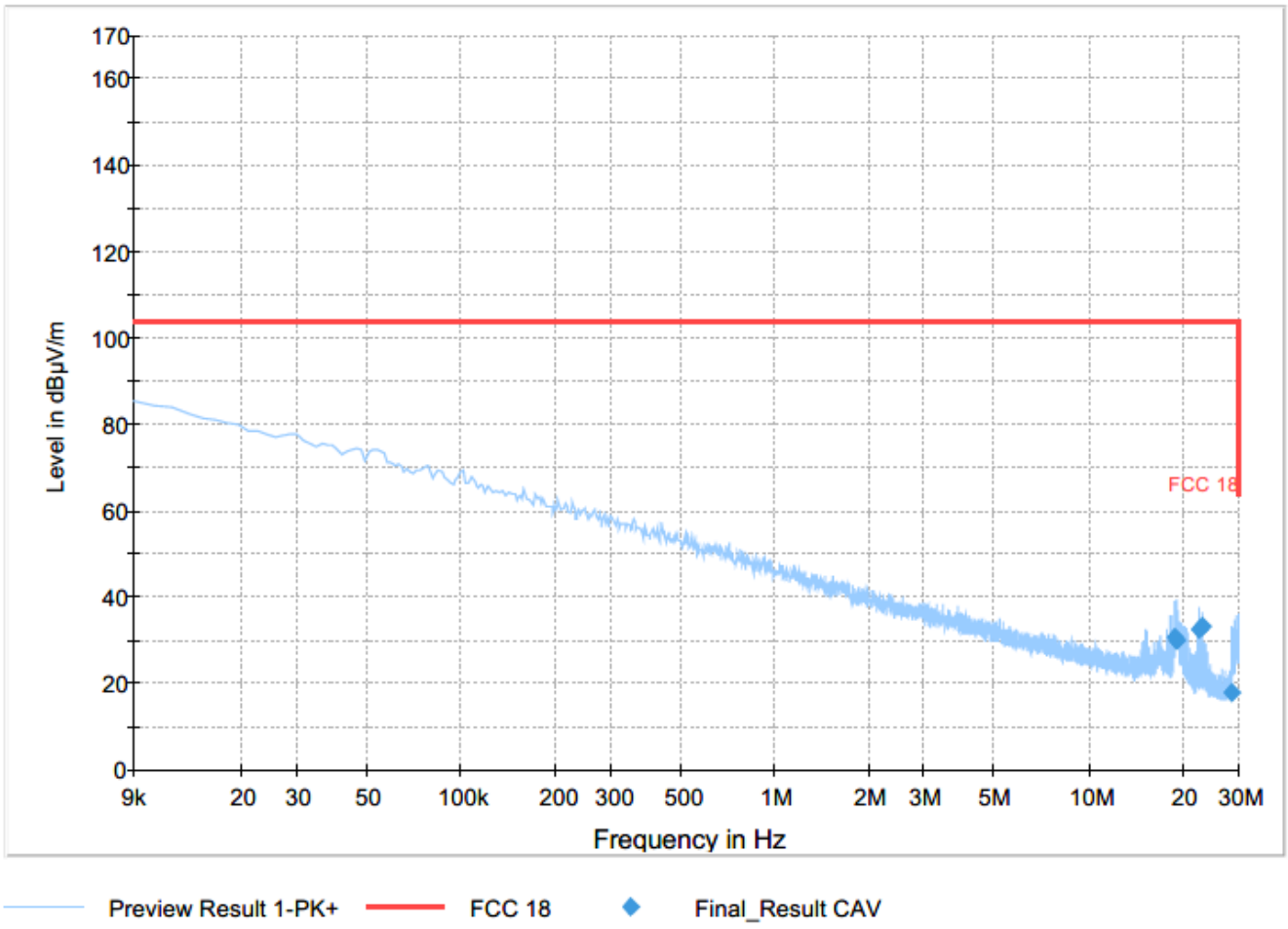
| Test Results | | | | | | |
|---|---|---|---|---|---|---|
| **Plot #** | **EUT Position** | **EUT operating mode** | **Scan Frequency** | **Power Supply Input** | **Comments** | **Result** |
| 1 – 21 | U shape | K10 Frequency Resolved Measurement Option | 9kHz – 325 GHz | 120V AC | Final measurement | Pass |
| 22 – 40 | U shape | Single Frequency | 9kHz – 325 GHz | 120V AC | Final measurement | Pass |
| 41 - 45 | C shape | K10 Frequency Resolved Measurement Option | 9kHz – 40 GHz | 120V AC | Final measurement | Pass |
| 46 - 50 | C shape | Single Frequency | 9kHz – 40 GHz | 120V AC | Final measurement | Pass |

### 8.1.3 Measurement Plots:

**Plot # 1 Unwanted Emissions: 9 kHz - 30 MHz**

**Final Result**

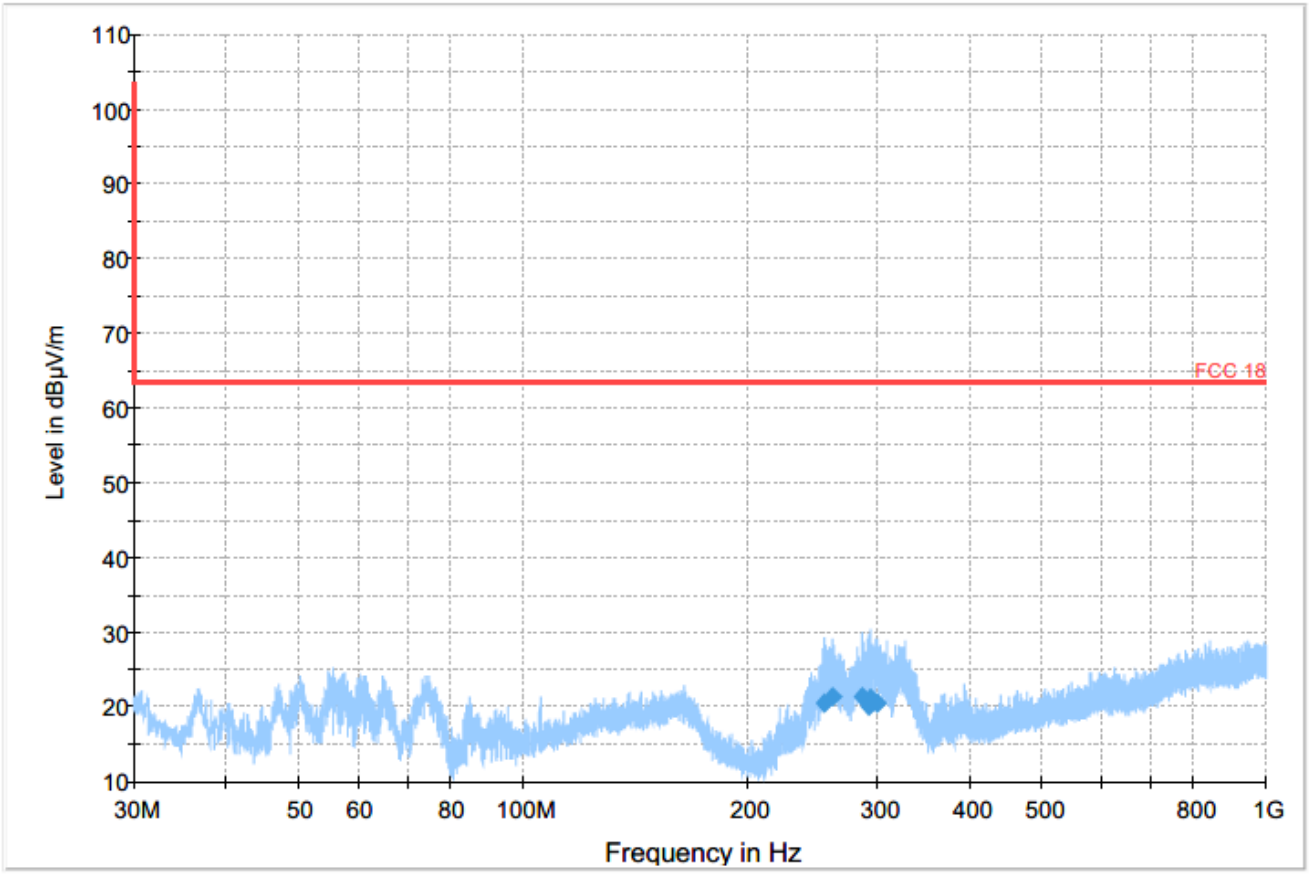
| Frequency (MHz) | CAverage (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| 18.92 | 30.81 | 103.52 | 72.71 | 500.0 | 9.0 | 107.0 | V | 181.0 | 16.5 | |
| 19.16 | 30.01 | 103.52 | 73.51 | 500.0 | 9.0 | 100.0 | V | 90.0 | 16.5 | |
| 22.58 | 32.40 | 103.52 | 71.12 | 500.0 | 9.0 | 100.0 | V | 330.0 | 16.2 | |
| 23.13 | 33.04 | 103.52 | 70.48 | 500.0 | 9.0 | 117.0 | V | 172.0 | 16.2 | |
| 28.73 | 17.91 | 103.52 | 85.61 | 500.0 | 9.0 | 117.0 | V | 175.0 | 15.9 | |



**Plot # 2 Unwanted Emissions 30 MHz – 1GHz**

## Final Result

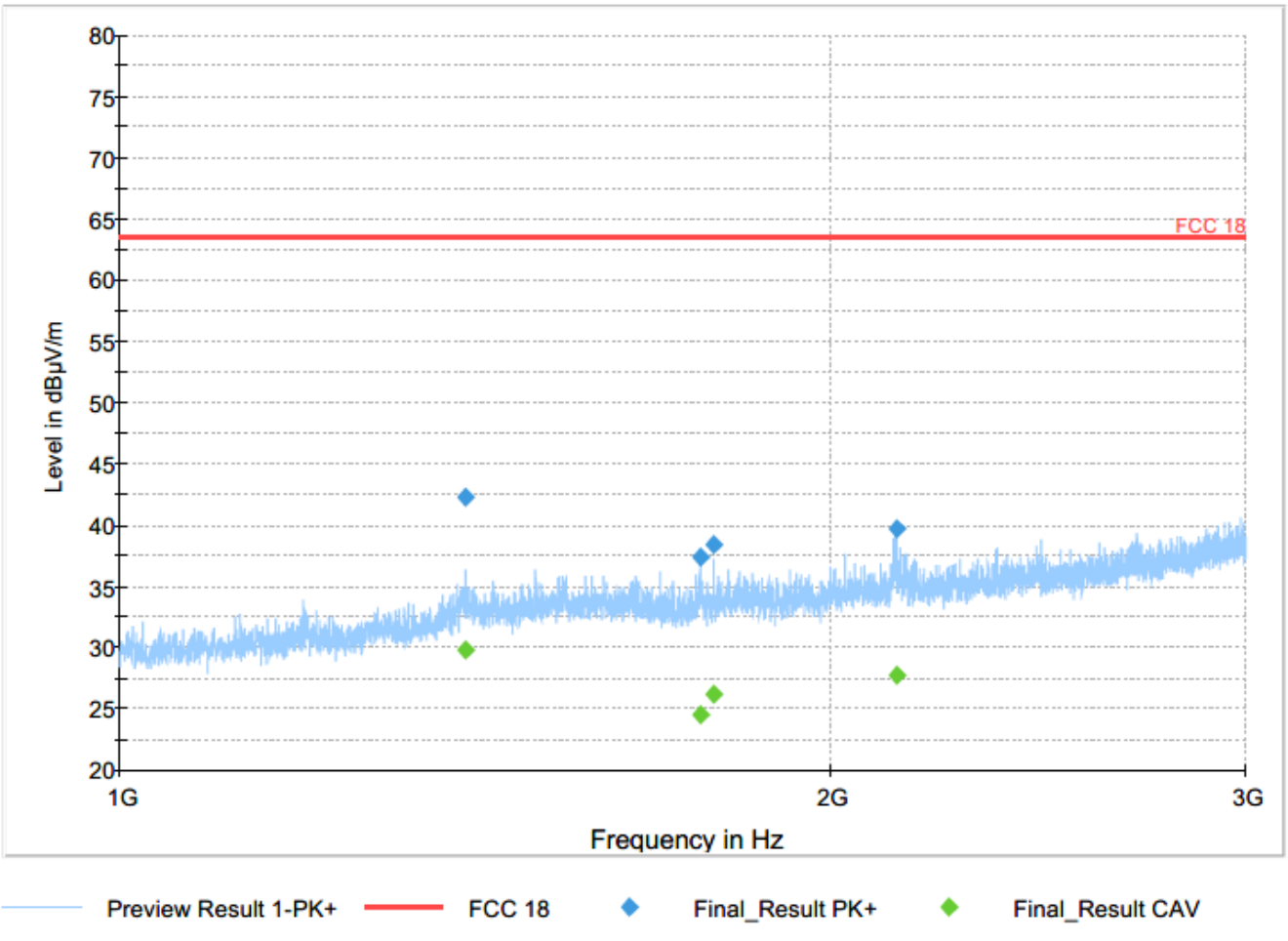
| Frequency (MHz) | CAverage (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|---|---|---|---|---|---|---|---|---|---|
| 255.23 | 20.57 | 63.52 | 42.95 | 500.0 | 120.0 | 107.0 | V | 98.0 | 21.6 |
| 261.51 | 21.46 | 63.52 | 42.06 | 500.0 | 120.0 | 150.0 | V | 106.0 | 20.9 |
| 285.98 | 21.42 | 63.52 | 42.10 | 500.0 | 120.0 | 142.0 | V | 120.0 | 21.1 |
| 292.51 | 20.08 | 63.52 | 43.44 | 500.0 | 120.0 | 100.0 | V | 85.0 | 21.1 |
| 293.82 | 21.13 | 63.52 | 42.39 | 500.0 | 120.0 | 142.0 | V | 132.0 | 21.1 |
| 299.78 | 20.49 | 63.52 | 43.03 | 500.0 | 120.0 | 173.0 | V | 121.0 | 21.3 |



**Plot # 3 Unwanted Emissions: 1-3 GHz**

## Final Result

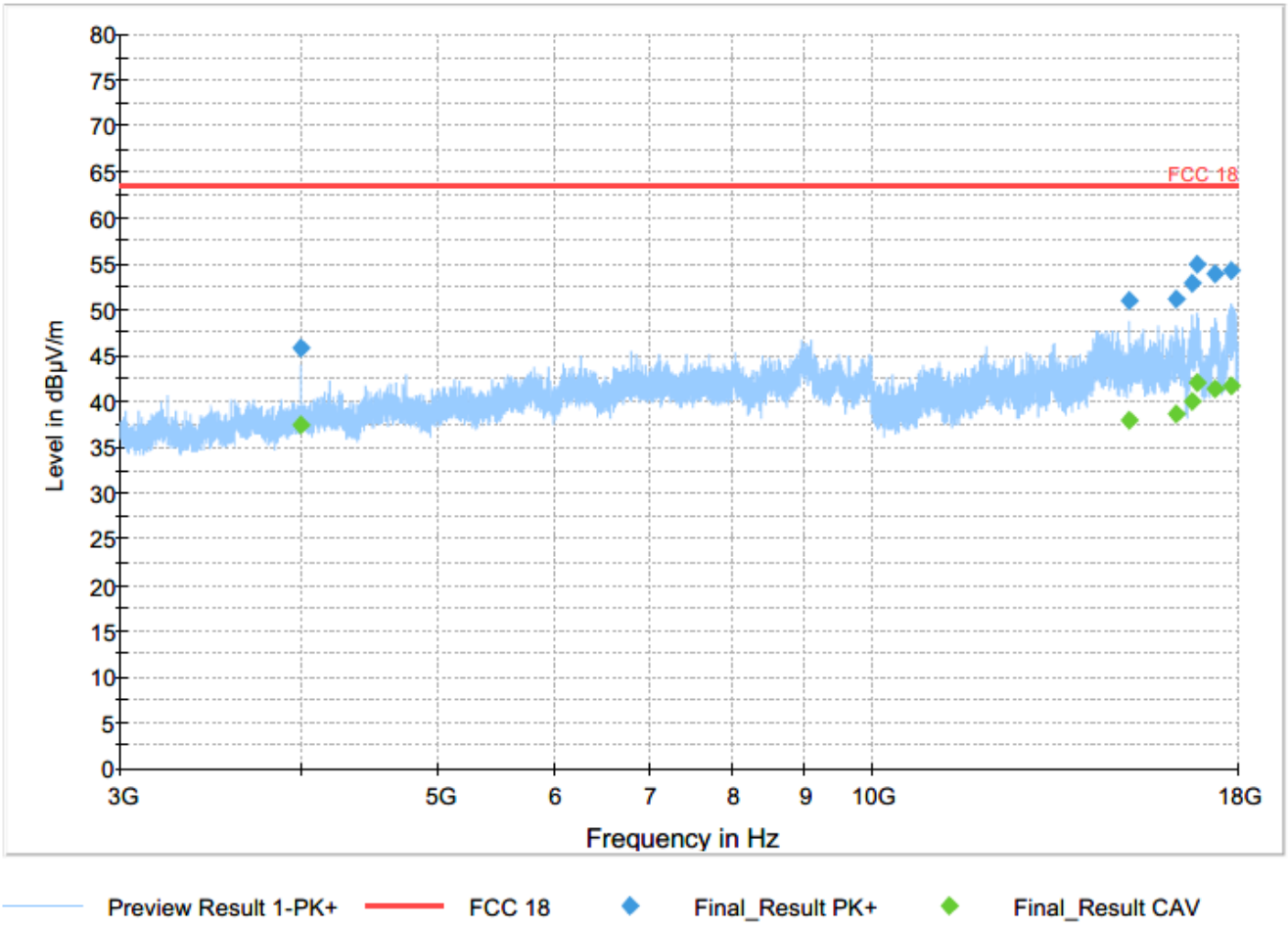
| Frequency (MHz) | MaxPeak (dBµV/m) | CAverage (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1401.50 | --- | 29.83 | 63.52 | 33.69 | 500.0 | 1000.0 | 234.0 | V | 18.0 | -3.3 |
| 1401.50 | 42.33 | --- | 63.52 | 21.19 | 500.0 | 1000.0 | 234.0 | V | 18.0 | -3.3 |
| 1761.75 | 37.45 | --- | 63.52 | 26.07 | 500.0 | 1000.0 | 135.0 | H | 154.0 | -2.9 |
| 1761.75 | --- | 24.46 | 63.52 | 39.06 | 500.0 | 1000.0 | 135.0 | H | 154.0 | -2.9 |
| 1784.25 | --- | 26.22 | 63.52 | 37.30 | 500.0 | 1000.0 | 112.0 | V | 24.0 | -2.7 |
| 1784.25 | 38.36 | --- | 63.52 | 25.16 | 500.0 | 1000.0 | 112.0 | V | 24.0 | -2.7 |
| 2134.25 | 39.68 | --- | 63.52 | 23.84 | 500.0 | 1000.0 | 112.0 | V | 3.0 | -1.2 |
| 2134.25 | --- | 27.67 | 63.52 | 35.85 | 500.0 | 1000.0 | 112.0 | V | 3.0 | -1.2 |



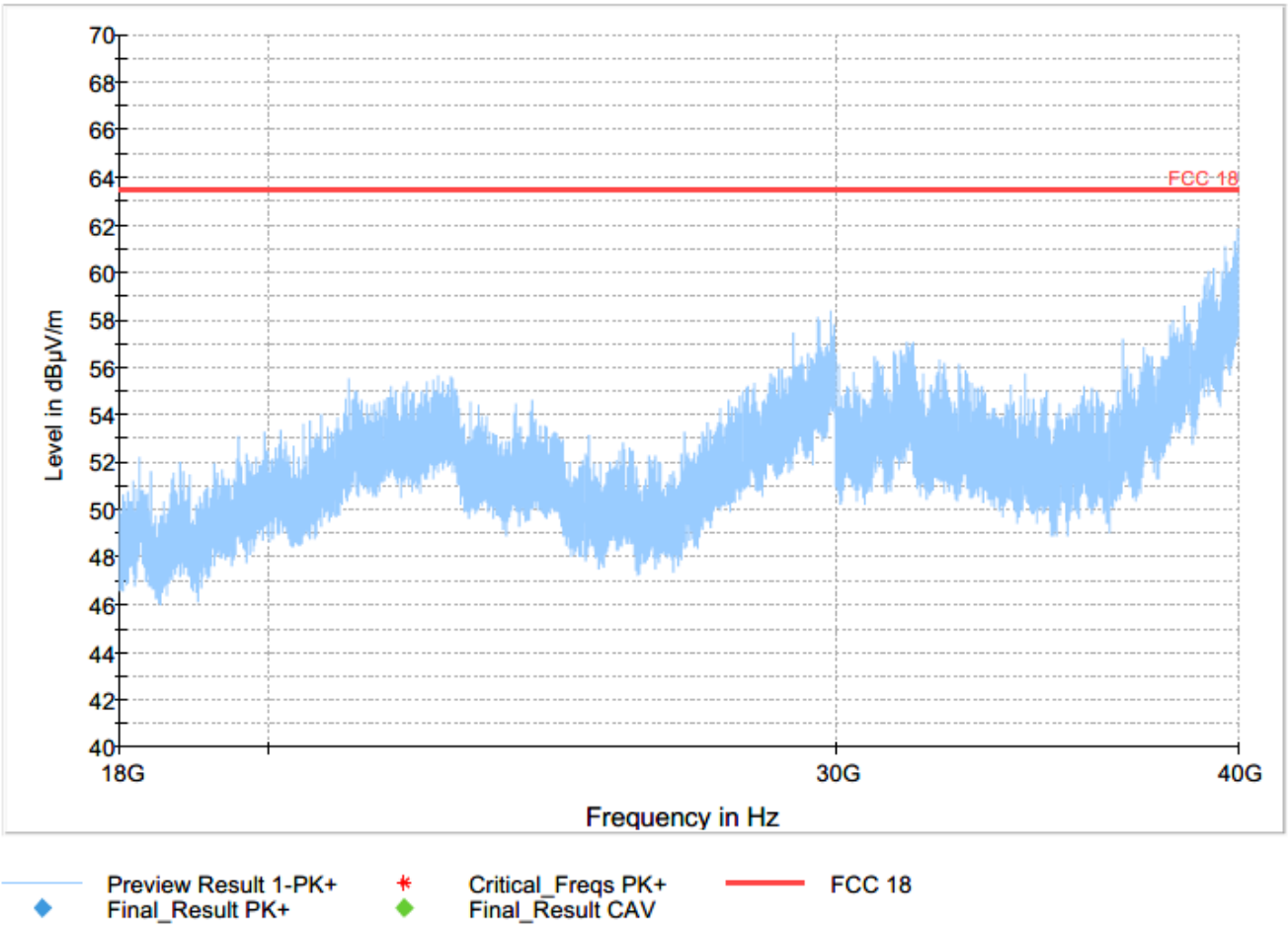
**Plot # 4 Unwanted Emissions: 3 - 18 GHz**

## Final_Result

| Frequency (MHz) | MaxPeak (dBµV/m) | CAverage (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|---|---|---|---|---|---|---|---|---|---|---|
| 4000.00 | 45.77 | --- | 63.52 | 17.75 | 500.0 | 1000.0 | 107.0 | H | 316.0 | -31.9 |
| 4000.00 | --- | 37.36 | 63.52 | 26.16 | 500.0 | 1000.0 | 107.0 | H | 316.0 | -31.9 |
| 15117.82 | --- | 37.93 | 63.52 | 25.59 | 500.0 | 1000.0 | 131.0 | V | 134.0 | -16.8 |
| 15117.82 | 50.90 | --- | 63.52 | 12.62 | 500.0 | 1000.0 | 131.0 | V | 134.0 | -16.8 |
| 16296.87 | 51.15 | --- | 63.52 | 12.37 | 500.0 | 1000.0 | 136.0 | V | 278.0 | -12.1 |
| 16296.87 | --- | 38.64 | 63.52 | 24.88 | 500.0 | 1000.0 | 136.0 | V | 278.0 | -12.1 |
| 16756.36 | --- | 40.09 | 63.52 | 23.43 | 500.0 | 1000.0 | 107.0 | V | 96.0 | -12.3 |
| 16756.36 | 52.89 | --- | 63.52 | 10.63 | 500.0 | 1000.0 | 107.0 | V | 96.0 | -12.3 |
| 16886.55 | 54.97 | --- | 63.52 | 8.55 | 500.0 | 1000.0 | 293.0 | V | 162.0 | -11.9 |
| 16886.55 | --- | 42.10 | 63.52 | 21.42 | 500.0 | 1000.0 | 293.0 | V | 162.0 | -11.9 |
| 17363.05 | --- | 41.43 | 63.52 | 22.09 | 500.0 | 1000.0 | 273.0 | H | 299.0 | -10.1 |
| 17363.05 | 53.84 | --- | 63.52 | 9.68 | 500.0 | 1000.0 | 273.0 | H | 299.0 | -10.1 |
| 17805.96 | 54.26 | --- | 63.52 | 9.26 | 500.0 | 1000.0 | 107.0 | H | 311.0 | -7.5 |
| 17805.96 | --- | 41.72 | 63.52 | 21.80 | 500.0 | 1000.0 | 107.0 | H | 311.0 | -7.5 |

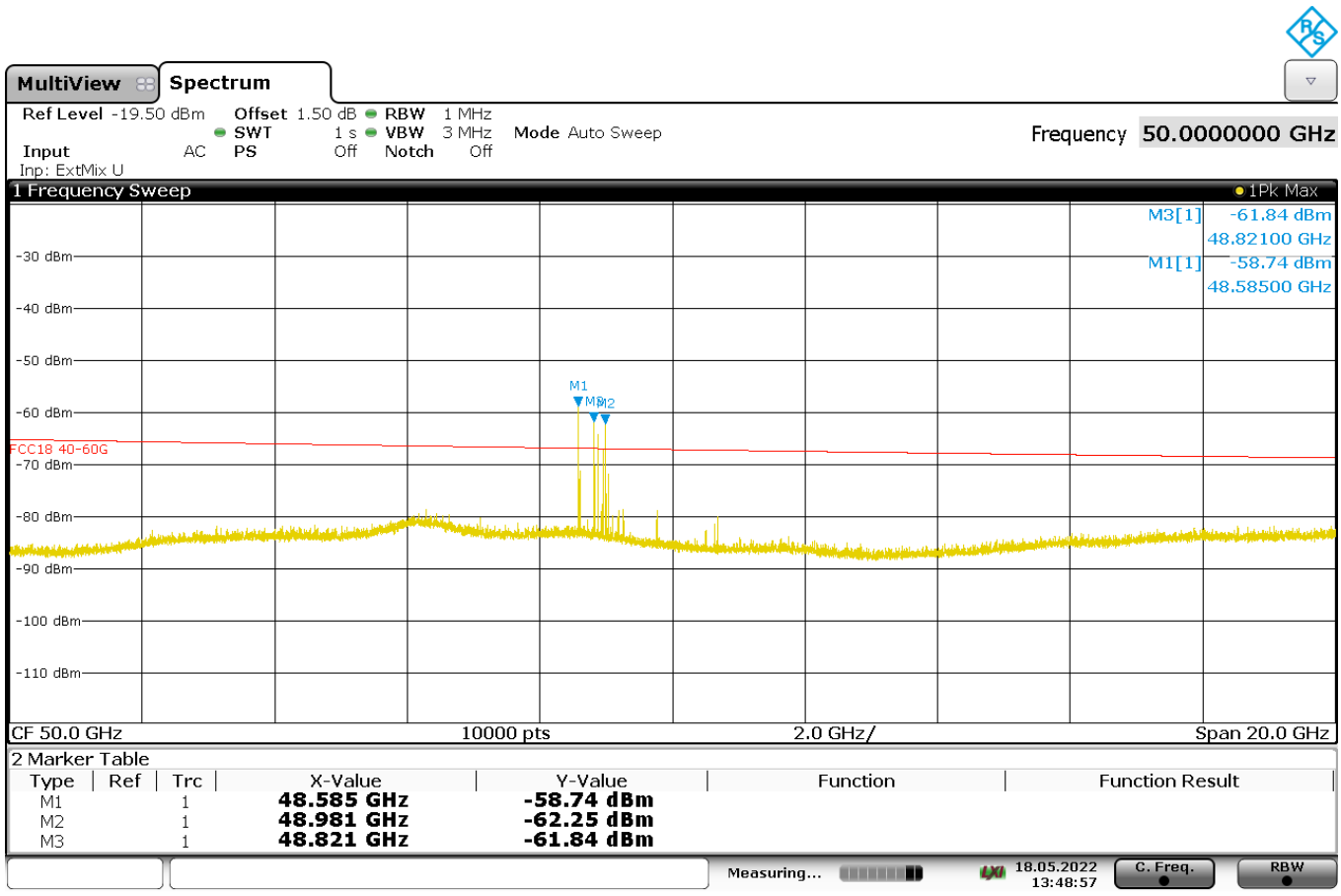


**Plot # 5 Unwanted Emissions: 18-40 GHz**



**Plot # 6 Unwanted Emissions: 40 - 60 GHz**

**Measurement antenna orientation:** Horizontal

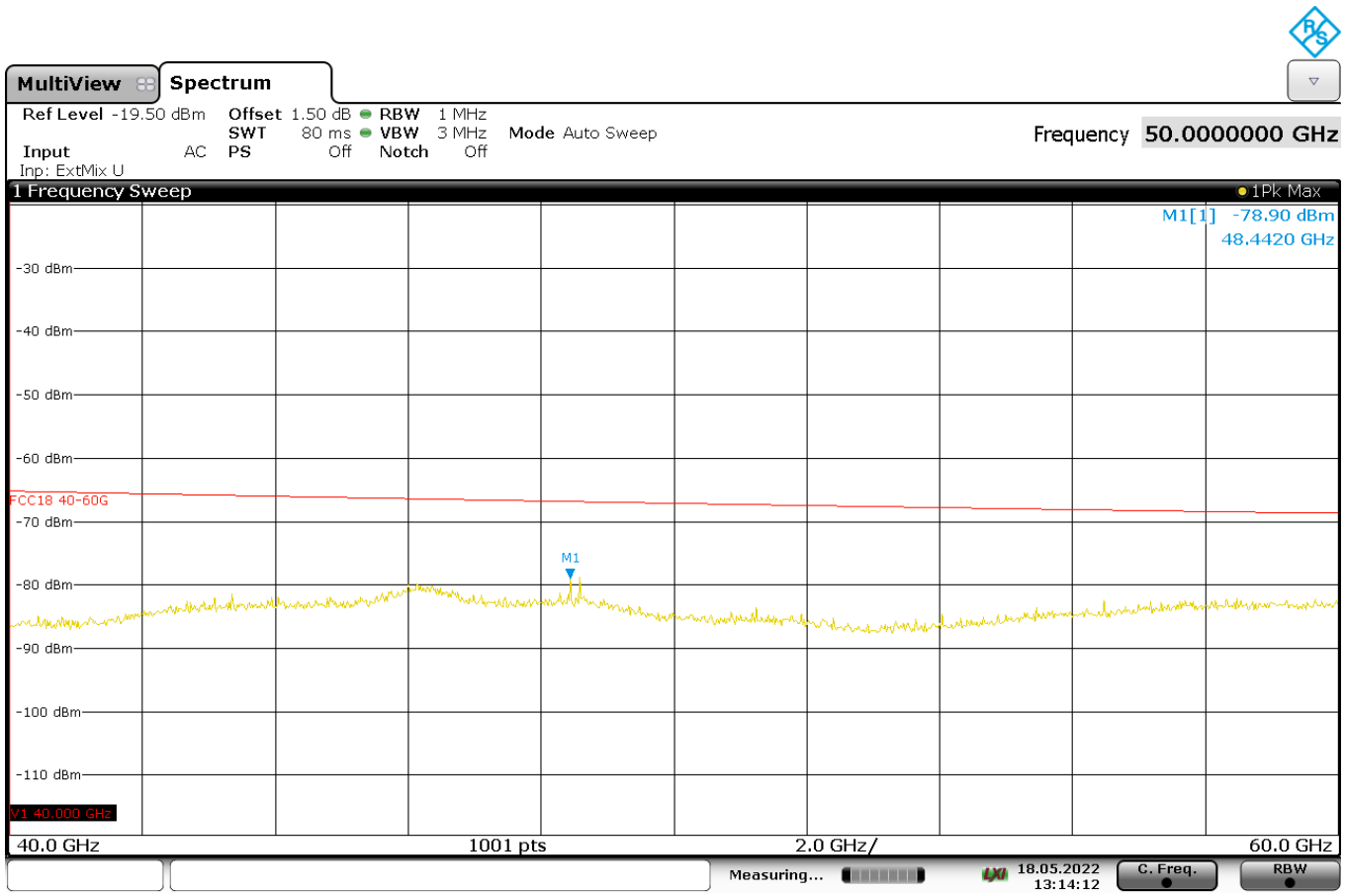



Note: When using Zero Span, and RMS detector, the follow amplitudes are measured.

| | |
|---|---|
| 48.585GHz | -76.52dBm |
| 48.821GHz | -78.54dBm |
| 48.981GHz | -83.05dBm |

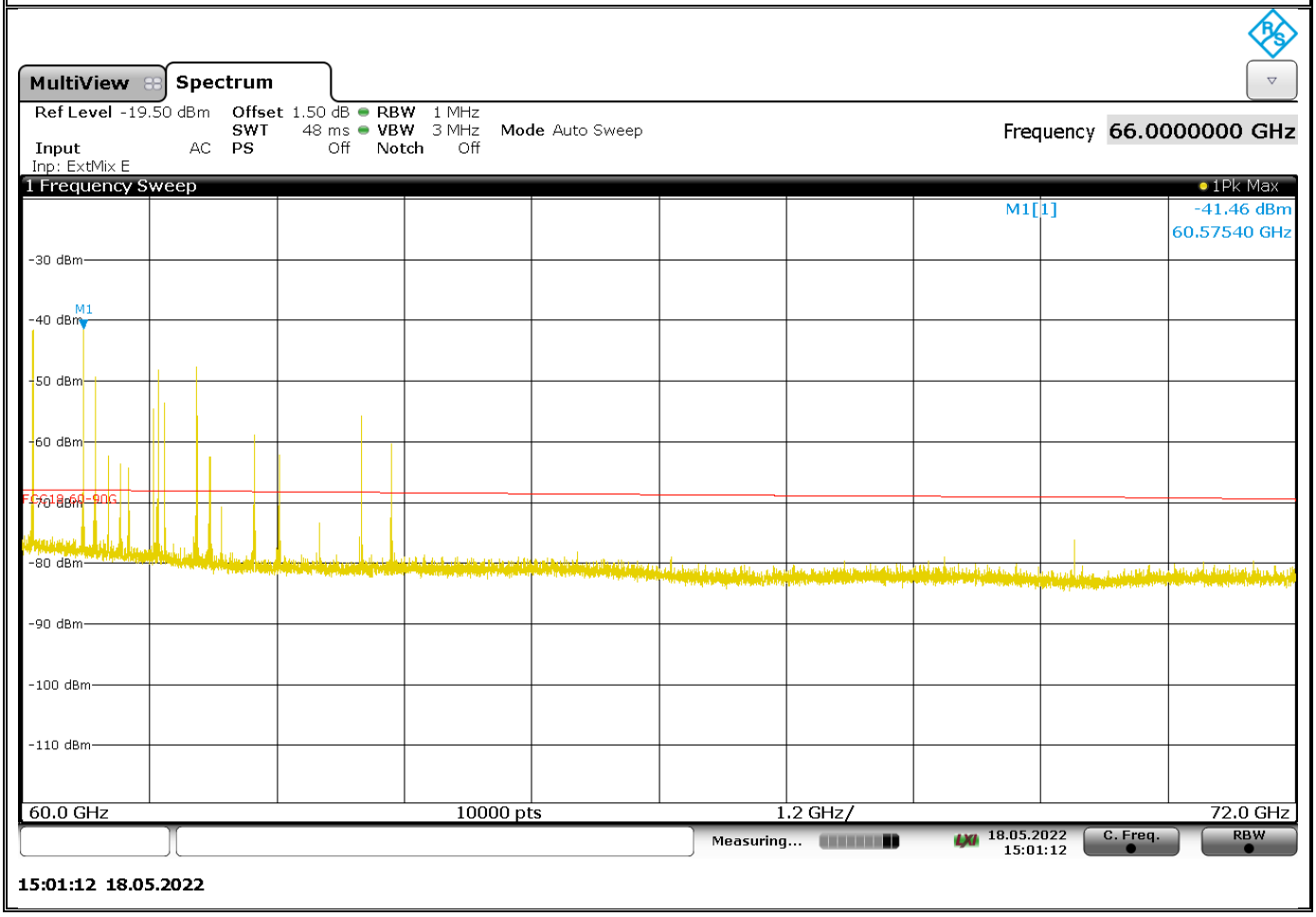
**Plot # 7 Unwanted Emissions: 40 - 60 GHz**

**Measurement antenna orientation:** Vertical



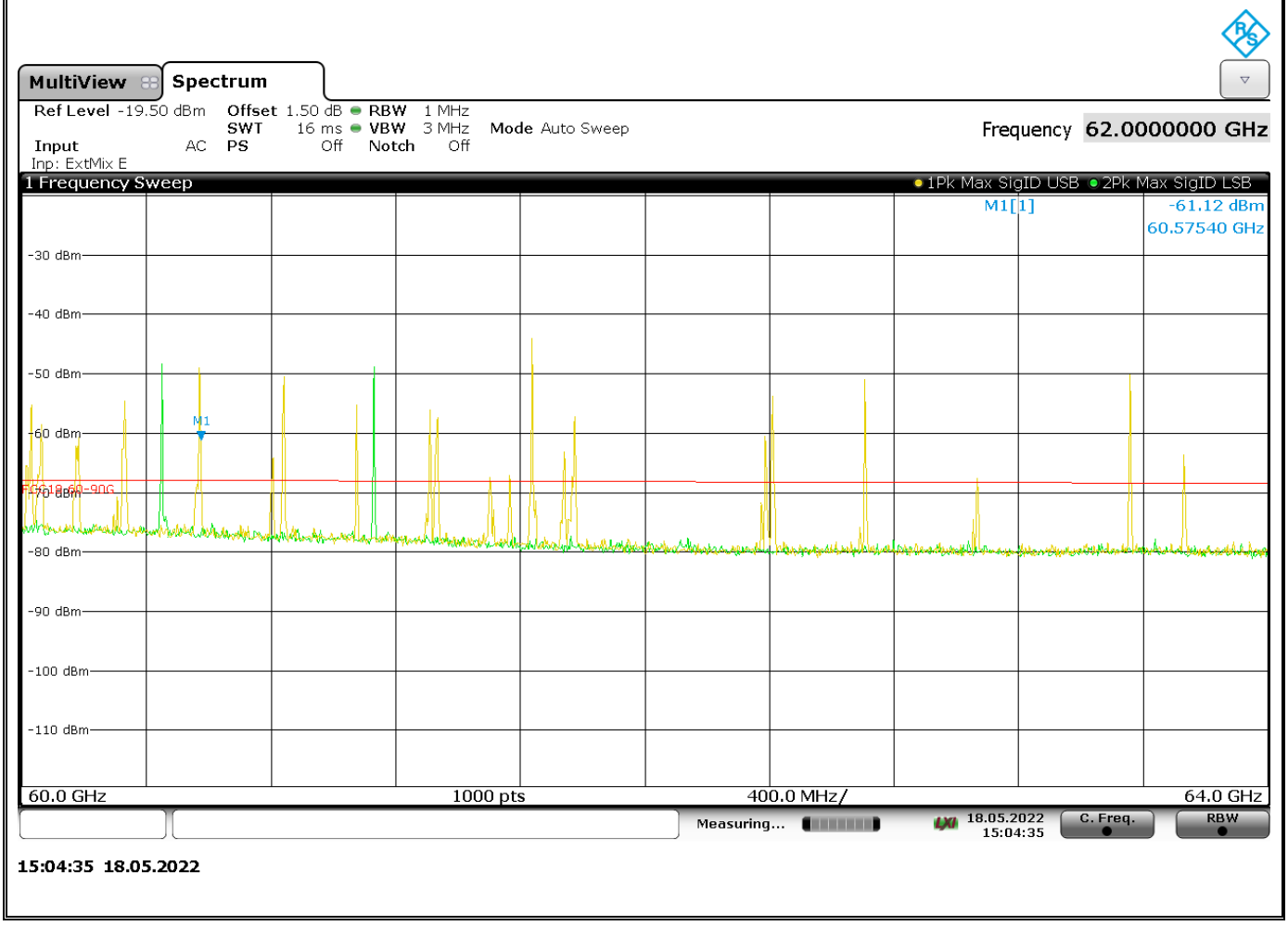
**Plot # 8 Unwanted Emissions: 60 - 72 GHz**

**Measurement antenna orientation:** Horizontal



**Plot # 9 Unwanted Emissions: 60 - 64 GHz with Signal ID on**

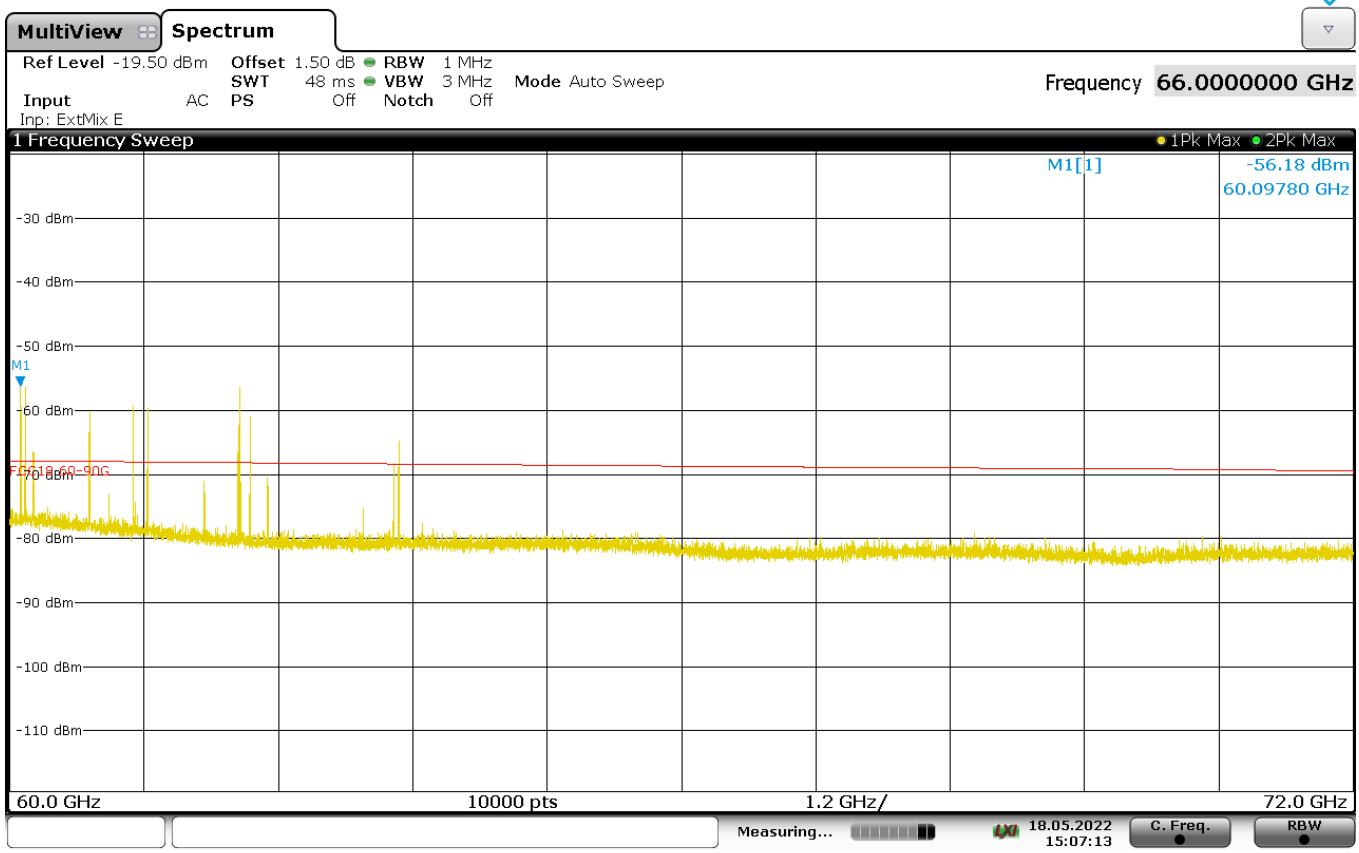
**Measurement antenna orientation:** Horizontal




Note: The Signal ID function of the ESW44 was used to evaluate the spectrum from 60-64GHz. The conclusion is that all observed emissions are products of the external mixer.

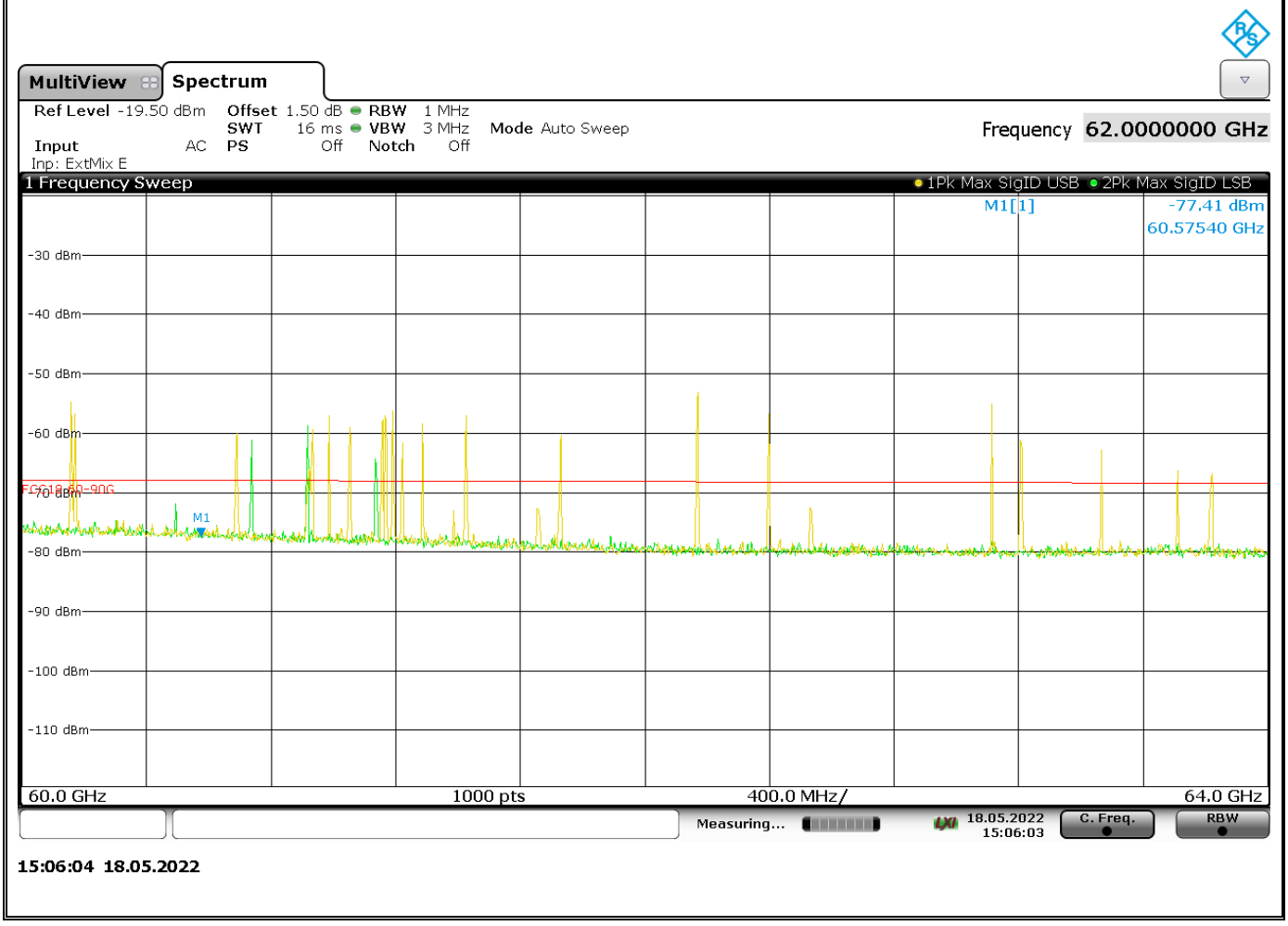
**Plot # 10 Unwanted Emissions: 60 - 72 GHz**

**Measurement antenna orientation:** Vertical



**Plot # 11 Unwanted Emissions: 60 - 64 GHz with Signal ID on**

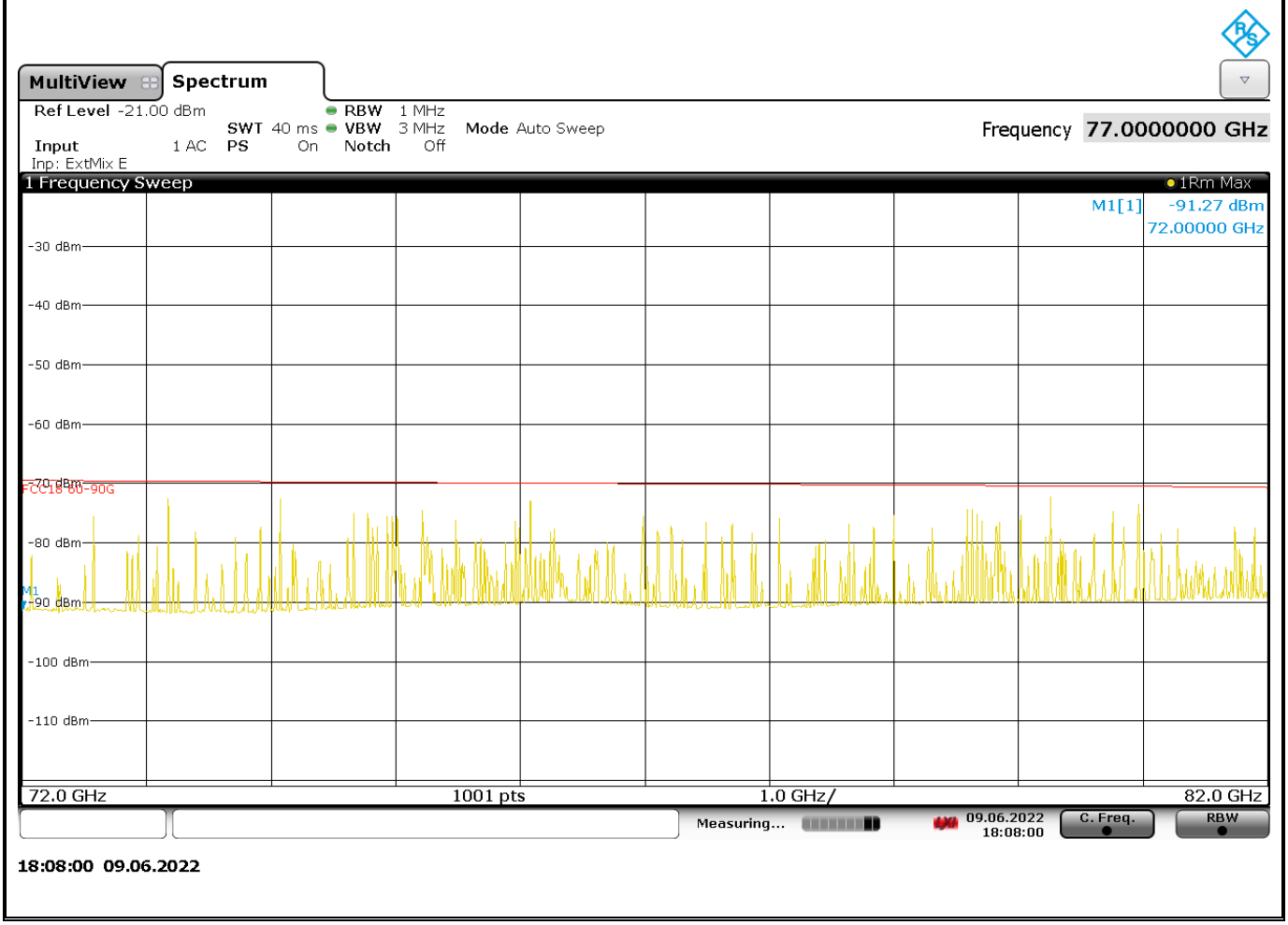
**Measurement antenna orientation:** Vertical




Note: The Signal ID function of the ESW44 was used to evaluate the spectrum from 60-64GHz. The conclusion is that all observed emissions are products of the external mixer.

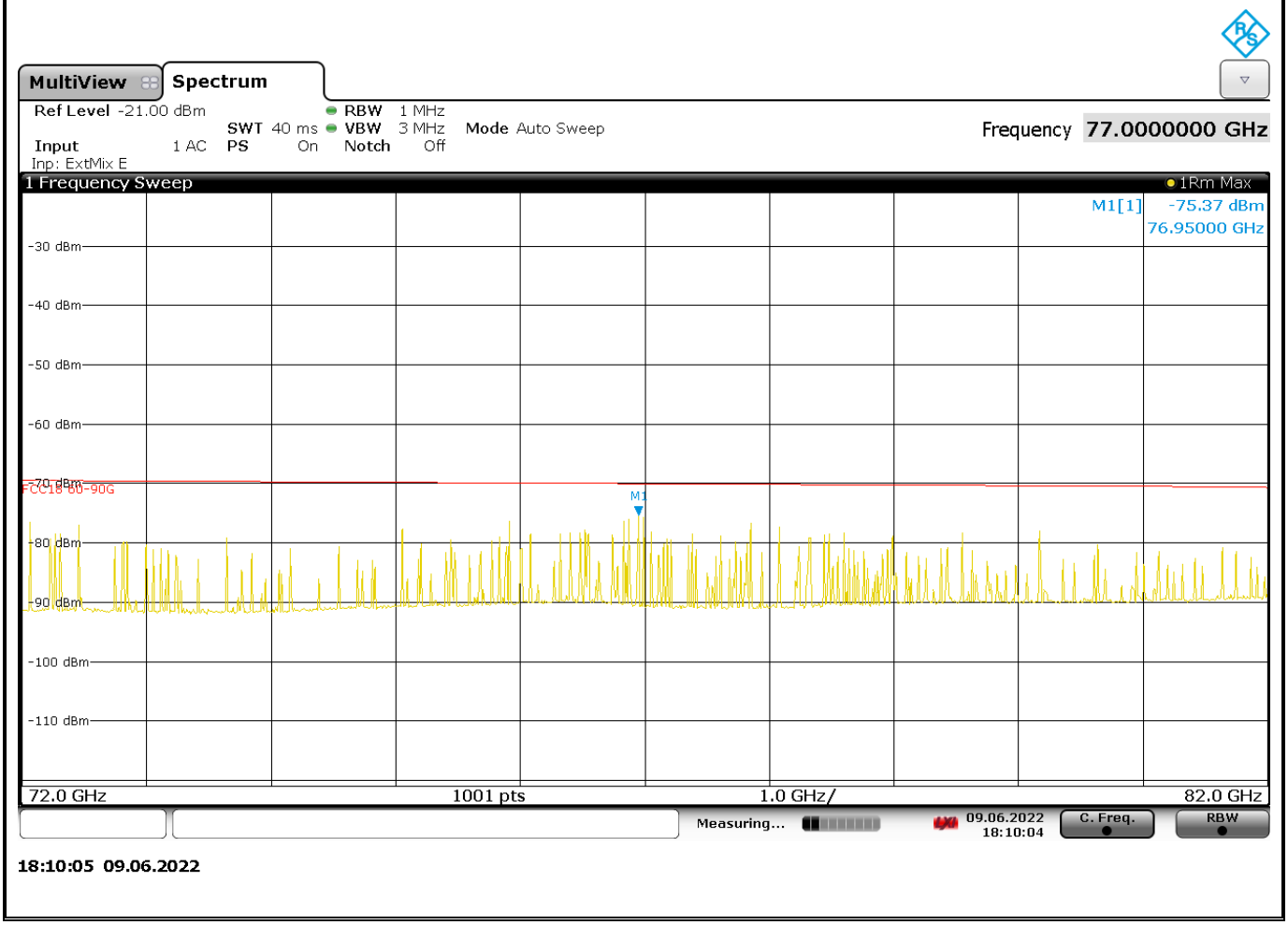
**Plot # 12 Unwanted Emissions: 72 - 82 GHz, Fundamentals**

**Measurement antenna orientation:** Horizontal



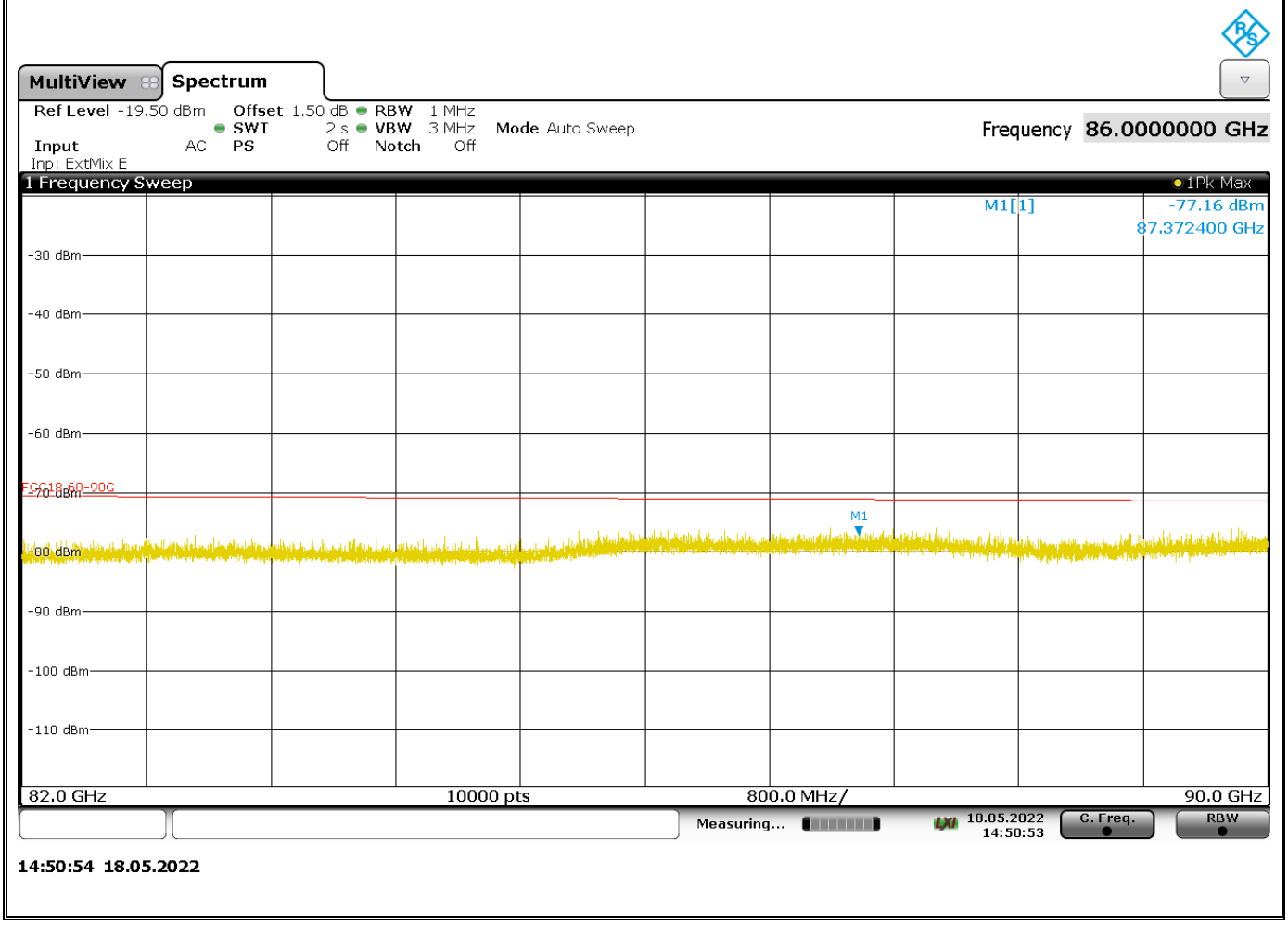
**Plot # 13 Unwanted Emissions: 72 - 82 GHz, Fundamentals**

**Measurement antenna orientation:** Vertical



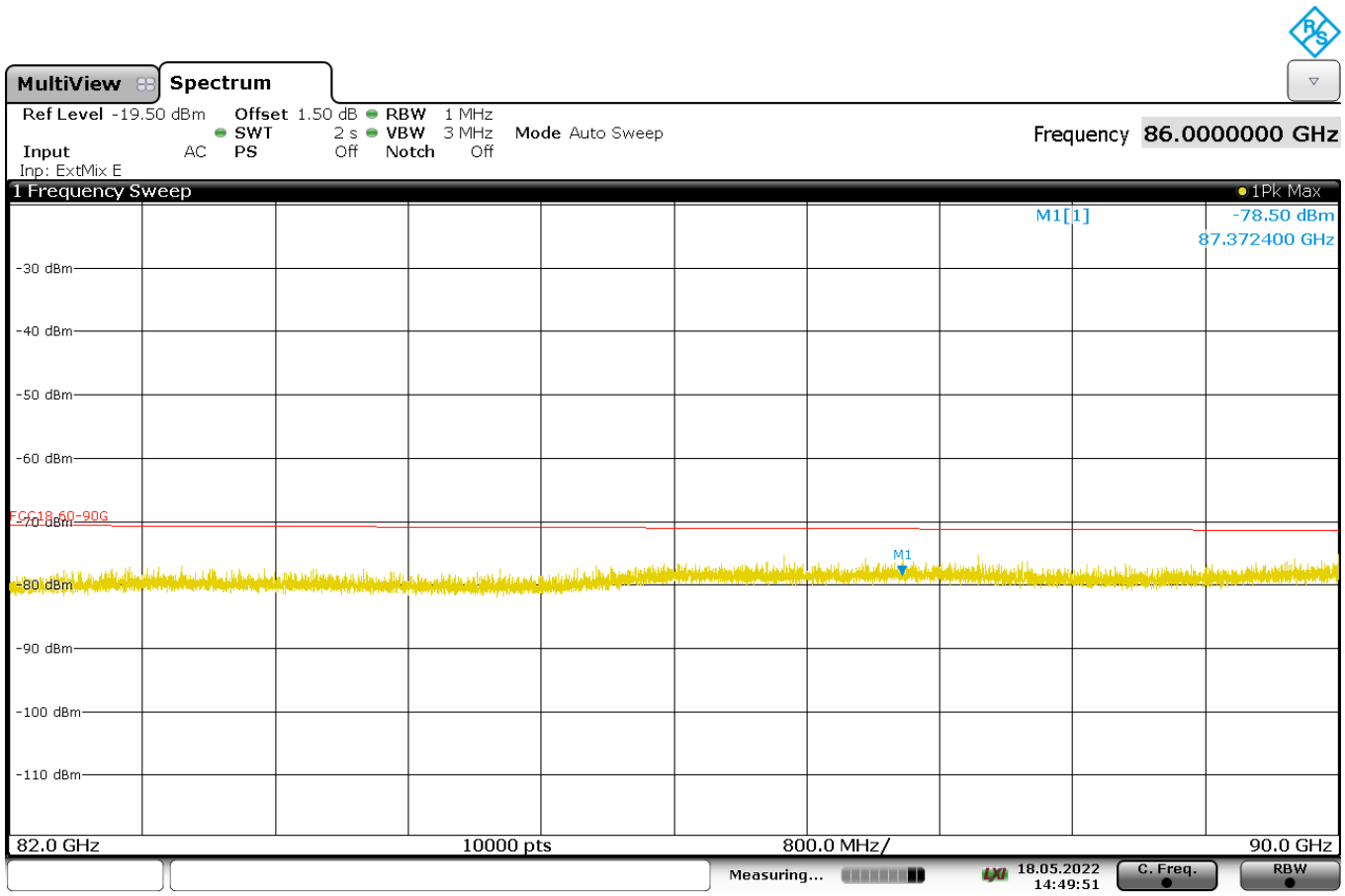
**Plot # 14 Unwanted Emissions: 82 - 90 GHz**

**Measurement antenna orientation:** Horizontal



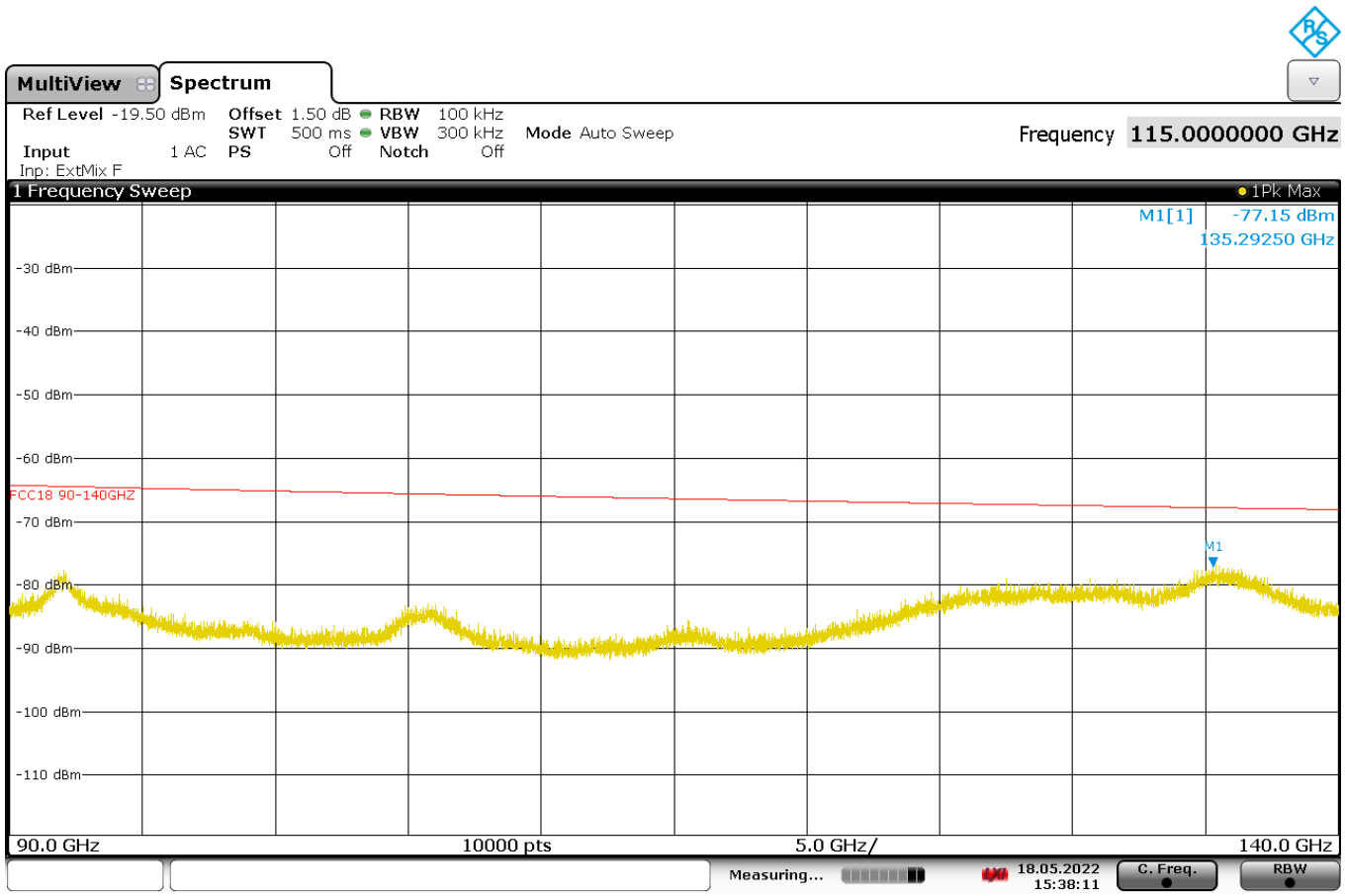
**Plot # 15 Unwanted Emissions: 82 - 90 GHz**

**Measurement antenna orientation:** Vertical



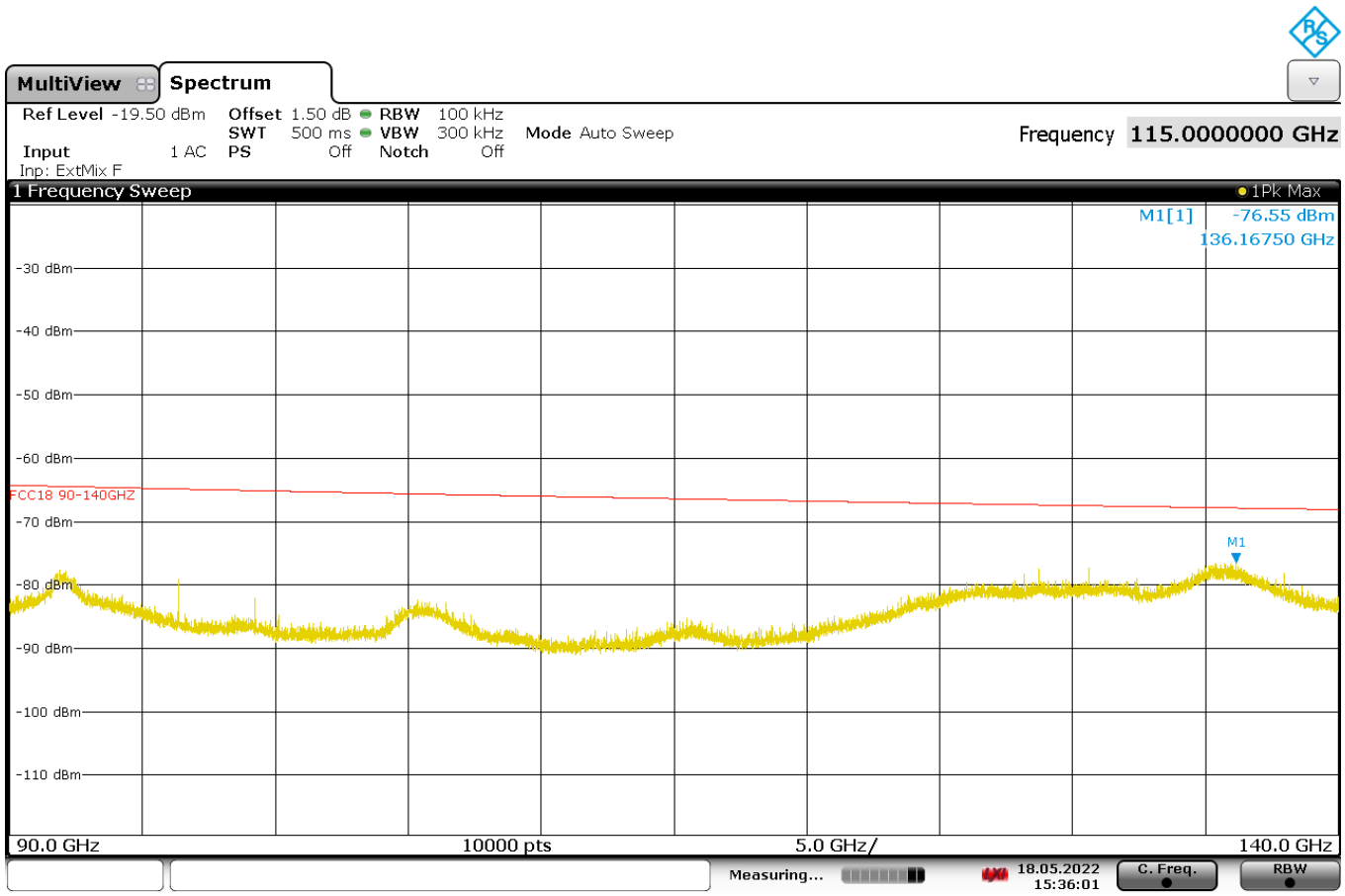
**Plot # 16 Unwanted Emissions: 90 - 140 GHz**

**Measurement antenna orientation:** Horizontal



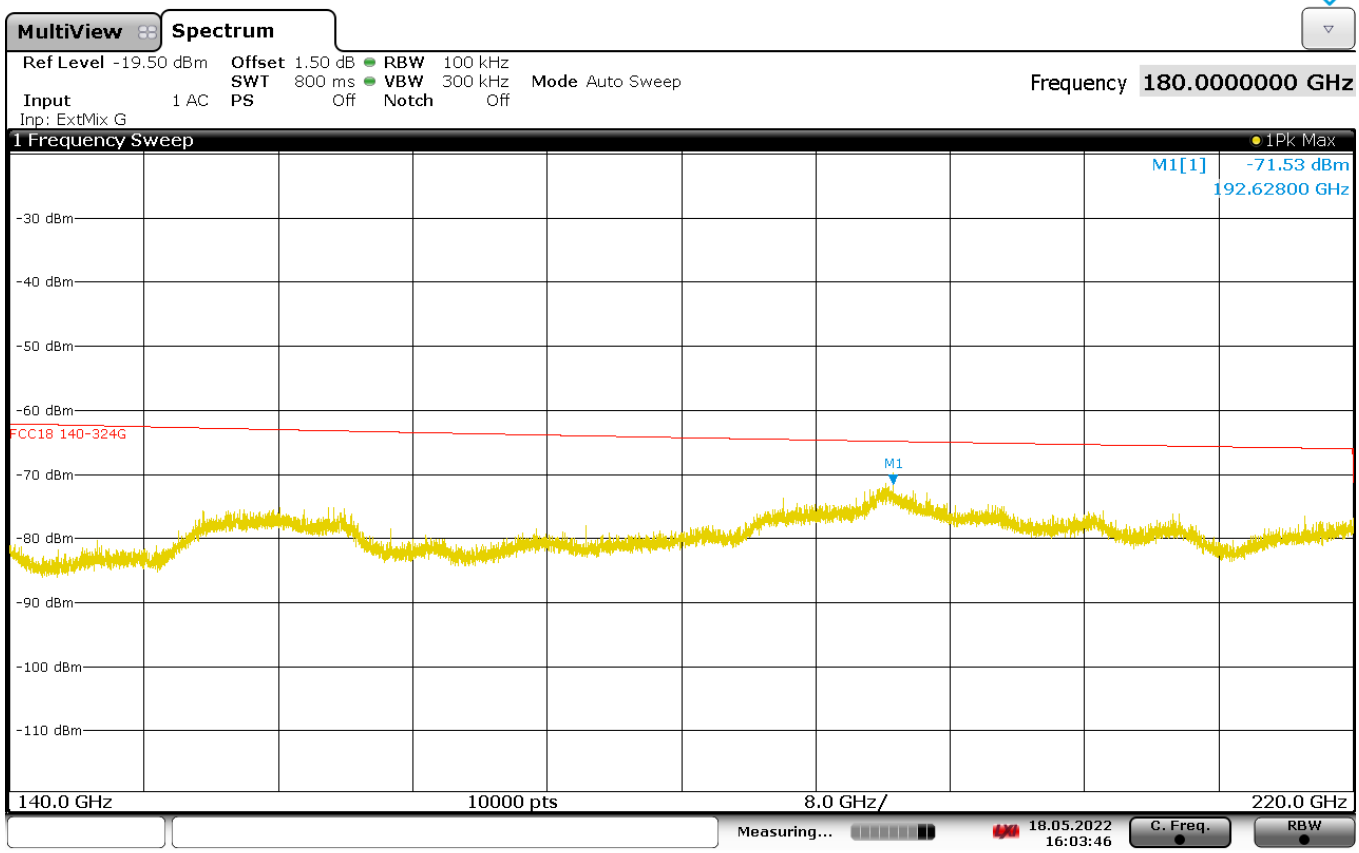
**Plot # 17 Unwanted Emissions: 90 - 140 GHz**

**Measurement antenna orientation:** Vertical



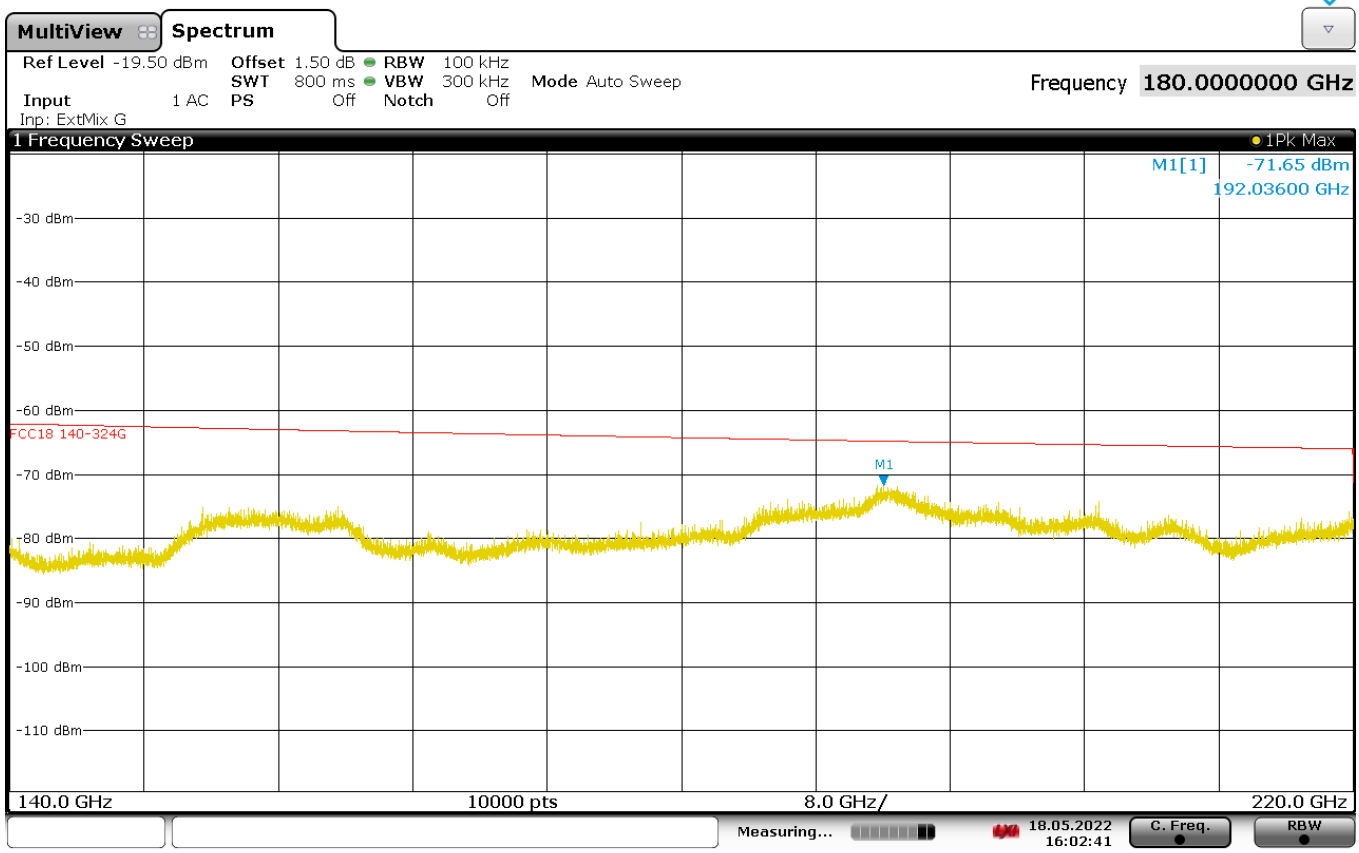
**Plot # 18 Unwanted Emissions: 140 - 220 GHz**

**Measurement antenna orientation:** Horizontal



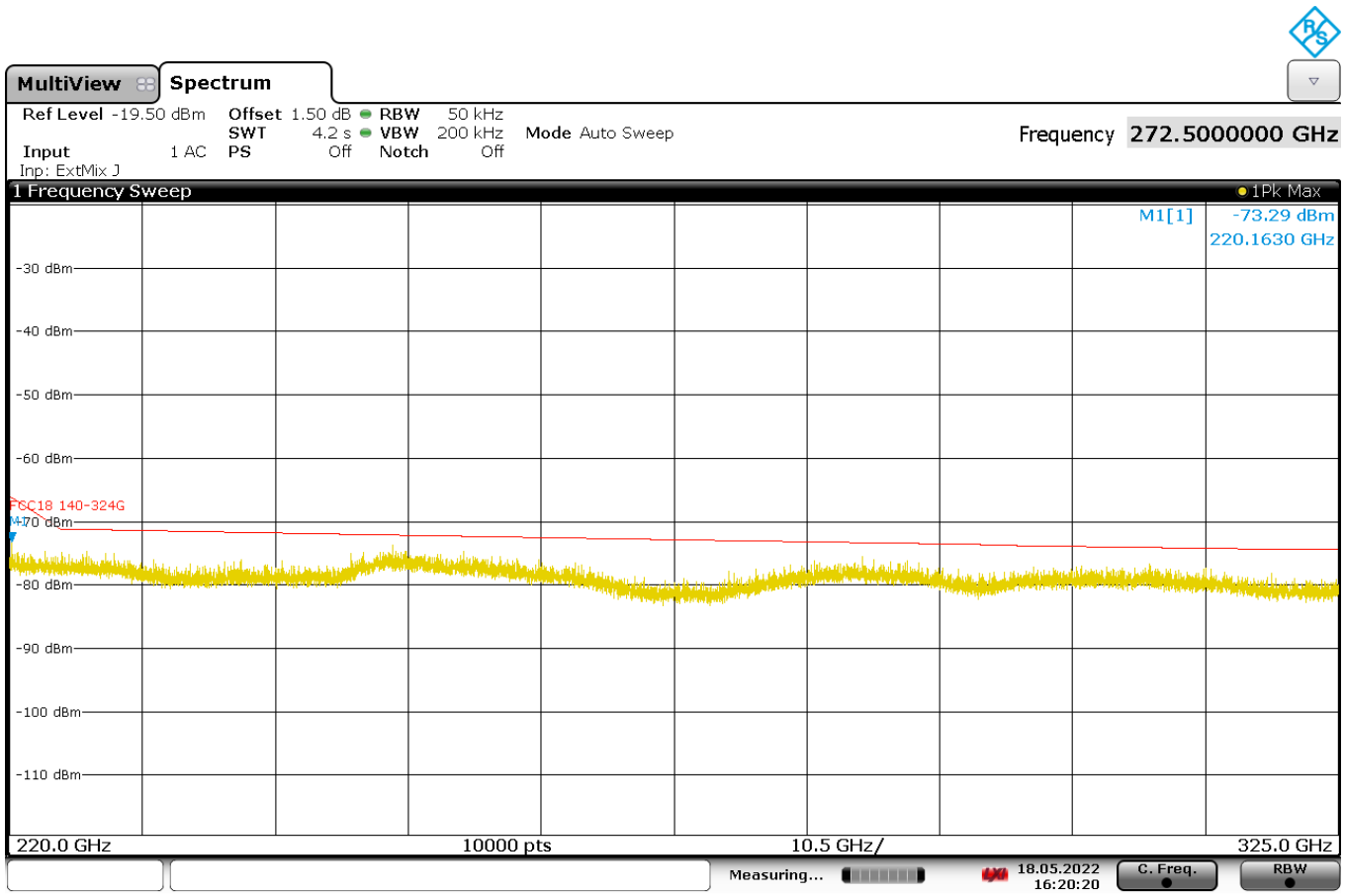
**Plot # 19 Unwanted Emissions: 140 - 220 GHz**

**Measurement antenna orientation:** Vertical



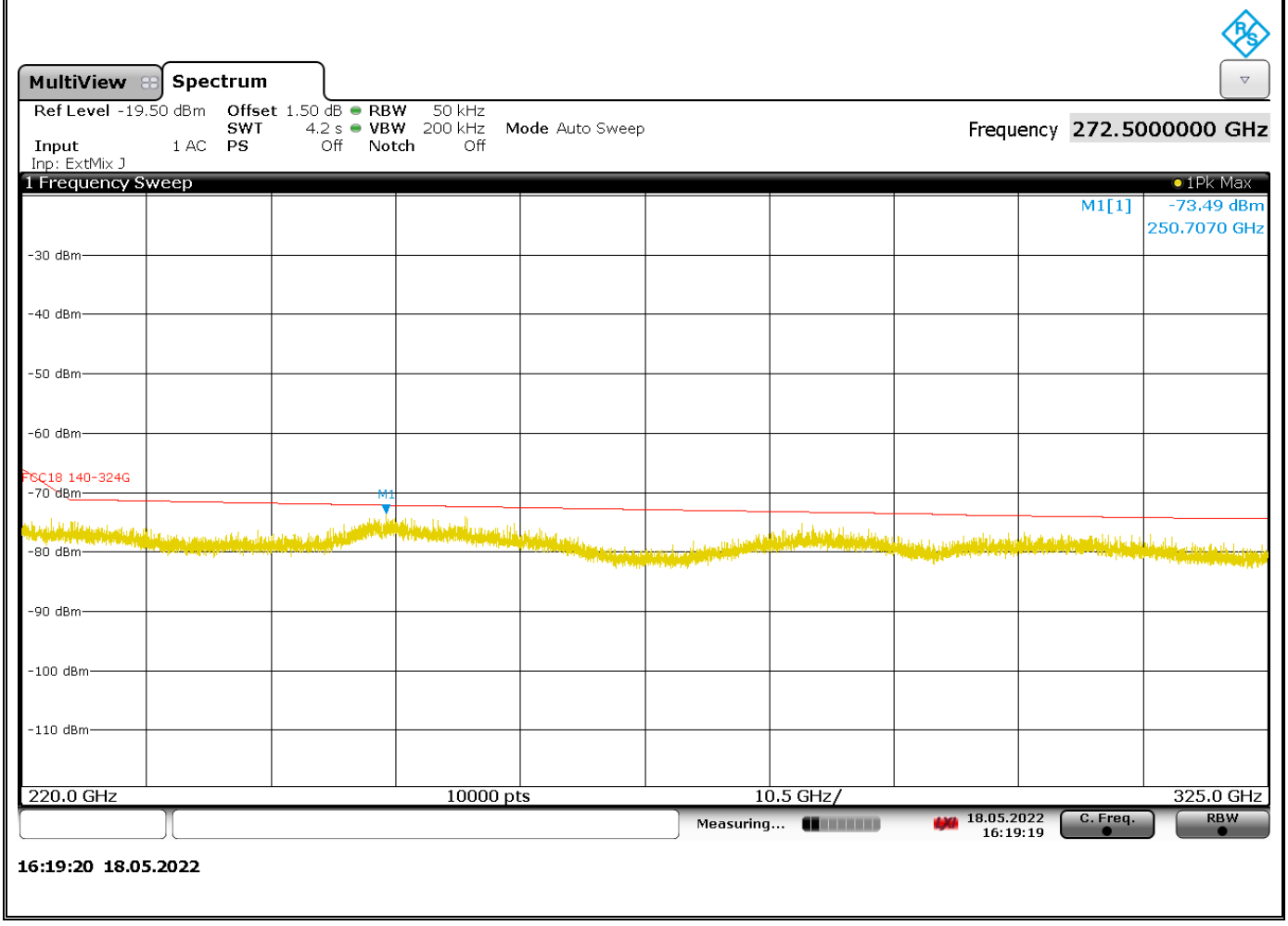
**Plot # 20 Unwanted Emissions: 220 - 325 GHz**

**Measurement antenna orientation:** Horizontal



**Plot # 21 Unwanted Emissions: 220 - 325 GHz**

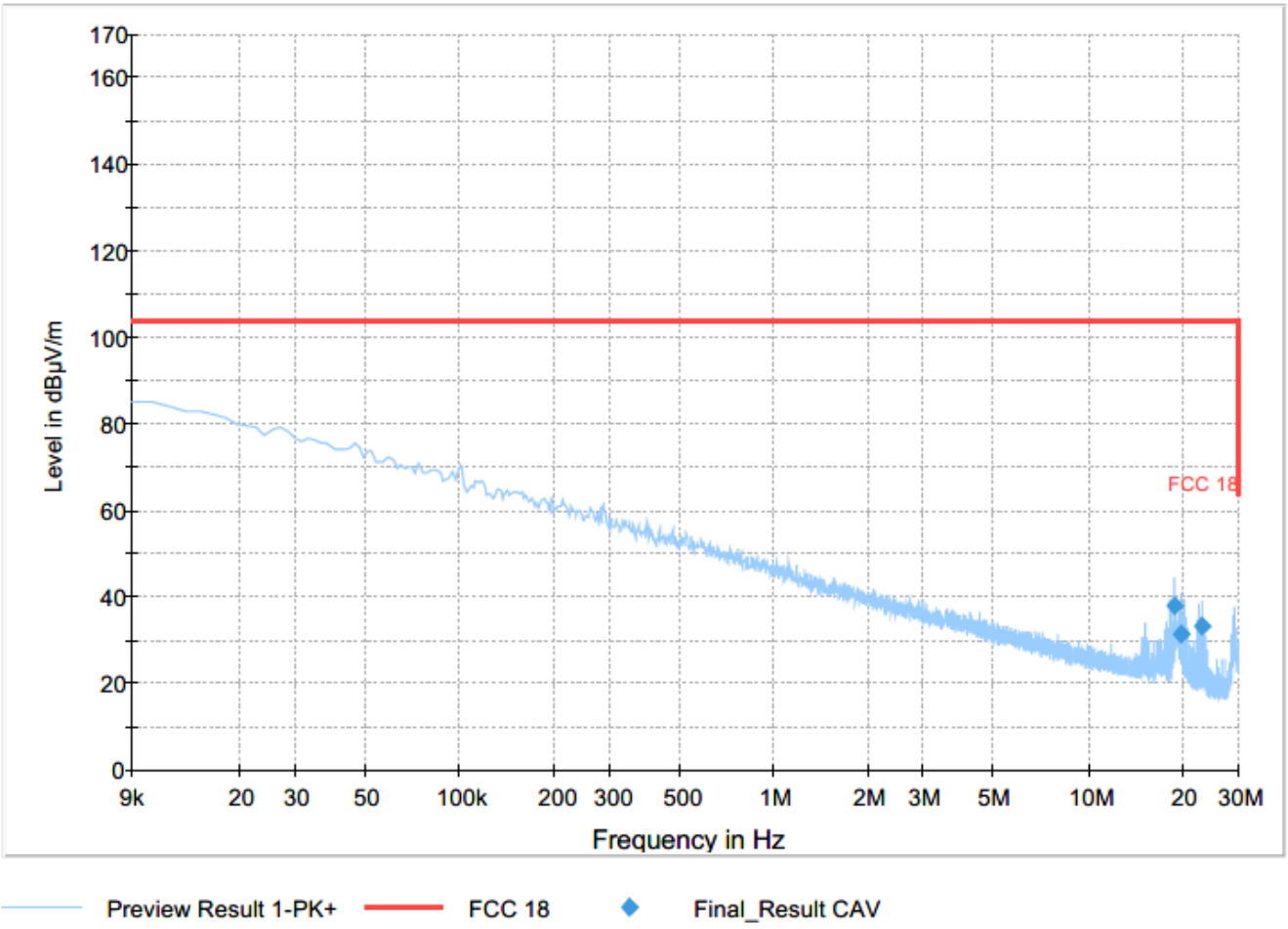
**Measurement antenna orientation:** Vertical



**Plot # 22 Unwanted Emissions: 9 kHz - 30 MHz**

## Final_Result

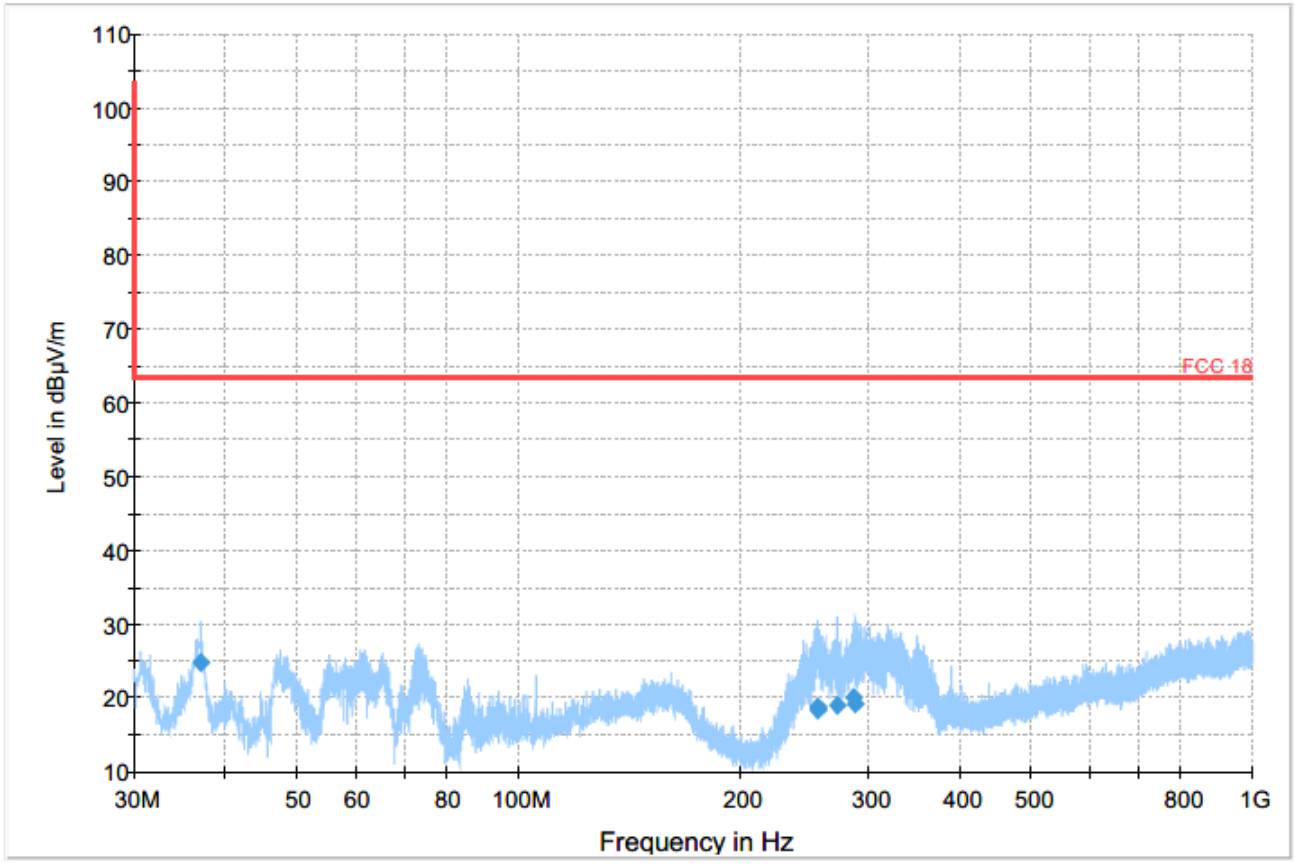
| Frequency (MHz) | CAverage (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| 18.92 | 38.05 | 103.52 | 65.47 | 500.0 | 9.0 | 100.0 | V | 237.0 | 16.5 | |
| 19.71 | 31.28 | 103.52 | 72.24 | 500.0 | 9.0 | 100.0 | V | 236.0 | 16.5 | |
| 23.13 | 33.22 | 103.52 | 70.30 | 500.0 | 9.0 | 100.0 | V | 43.0 | 16.2 | |



**Plot # 23 Unwanted Emissions 30 MHz – 1GHz**

## Final Result

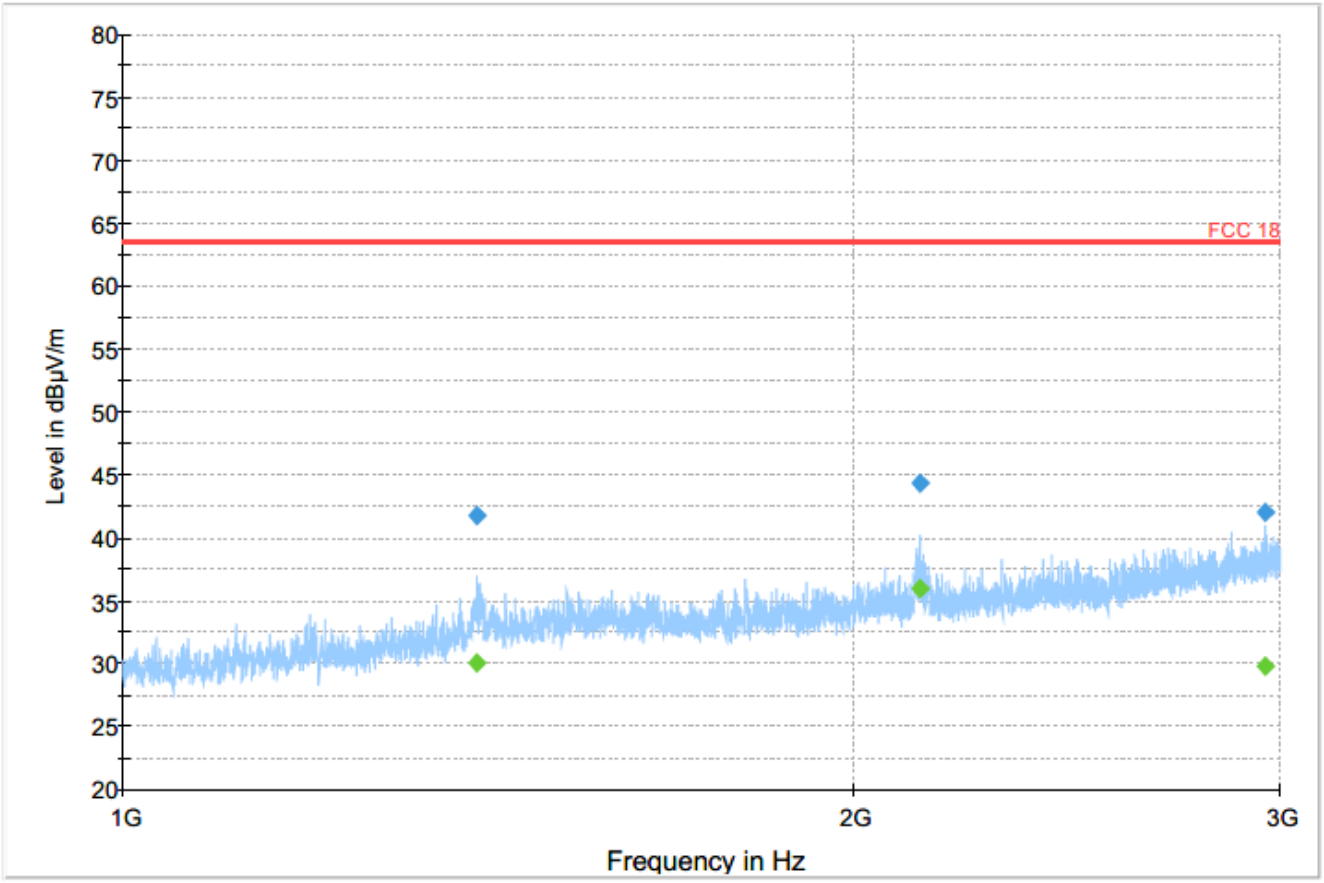
| Frequency (MHz) | CAverage (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|---|---|---|---|---|---|---|---|---|---|
| 36.98 | 24.91 | 63.52 | 38.61 | 500.0 | 120.0 | 100.0 | V | 344.0 | 21.0 |
| 255.60 | 18.26 | 63.52 | 45.26 | 500.0 | 120.0 | 176.0 | V | 101.0 | 21.5 |
| 255.82 | 18.87 | 63.52 | 44.65 | 500.0 | 120.0 | 117.0 | V | 106.0 | 21.5 |
| 272.43 | 19.10 | 63.52 | 44.42 | 500.0 | 120.0 | 134.0 | V | 122.0 | 21.2 |
| 287.03 | 20.18 | 63.52 | 43.34 | 500.0 | 120.0 | 107.0 | V | 121.0 | 21.0 |
| 288.53 | 19.27 | 63.52 | 44.25 | 500.0 | 120.0 | 195.0 | V | 137.0 | 21.0 |



**Plot # 24 Unwanted Emissions: 1-3 GHz**

## Final Result

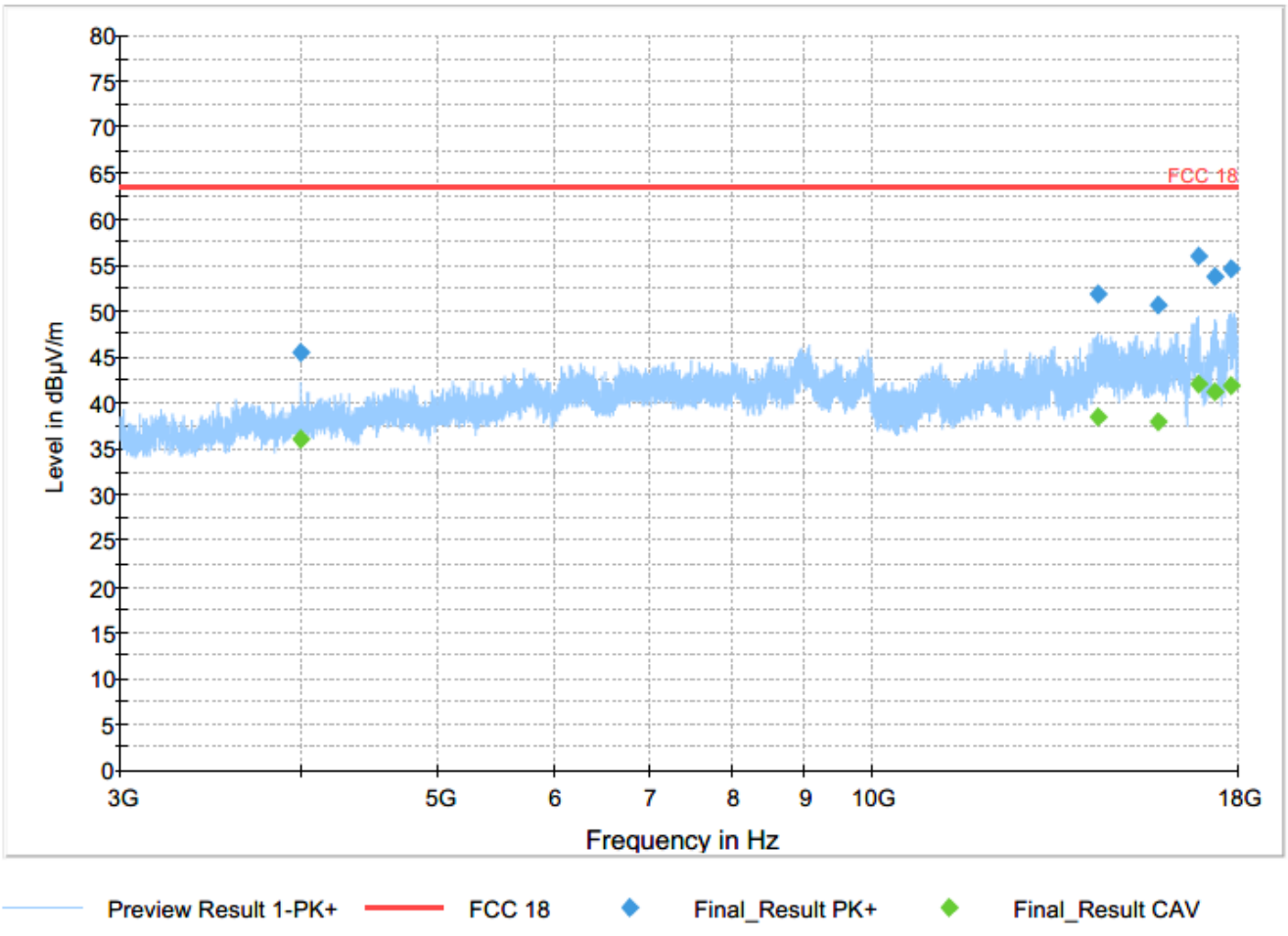
| Frequency (MHz) | MaxPeak (dBµV/m) | CAverage (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1398.25 | 41.80 | --- | 63.52 | 21.72 | 500.0 | 1000.0 | 250.0 | V | -3.0 | -3.3 |
| 1398.25 | --- | 30.05 | 63.52 | 33.47 | 500.0 | 1000.0 | 250.0 | V | -3.0 | -3.3 |
| 2131.00 | --- | 35.92 | 63.52 | 27.60 | 500.0 | 1000.0 | 140.0 | V | -25.0 | -1.2 |
| 2131.00 | 44.31 | --- | 63.52 | 19.21 | 500.0 | 1000.0 | 140.0 | V | -25.0 | -1.2 |
| 2958.50 | 42.01 | --- | 63.52 | 21.51 | 500.0 | 1000.0 | 145.0 | H | 40.0 | 2.3 |
| 2958.50 | --- | 29.78 | 63.52 | 33.74 | 500.0 | 1000.0 | 145.0 | H | 40.0 | 2.3 |



**Plot # 25 Unwanted Emissions: 3 - 18 GHz**

## Final Result

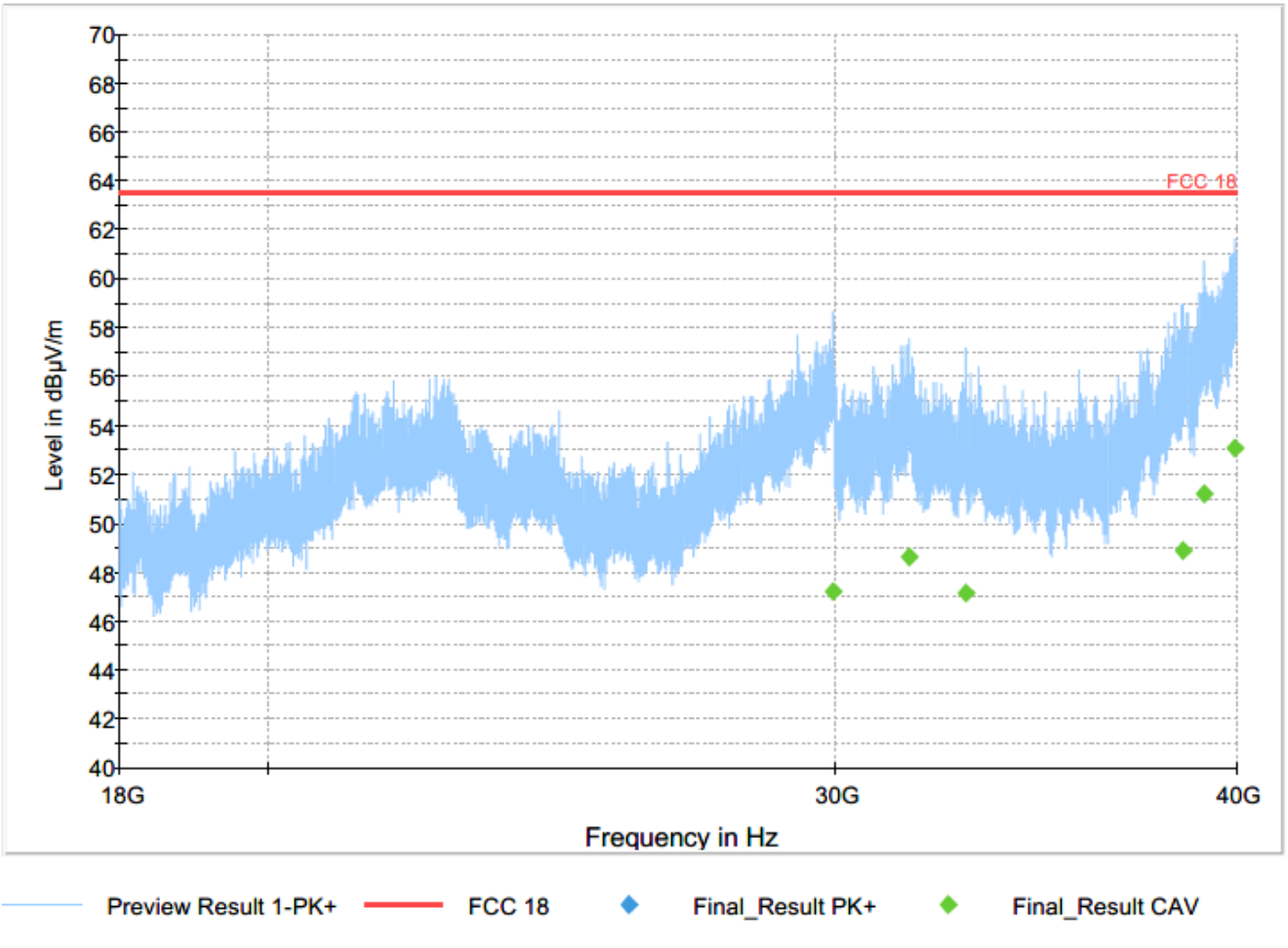
| Frequency (MHz) | MaxPeak (dBµV/m) | CAverage (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|---|---|---|---|---|---|---|---|---|---|---|
| 3999.75 | --- | 36.04 | 63.52 | 27.48 | 500.0 | 1000.0 | 176.0 | H | 55.0 | -31.9 |
| 3999.75 | 45.52 | --- | 63.52 | 18.00 | 500.0 | 1000.0 | 176.0 | H | 55.0 | -31.9 |
| 14376.44 | 51.88 | --- | 63.52 | 11.64 | 500.0 | 1000.0 | 235.0 | V | 198.0 | -16.5 |
| 14376.44 | --- | 38.53 | 63.52 | 24.99 | 500.0 | 1000.0 | 235.0 | V | 198.0 | -16.5 |
| 15840.87 | --- | 37.92 | 63.52 | 25.60 | 500.0 | 1000.0 | 249.0 | H | 209.0 | -14.0 |
| 15840.87 | 50.66 | --- | 63.52 | 12.86 | 500.0 | 1000.0 | 249.0 | H | 209.0 | -14.0 |
| 16891.35 | --- | 42.07 | 63.52 | 21.45 | 500.0 | 1000.0 | 210.0 | H | 167.0 | -11.9 |
| 16891.35 | 55.92 | --- | 63.52 | 7.60 | 500.0 | 1000.0 | 210.0 | H | 167.0 | -11.9 |
| 17365.96 | --- | 41.26 | 63.52 | 22.26 | 500.0 | 1000.0 | 186.0 | V | 42.0 | -10.1 |
| 17365.96 | 53.71 | --- | 63.52 | 9.81 | 500.0 | 1000.0 | 186.0 | V | 42.0 | -10.1 |
| 17792.15 | 54.57 | --- | 63.52 | 8.95 | 500.0 | 1000.0 | 127.0 | H | 237.0 | -7.7 |
| 17792.15 | --- | 41.85 | 63.52 | 21.67 | 500.0 | 1000.0 | 127.0 | H | 237.0 | -7.7 |



**Plot # 26 Unwanted Emissions: 18-40 GHz**

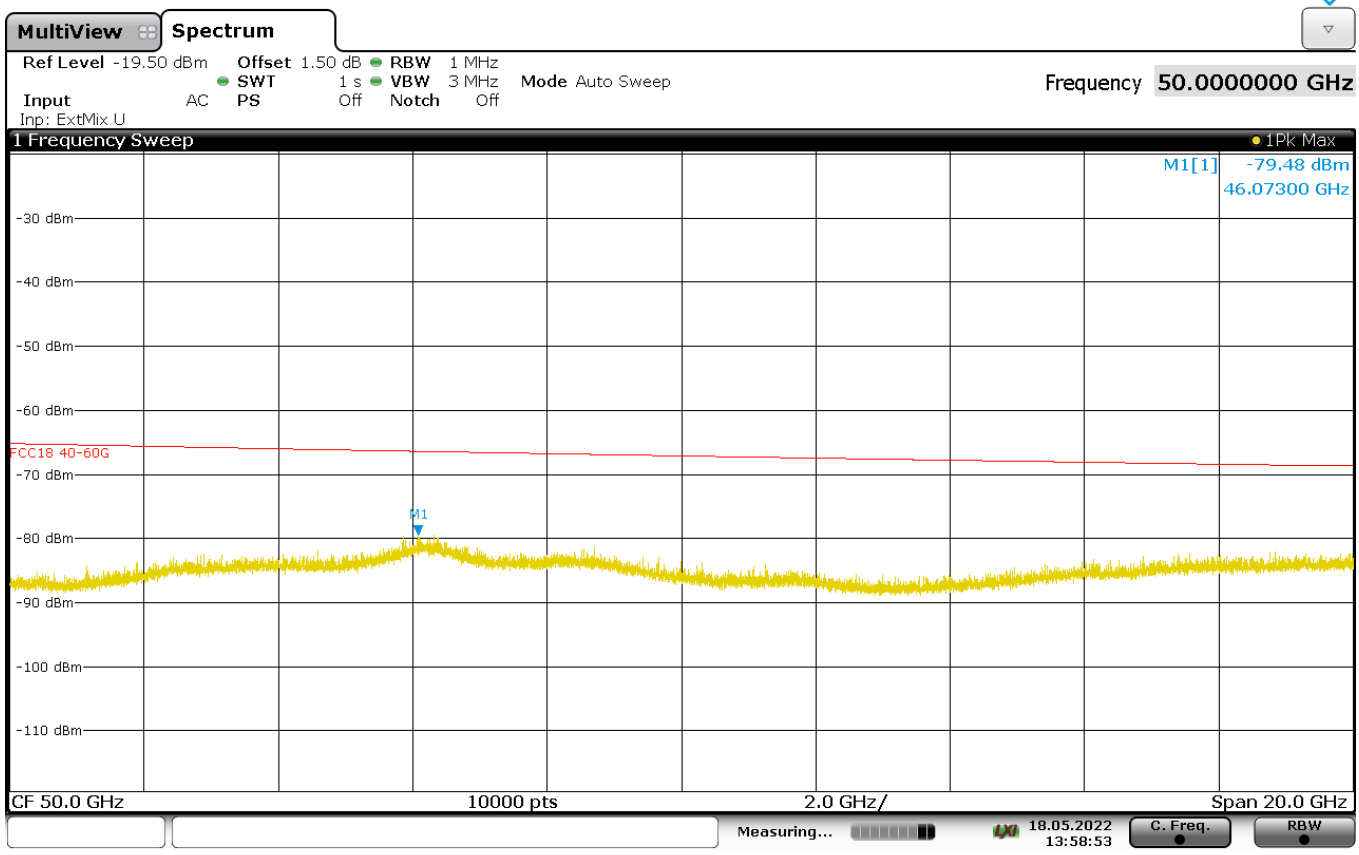
## Final Result

| Frequency (MHz) | MaxPeak (dBµV/m) | CAverage (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|---|---|---|---|---|---|---|---|---|---|---|
| 29959.13 | --- | 47.19 | 63.52 | 16.33 | 500.0 | 1000.0 | 100.0 | V | -73.0 | 22.9 |
| 31654.38 | --- | 48.63 | 63.52 | 14.89 | 500.0 | 1000.0 | 150.0 | H | 95.0 | 23.2 |
| 32959.06 | --- | 47.13 | 63.52 | 16.39 | 500.0 | 1000.0 | 100.0 | V | 52.0 | 22.0 |
| 38480.31 | --- | 48.85 | 63.52 | 14.67 | 500.0 | 1000.0 | 129.0 | H | 259.0 | 23.1 |
| 39072.50 | --- | 51.21 | 63.52 | 12.31 | 500.0 | 1000.0 | 122.0 | V | 172.0 | 23.8 |
| 39975.00 | --- | 53.09 | 63.52 | 10.43 | 500.0 | 1000.0 | 114.0 | H | 208.0 | 24.9 |



**Plot # 27 Unwanted Emissions: 40 - 60 GHz**

**Measurement antenna orientation:** Horizontal

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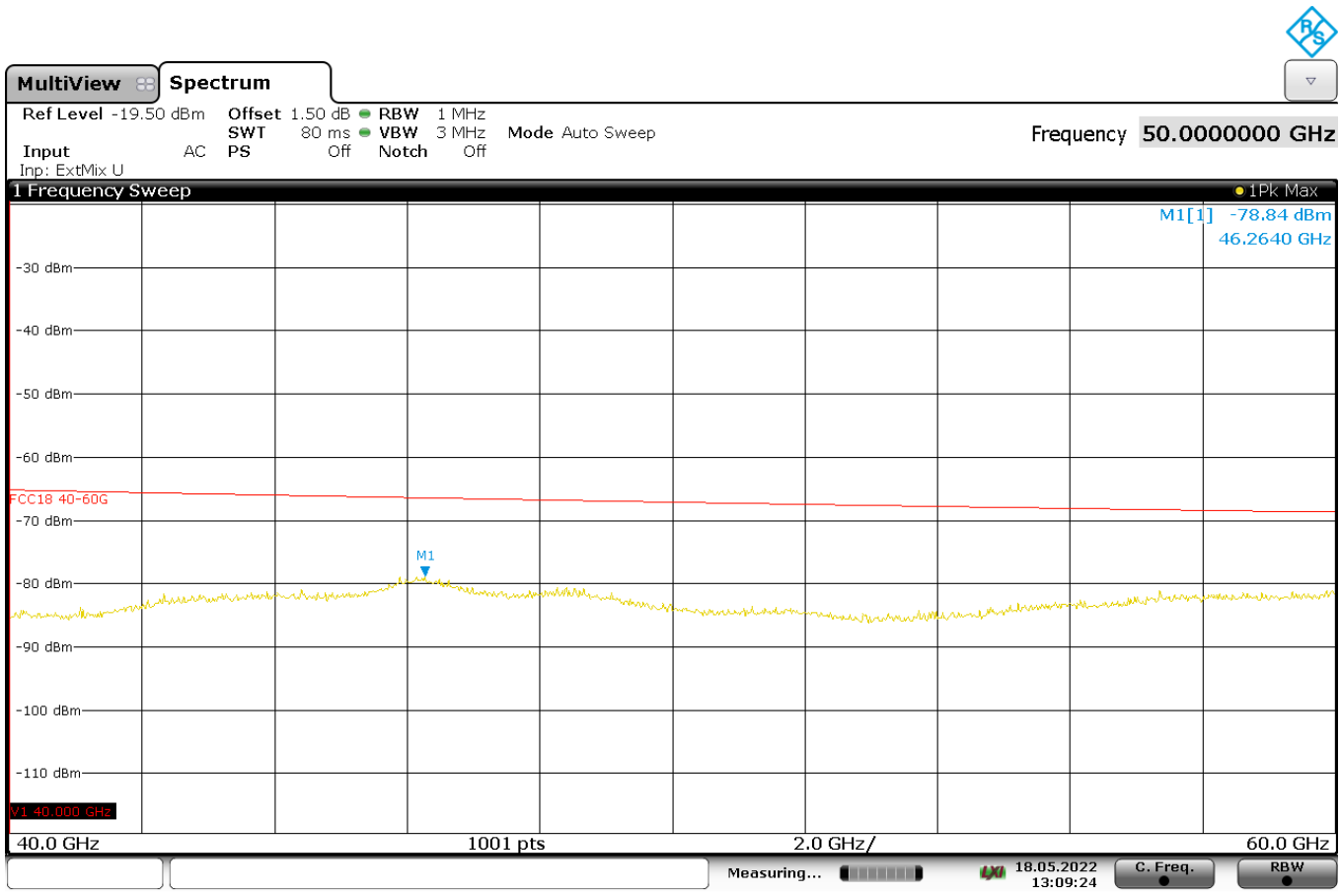
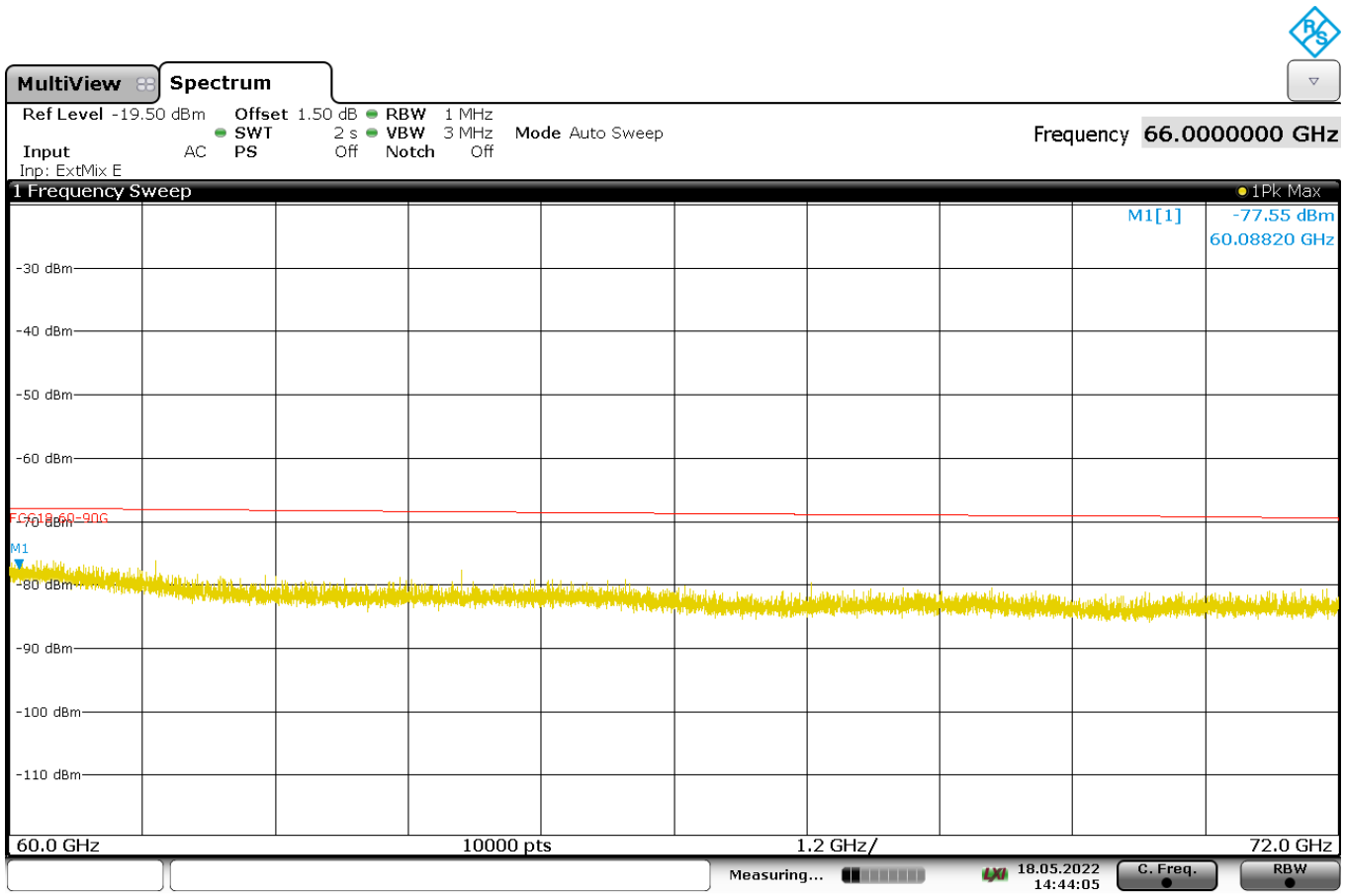
**Plot # 28 Unwanted Emissions: 40 - 60 GHz**

**Measurement antenna orientation:** Vertical



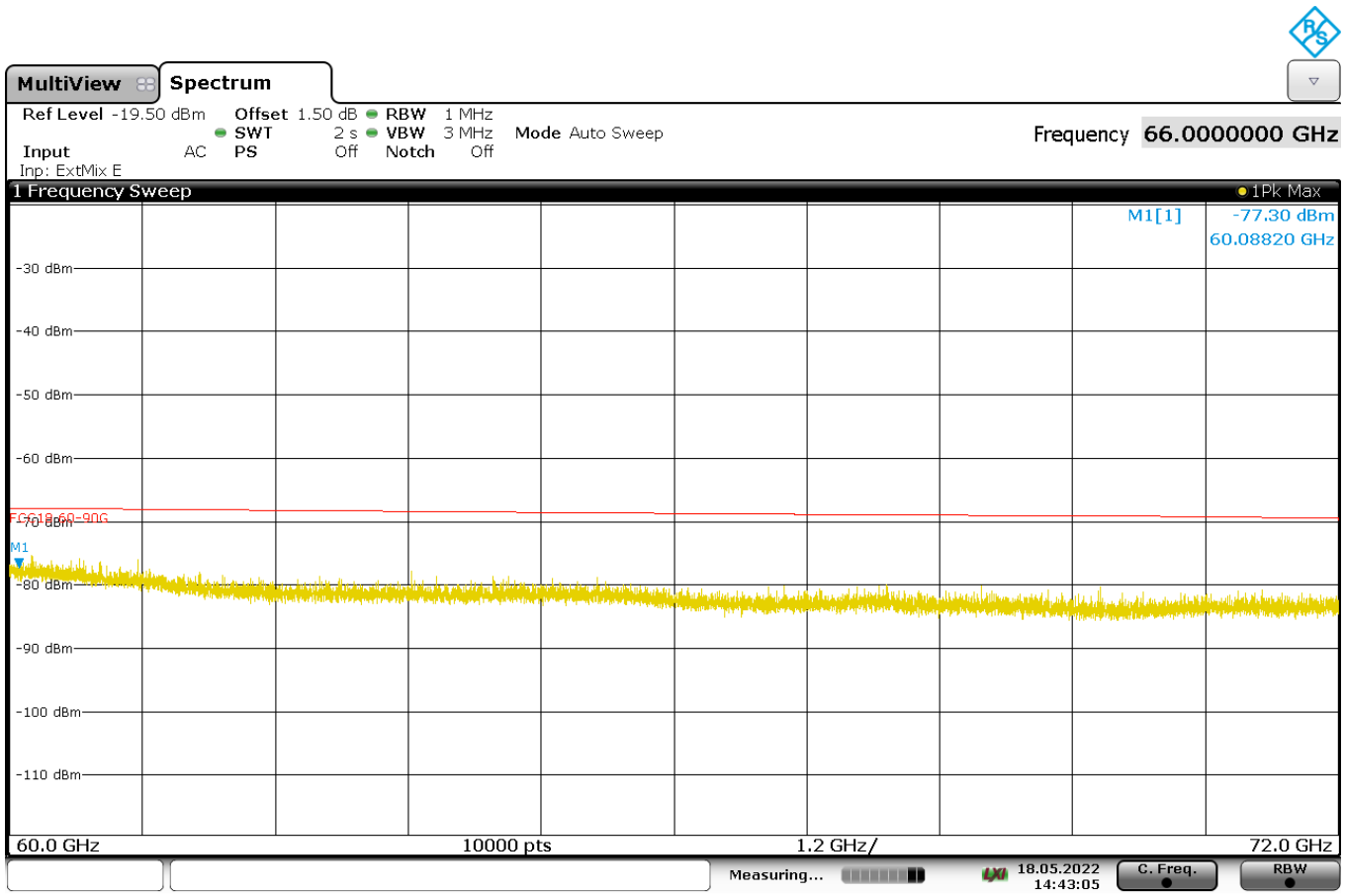
**Plot # 29 Unwanted Emissions: 60 - 72 GHz**

**Measurement antenna orientation:** Horizontal



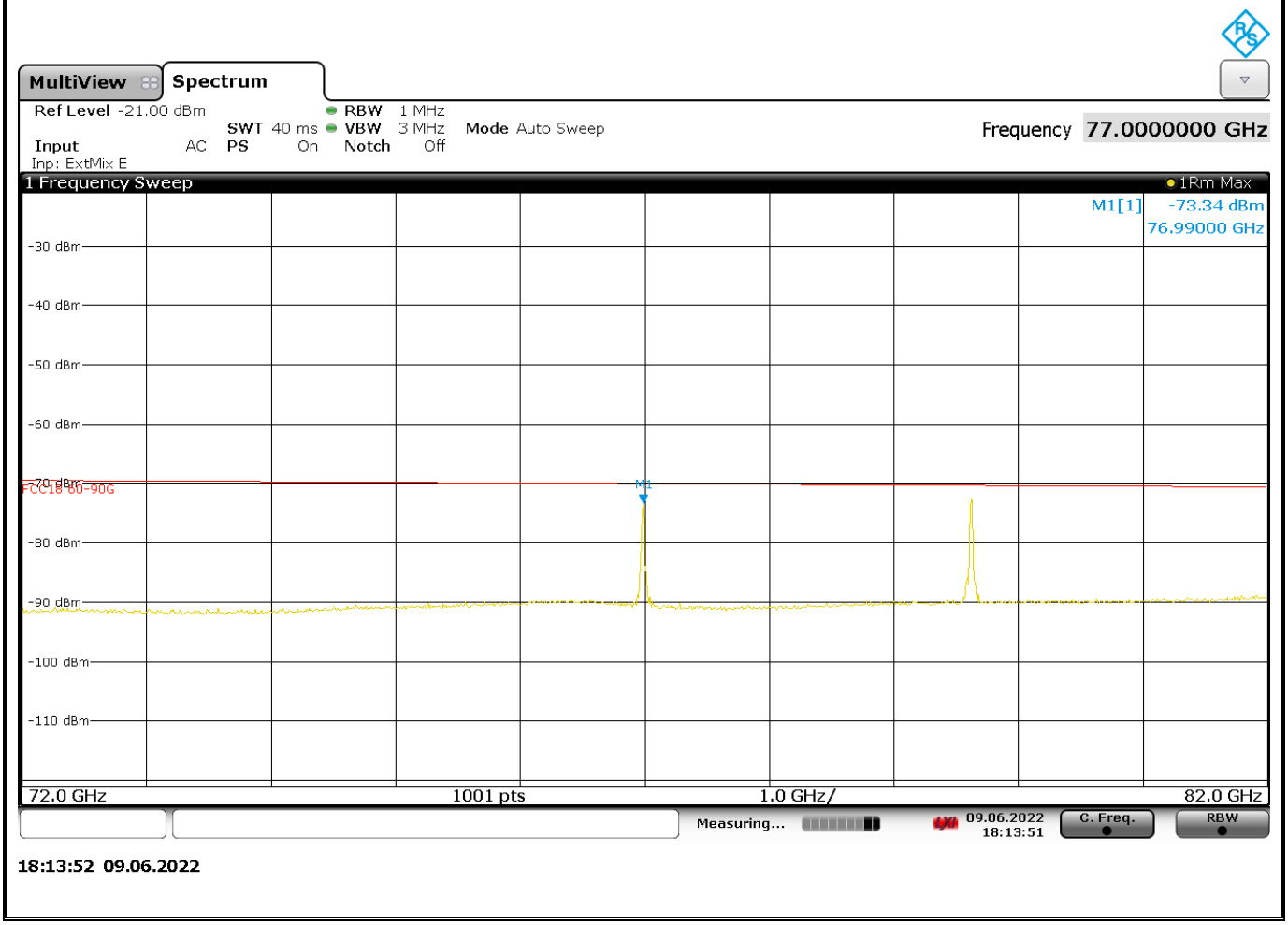
**Plot # 30 Unwanted Emissions: 60 - 72 GHz**

**Measurement antenna orientation:** Vertical



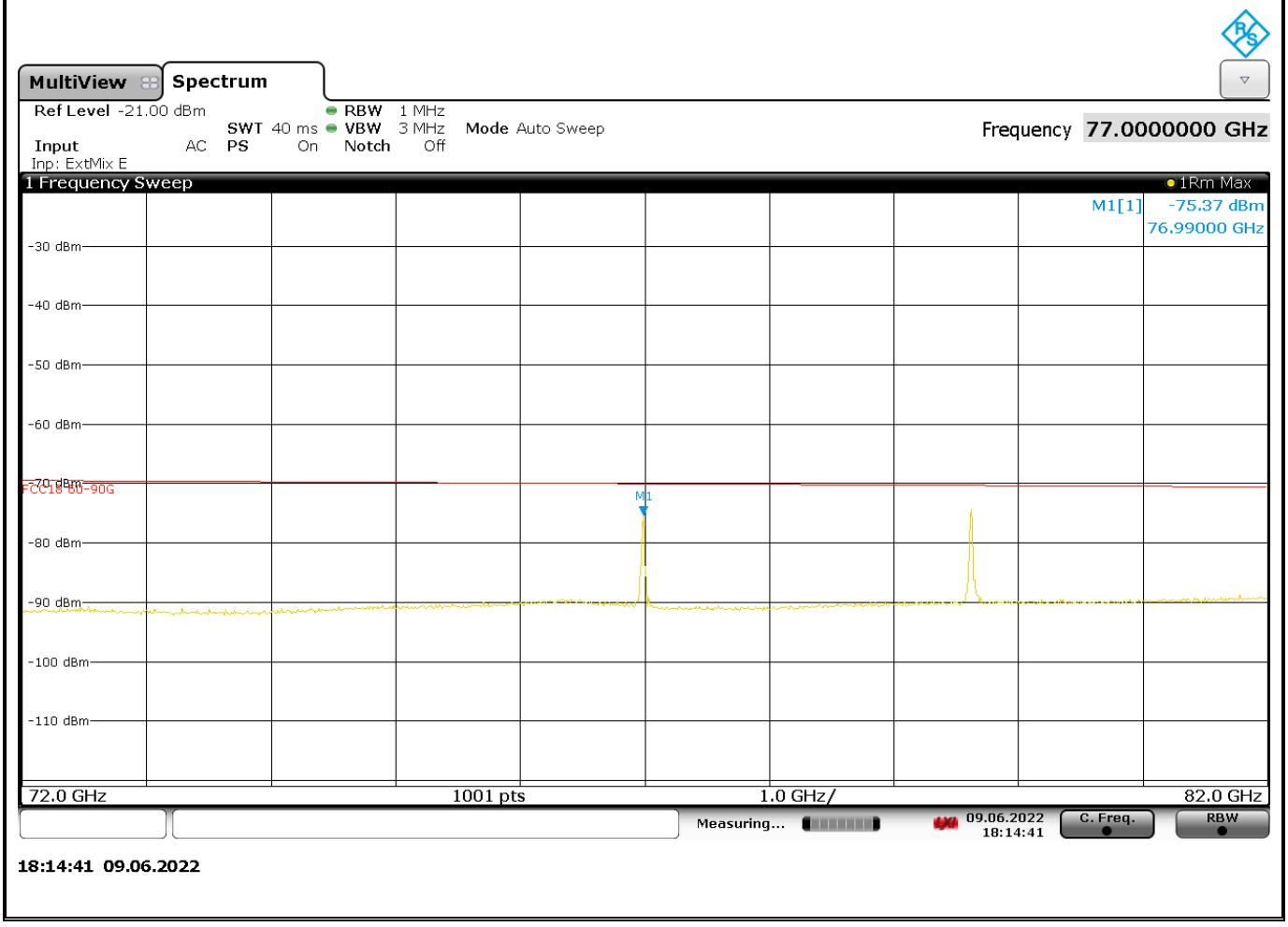
**Plot # 31 Unwanted Emissions: 72 - 82 GHz, Fundamentals**

**Measurement antenna orientation:** Horizontal



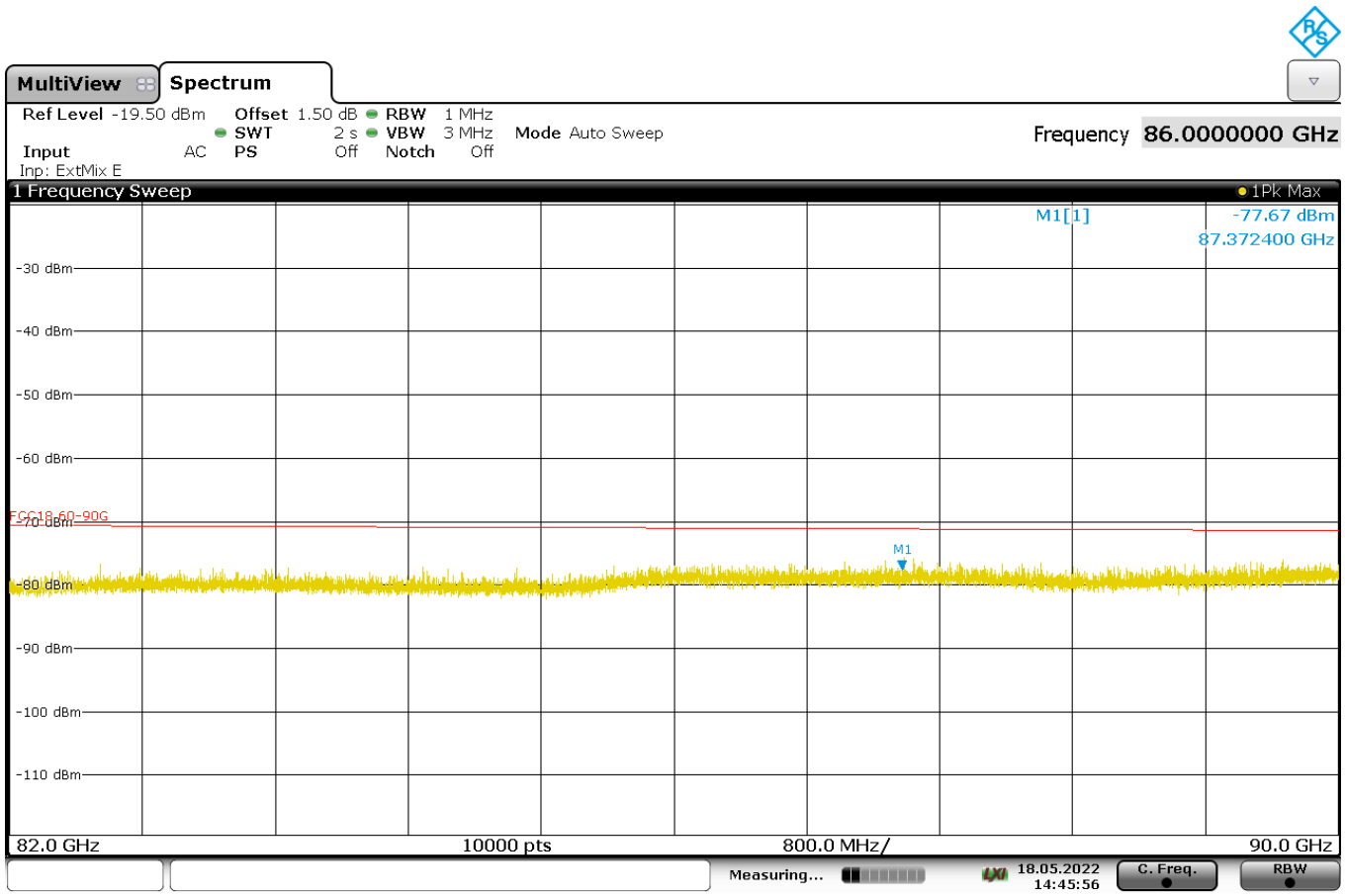
**Plot # 32 Unwanted Emissions: 72 - 82 GHz, Fundamentals**

**Measurement antenna orientation:** Vertical



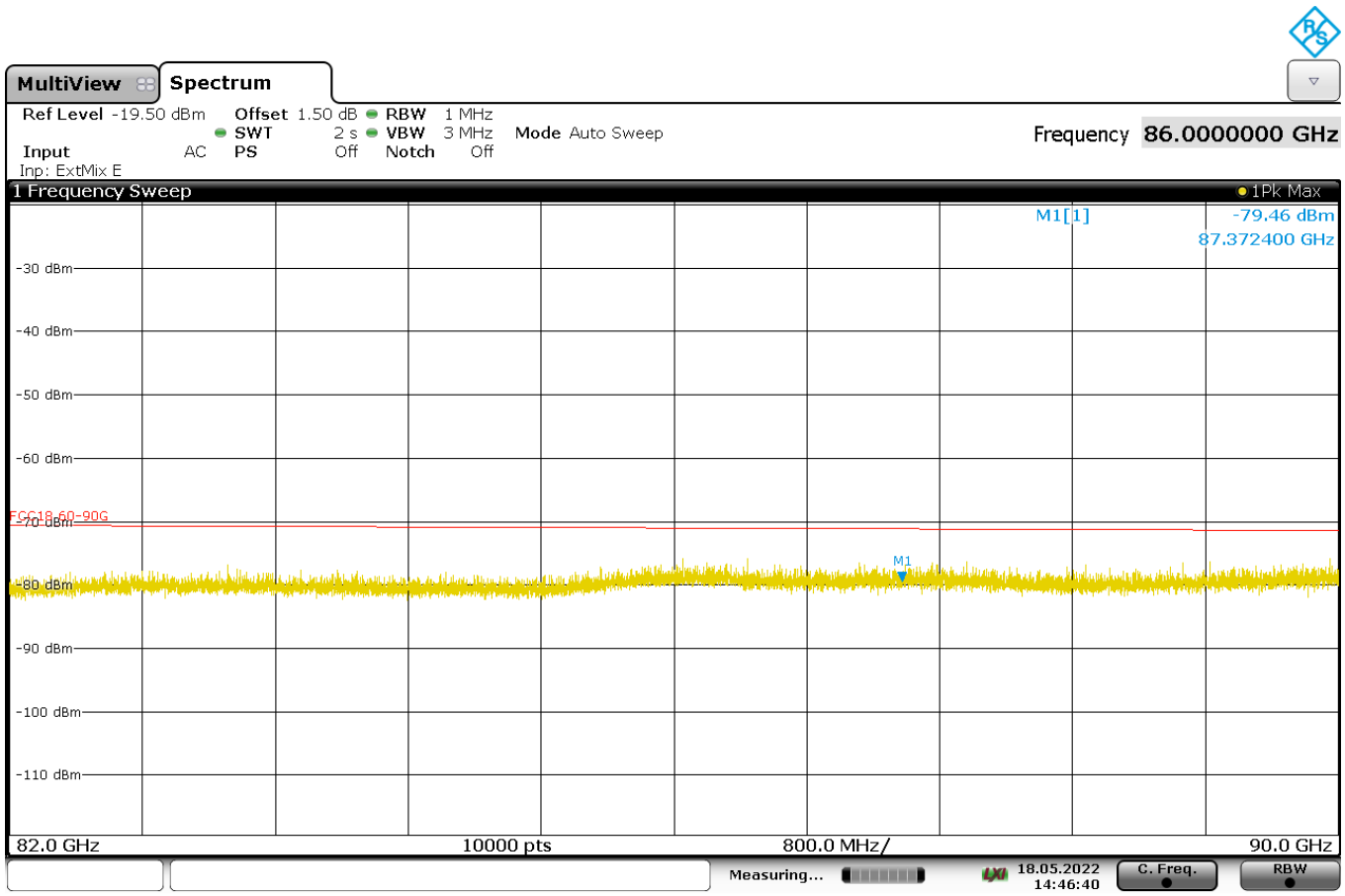
**Plot # 33 Unwanted Emissions: 82 - 90 GHz**

**Measurement antenna orientation:** Horizontal



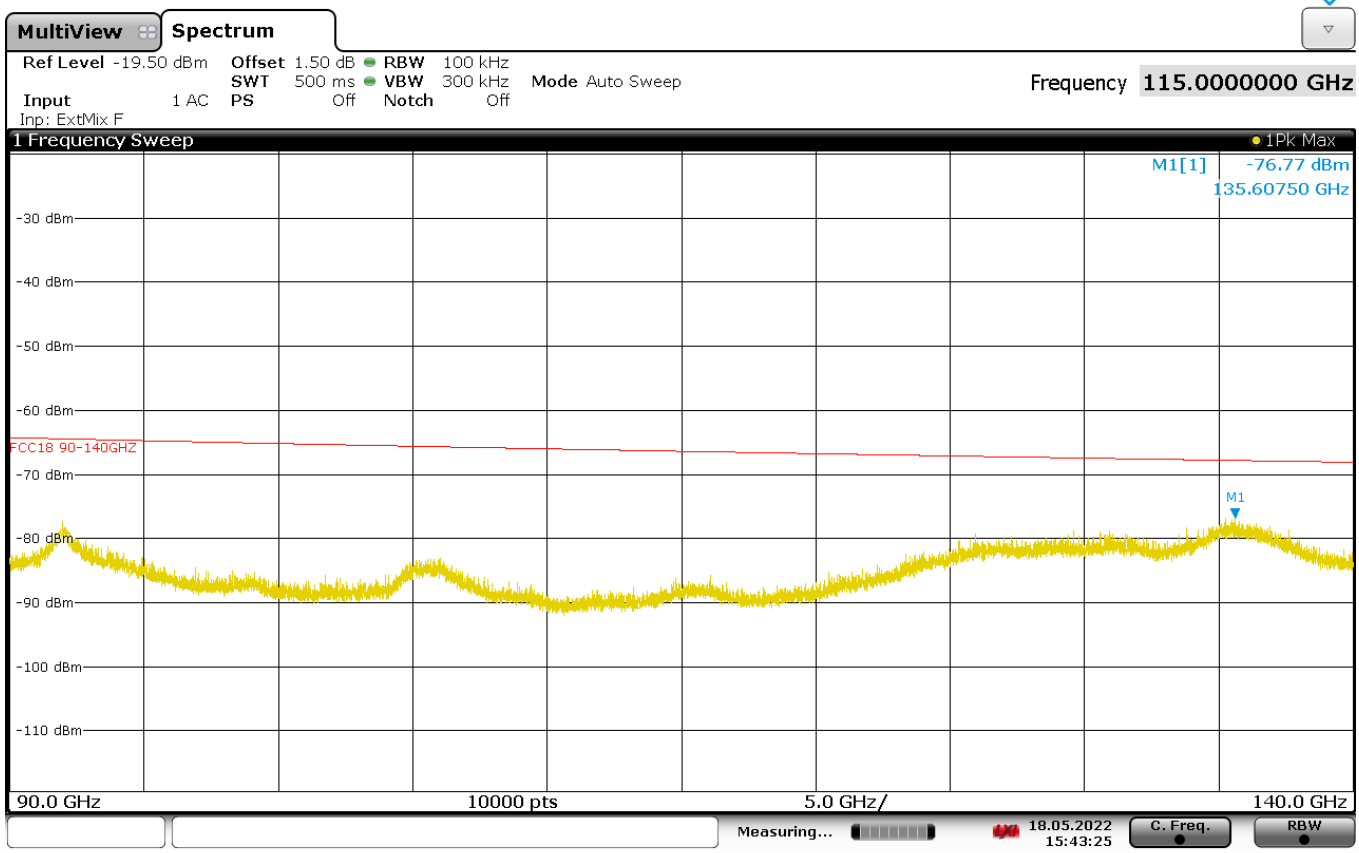
**Plot # 34 Unwanted Emissions: 82 - 90 GHz**

**Measurement antenna orientation:** Vertical



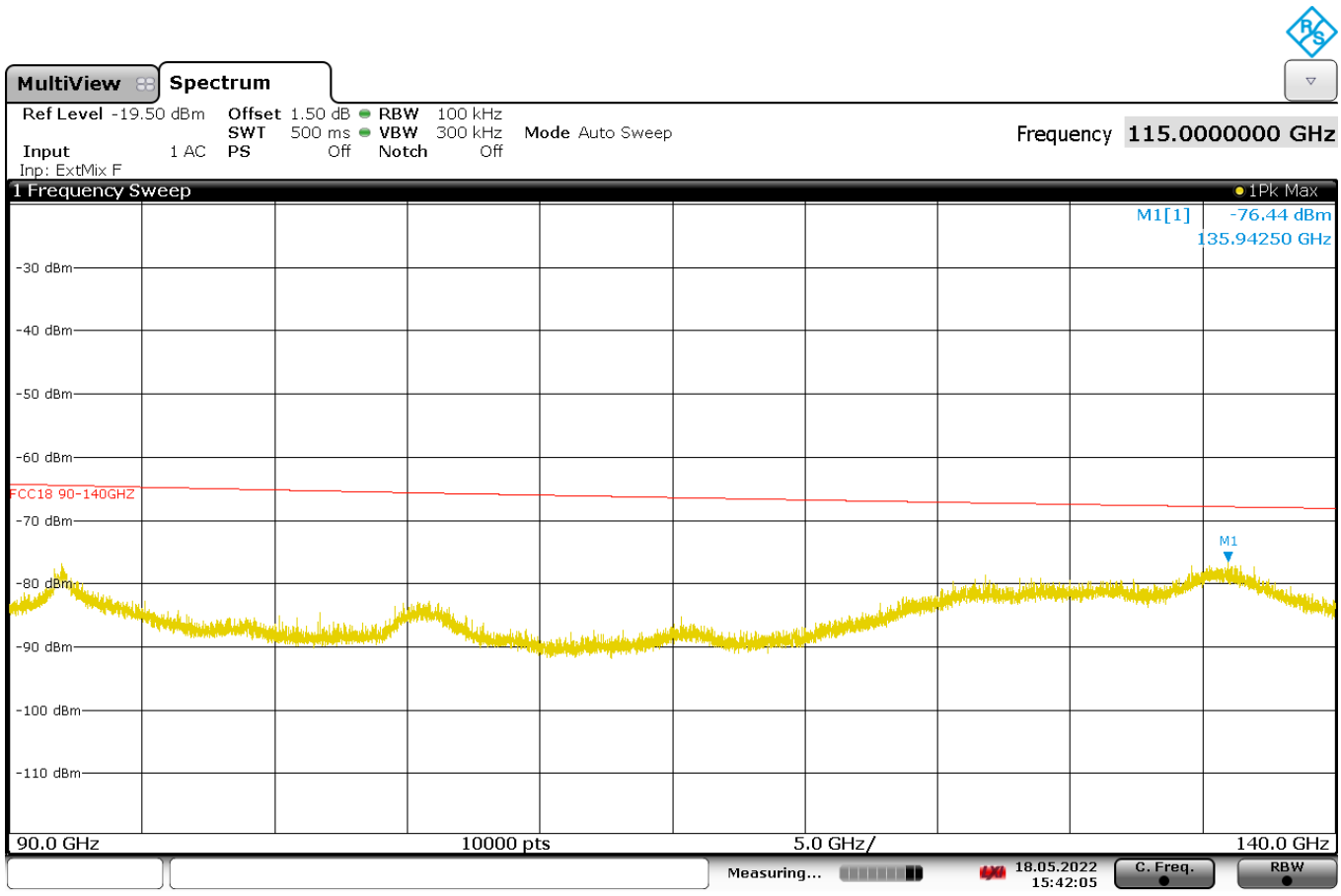
**Plot # 35 Unwanted Emissions: 90 - 140 GHz**

**Measurement antenna orientation:** Horizontal



**Plot # 36 Unwanted Emissions: 90 - 140 GHz**

**Measurement antenna orientation:** Vertical

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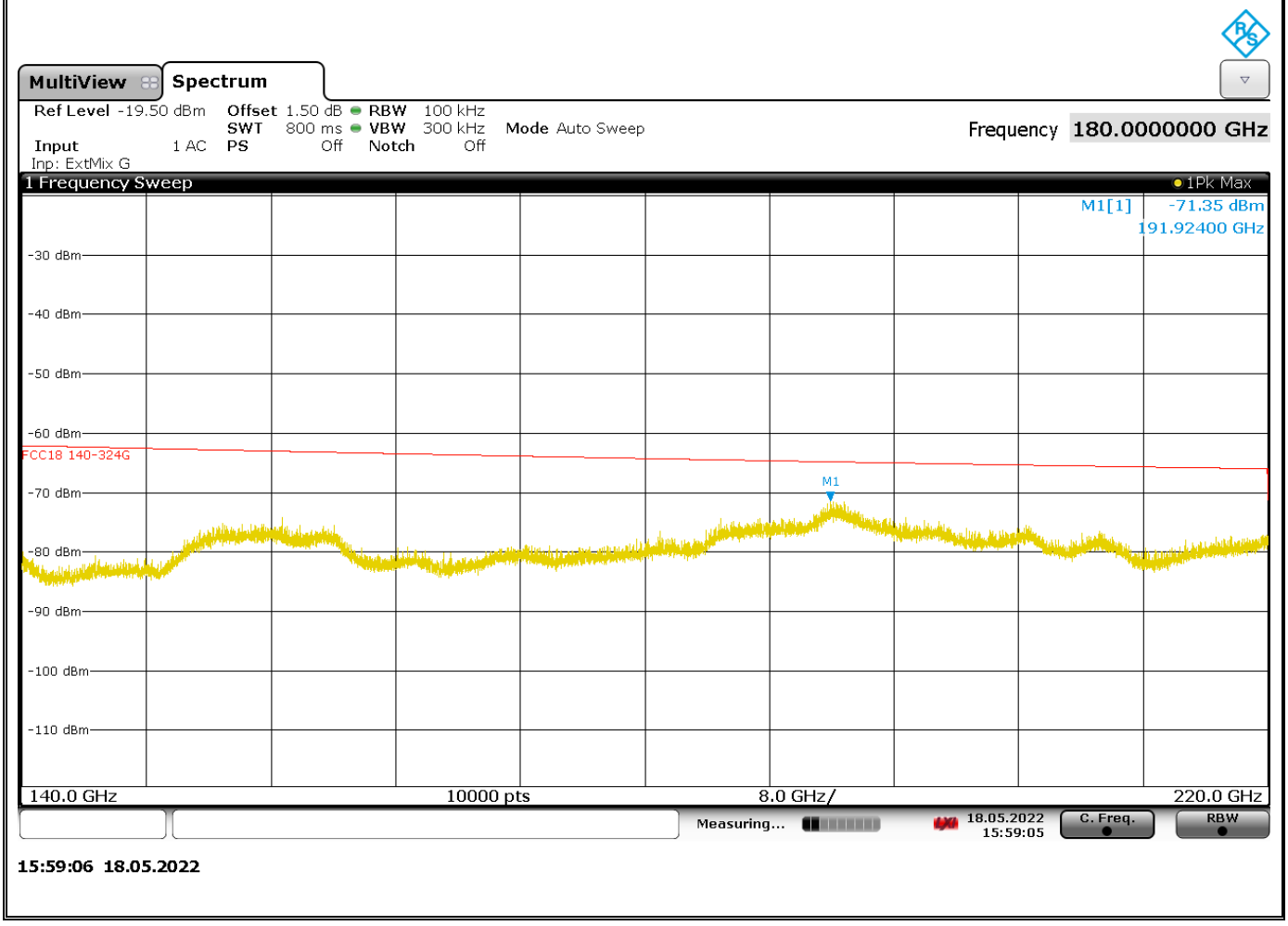
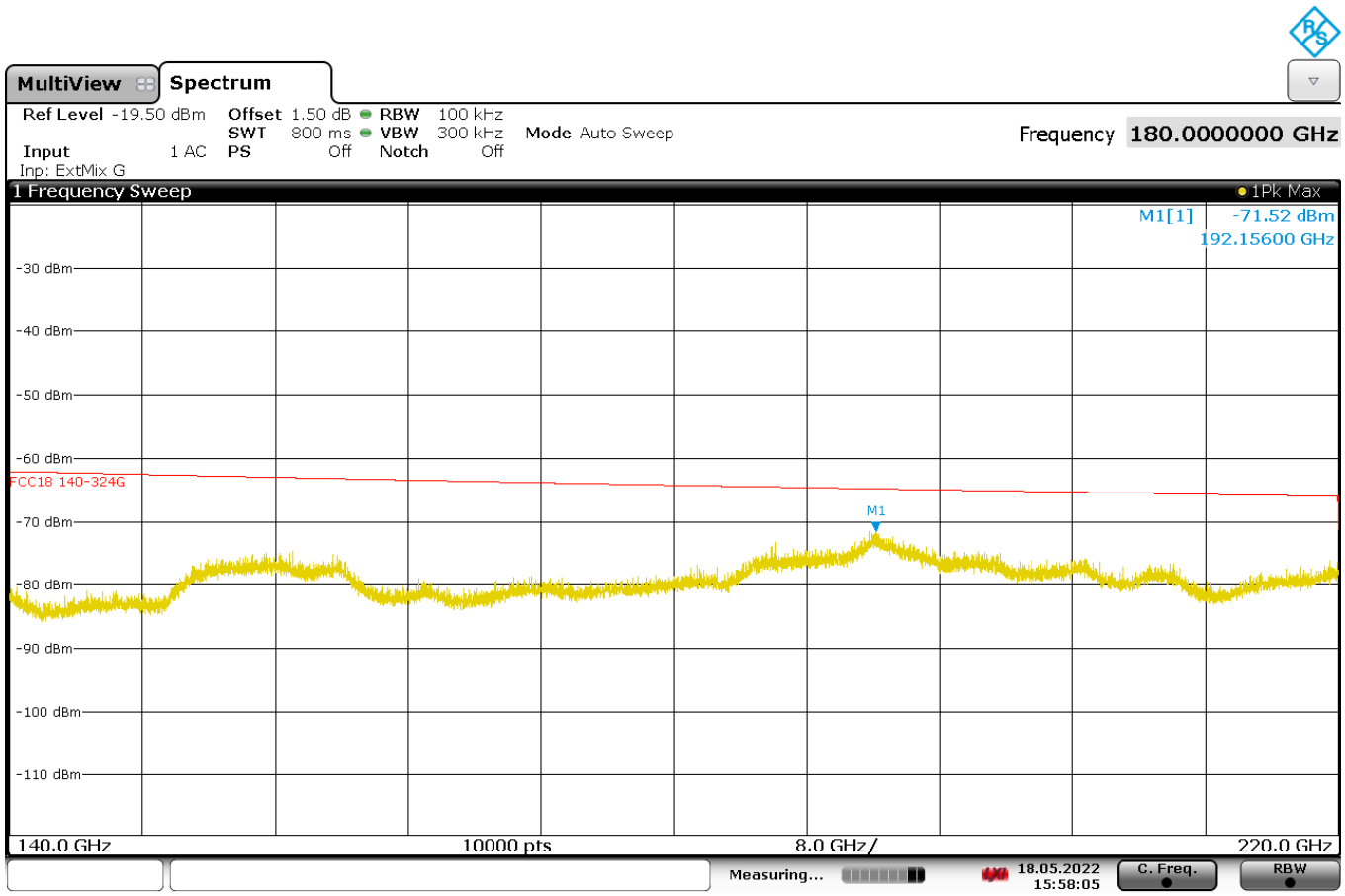
**Plot # 37 Unwanted Emissions: 140 - 220 GHz**

**Measurement antenna orientation:** Horizontal



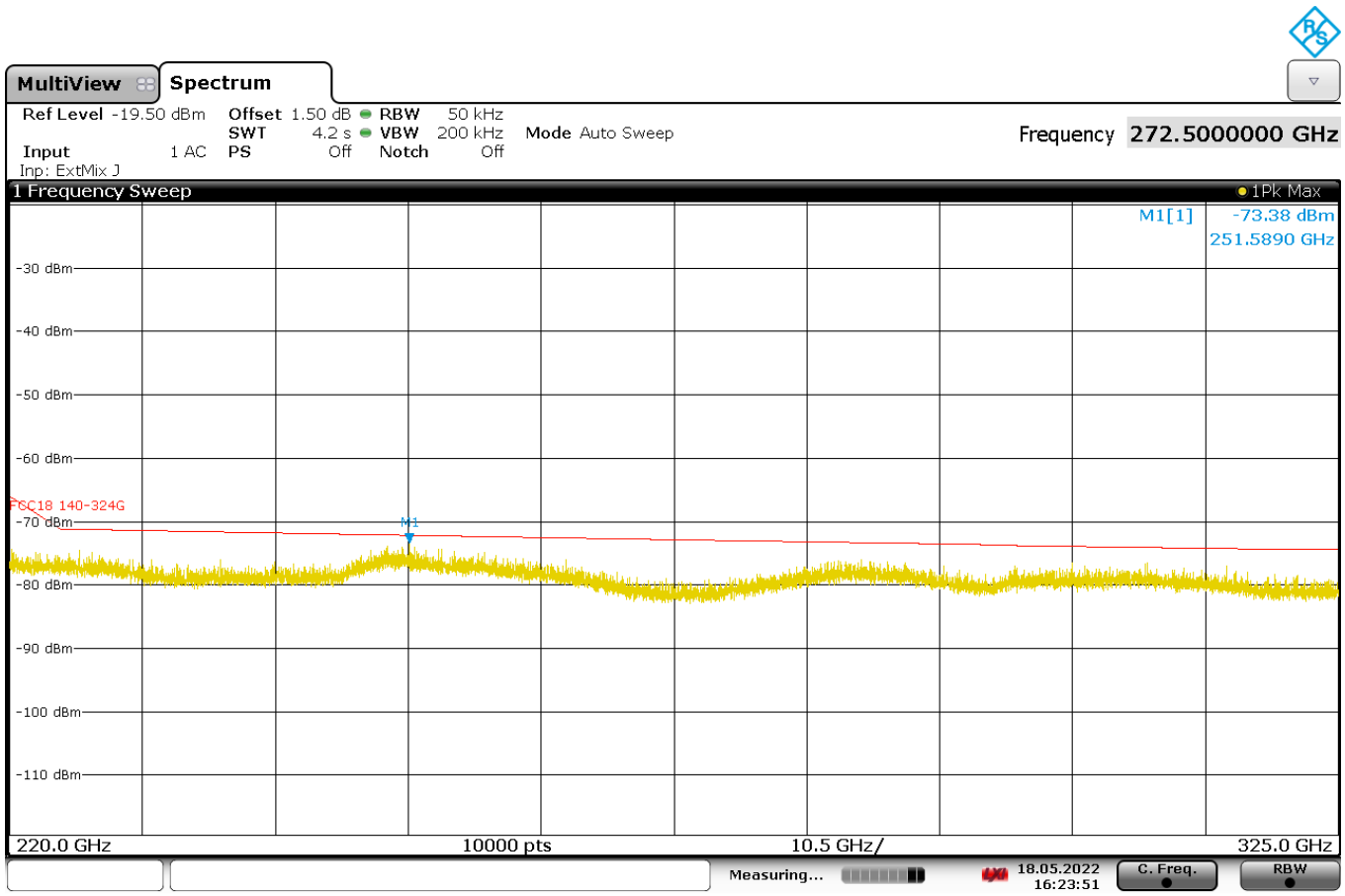
**Plot # 38 Unwanted Emissions: 140 - 220 GHz**

**Measurement antenna orientation:** Vertical



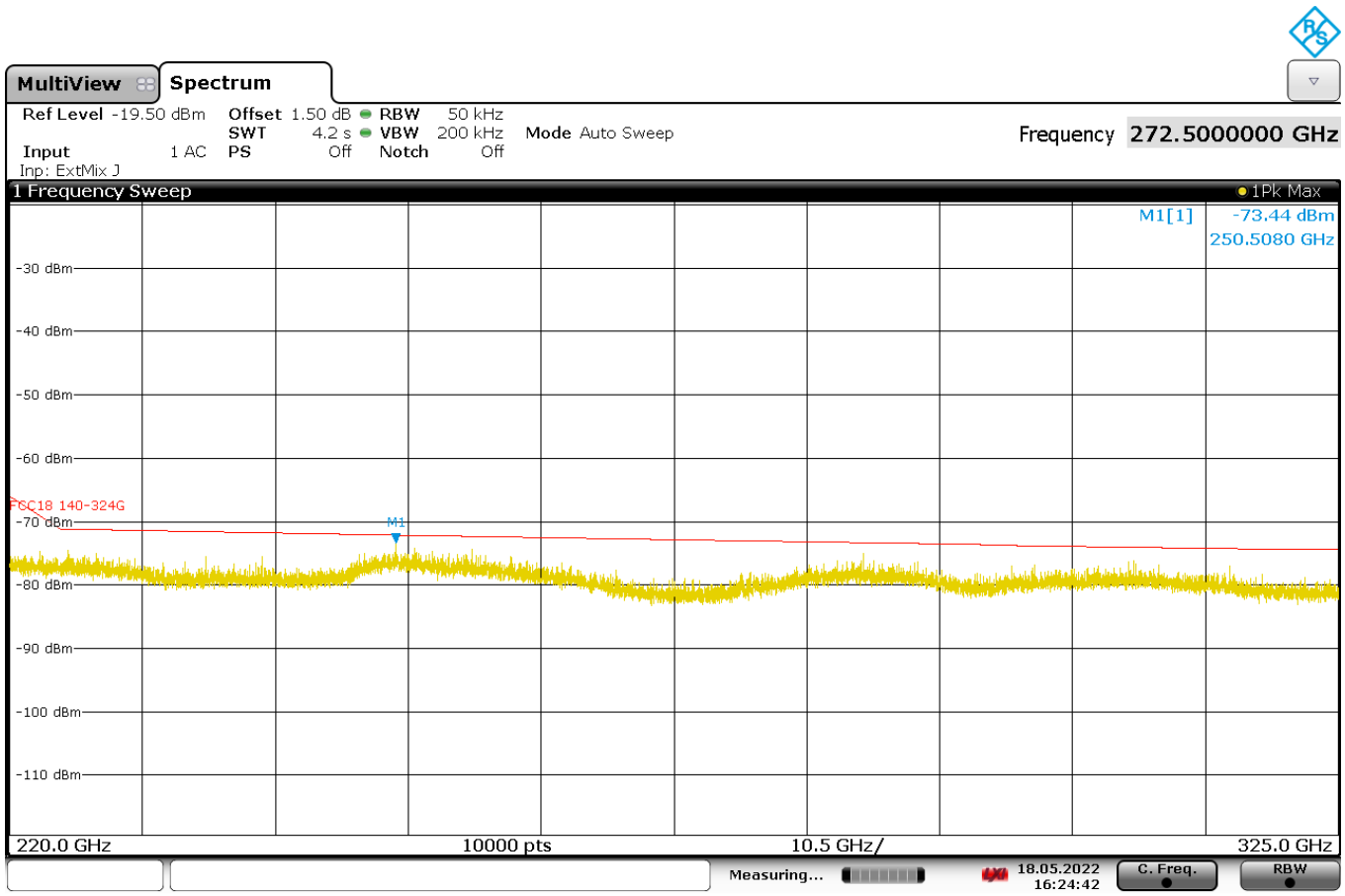
**Plot # 39 Unwanted Emissions: 220 - 325 GHz**

**Measurement antenna orientation:** Horizontal



**Plot # 40 Unwanted Emissions: 220 - 325 GHz**

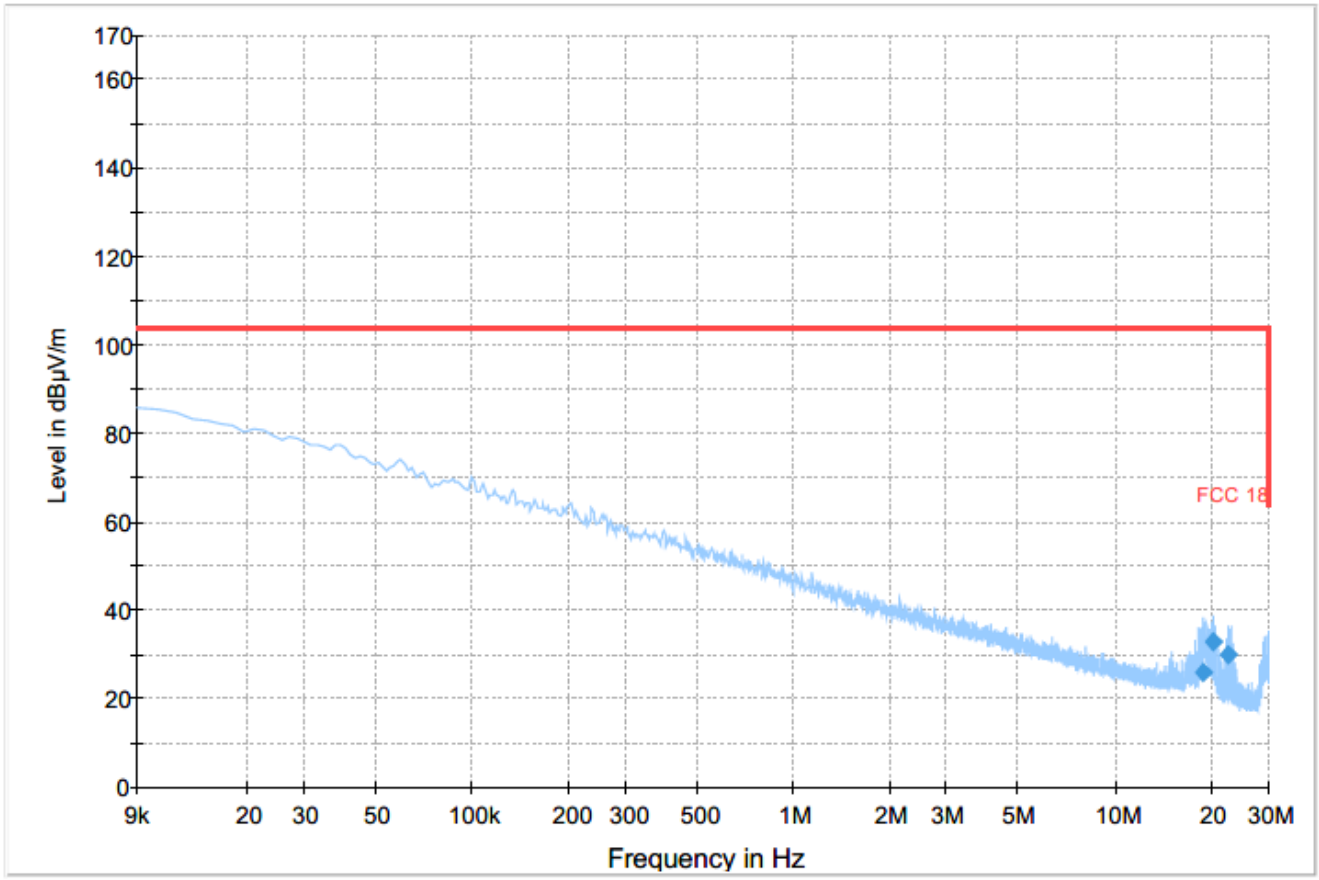
**Measurement antenna orientation:** Vertical



**Plot # 41 Unwanted Emissions: 9 kHz - 30 MHz**

## Final Result

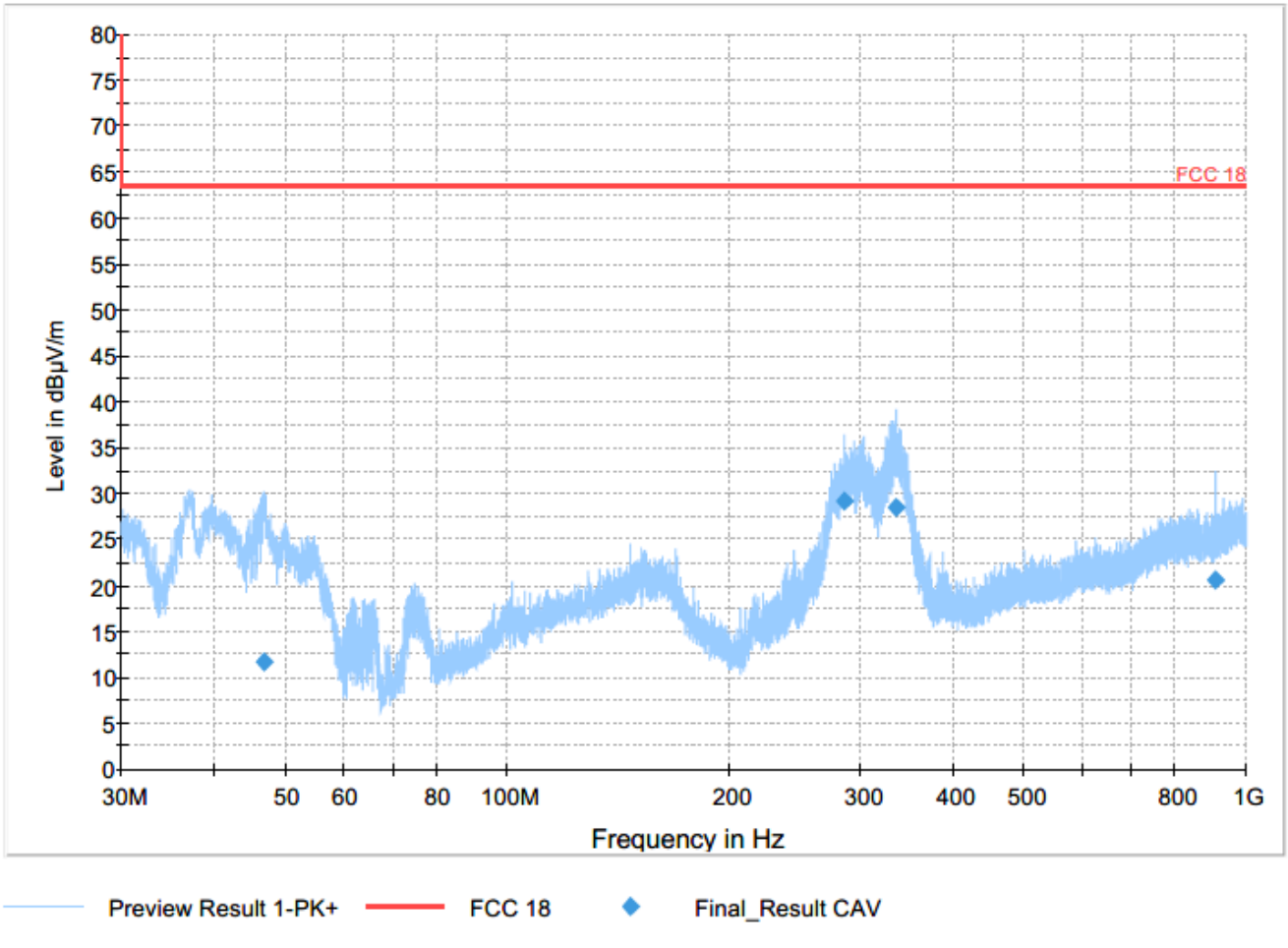
| Frequency (MHz) | CAverage (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| 18.91 | 25.90 | 103.52 | 77.62 | 500.0 | 9.0 | 177.0 | V | 133.0 | 16.5 | |
| 20.22 | 32.93 | 103.52 | 70.59 | 500.0 | 9.0 | 133.0 | V | 161.0 | 16.5 | |
| 22.59 | 29.89 | 103.52 | 73.63 | 500.0 | 9.0 | 107.0 | V | 306.0 | 16.2 | |



**Plot # 42 Unwanted Emissions 30 MHz – 1GHz**

## Final_Result

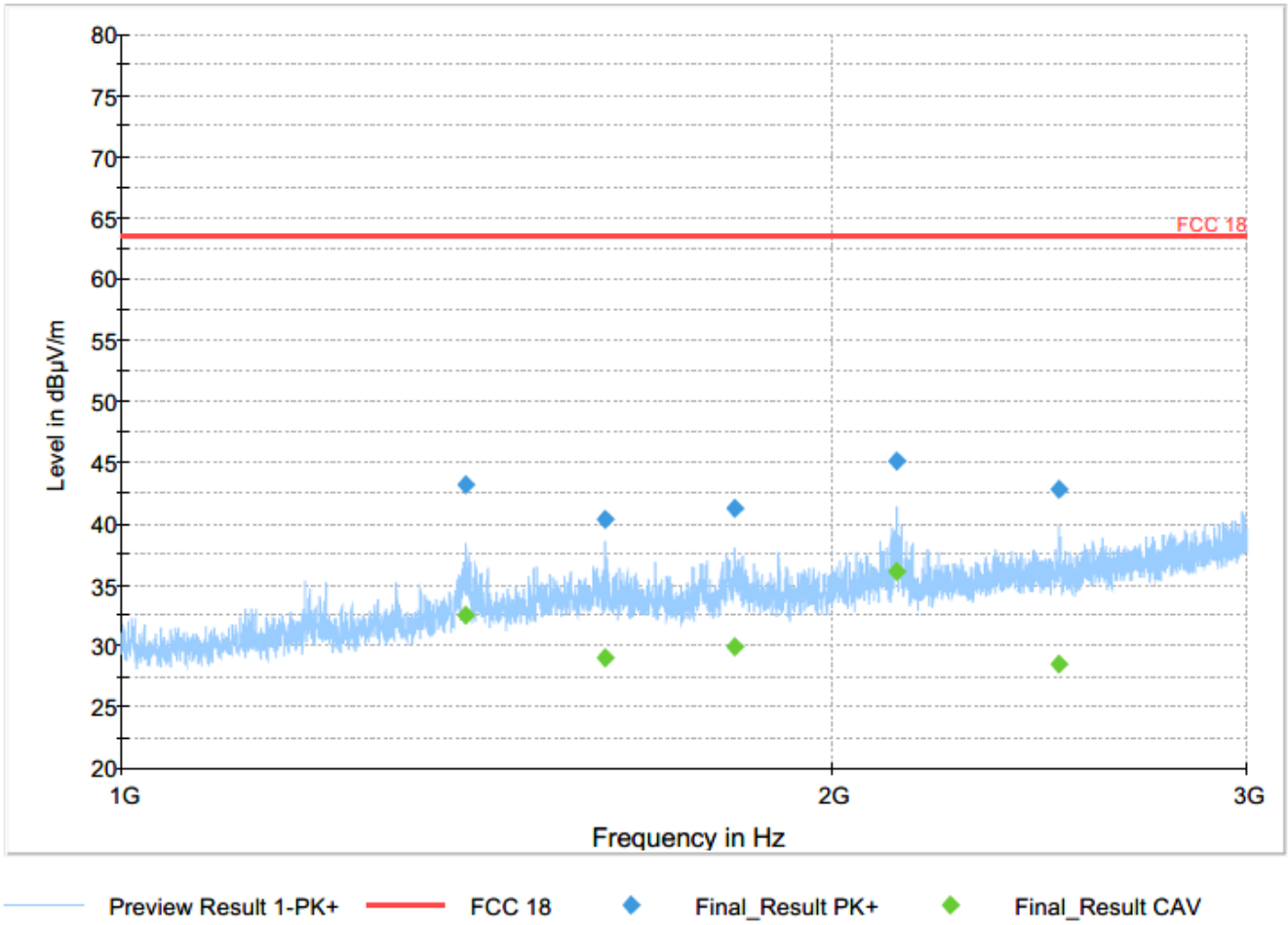
| Frequency (MHz) | CAverage (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|---|---|---|---|---|---|---|---|---|---|
| 46.90 | 11.69 | 63.52 | 51.83 | 500.0 | 120.0 | 151.0 | V | 61.0 | 16.9 |
| 286.18 | 29.21 | 63.52 | 34.31 | 500.0 | 120.0 | 117.0 | V | 212.0 | 21.1 |
| 335.09 | 28.47 | 63.52 | 35.05 | 500.0 | 120.0 | 100.0 | V | 163.0 | 21.6 |
| 908.29 | 20.67 | 63.52 | 42.85 | 500.0 | 120.0 | 133.0 | V | 123.0 | 31.5 |



**Plot # 43 Unwanted Emissions: 1-3 GHz**

## Final Result

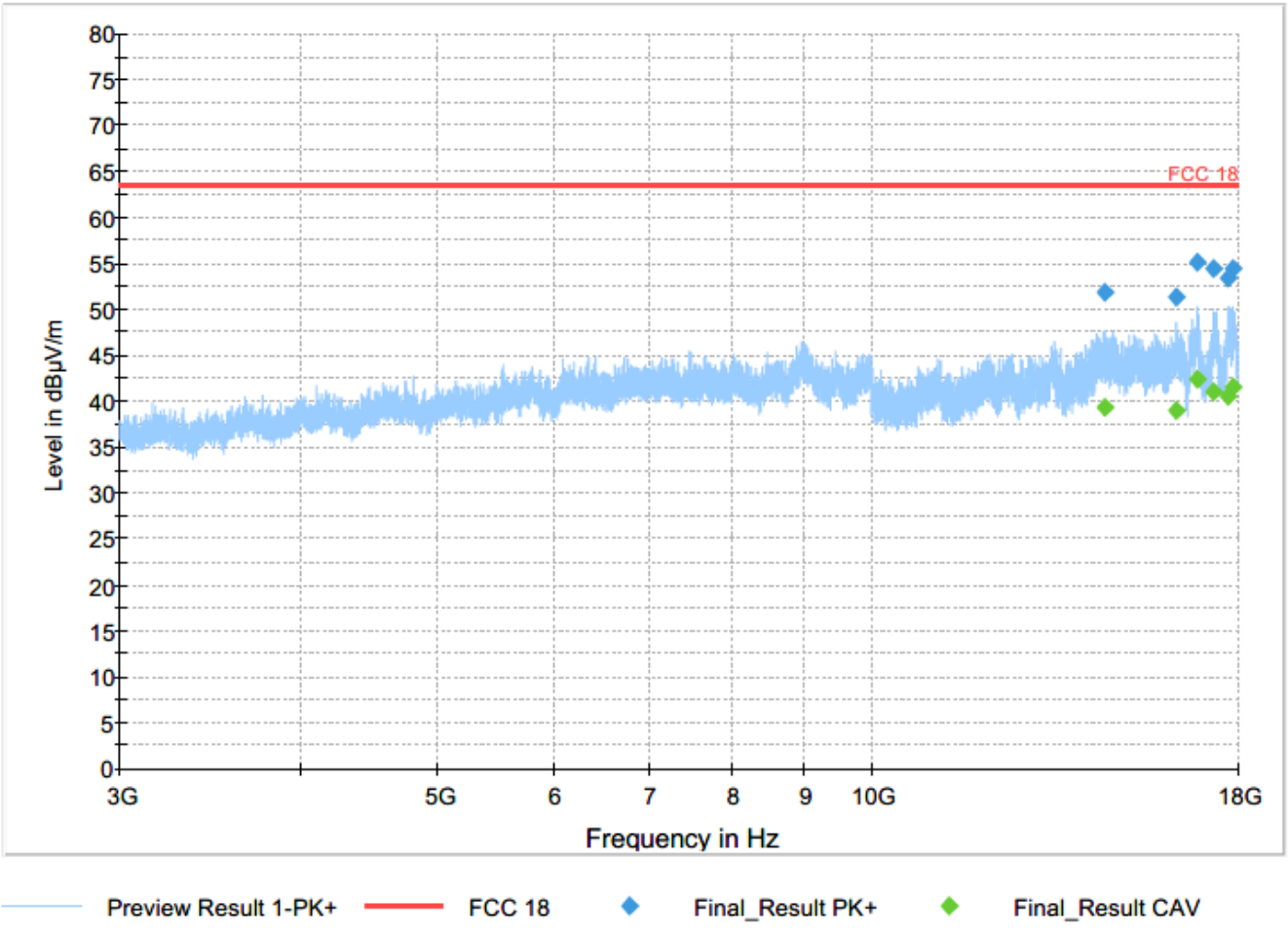
| Frequency (MHz) | MaxPeak (dBµV/m) | CAverage (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1399.75 | 43.16 | --- | 63.52 | 20.36 | 500.0 | 1000.0 | 100.0 | H | 183.0 | -3.3 |
| 1399.75 | --- | 32.43 | 63.52 | 31.09 | 500.0 | 1000.0 | 100.0 | H | 183.0 | -3.3 |
| 1603.25 | --- | 29.03 | 63.52 | 34.49 | 500.0 | 1000.0 | 146.0 | V | 209.0 | -2.4 |
| 1603.25 | 40.38 | --- | 63.52 | 23.14 | 500.0 | 1000.0 | 146.0 | V | 209.0 | -2.4 |
| 1819.25 | 41.20 | --- | 63.52 | 22.32 | 500.0 | 1000.0 | 245.0 | H | 240.0 | -2.2 |
| 1819.25 | --- | 29.88 | 63.52 | 33.64 | 500.0 | 1000.0 | 245.0 | H | 240.0 | -2.2 |
| 2130.50 | --- | 36.04 | 63.52 | 27.48 | 500.0 | 1000.0 | 136.0 | H | 141.0 | -1.2 |
| 2130.50 | 45.12 | --- | 63.52 | 18.40 | 500.0 | 1000.0 | 136.0 | H | 141.0 | -1.2 |
| 2498.00 | --- | 28.55 | 63.52 | 34.97 | 500.0 | 1000.0 | 117.0 | H | 164.0 | 0.2 |
| 2498.00 | 42.77 | --- | 63.52 | 20.75 | 500.0 | 1000.0 | 117.0 | H | 164.0 | 0.2 |



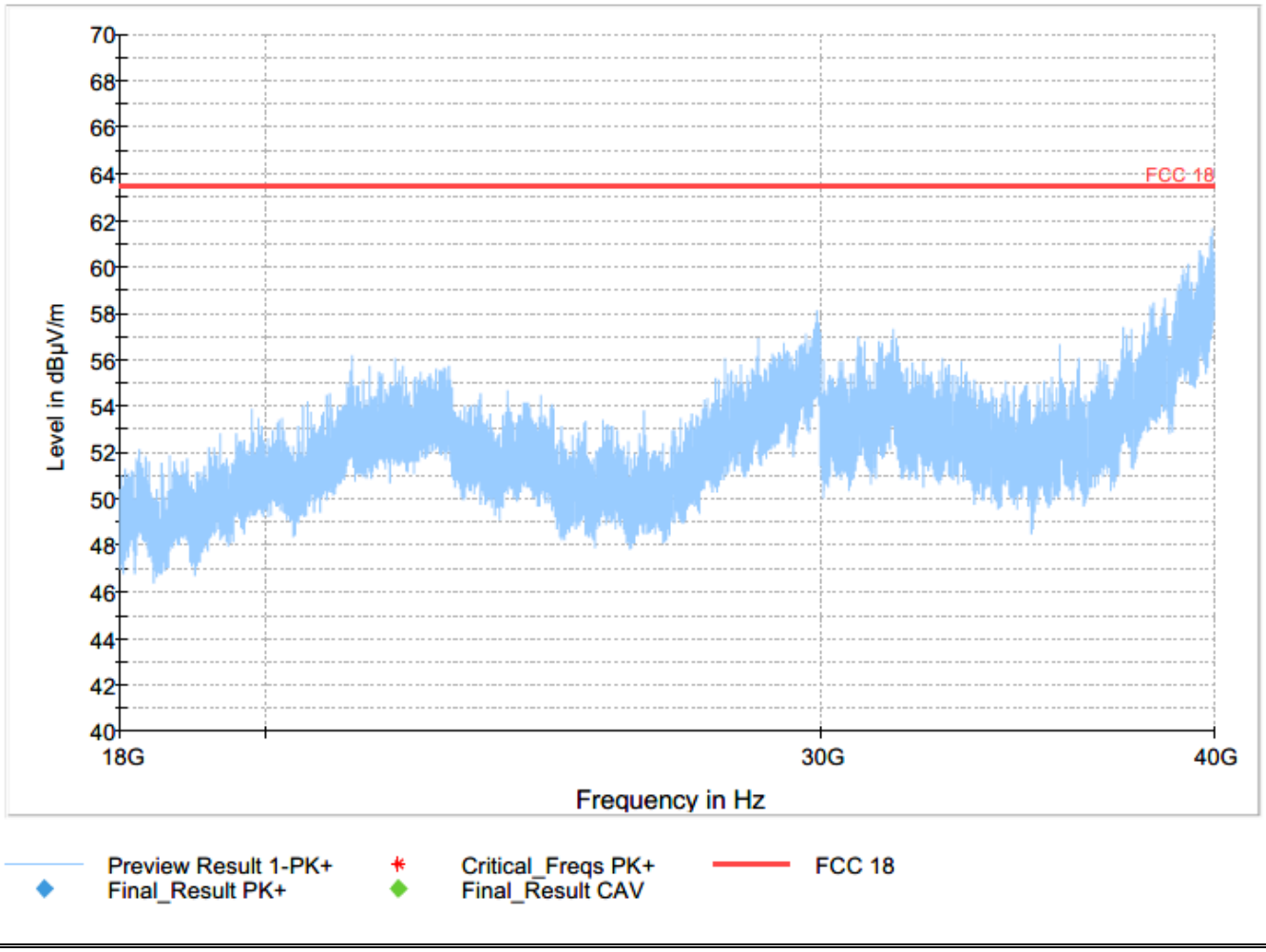
**Plot # 44 Unwanted Emissions: 3 - 18 GHz**

## Final Result

| Frequency (MHz) | MaxPeak (dBµV/m) | CAverage (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|---|---|---|---|---|---|---|---|---|---|---|
| 14531.20 | 51.89 | --- | 63.52 | 11.63 | 500.0 | 1000.0 | 246.0 | H | 283.0 | -17.0 |
| 14531.20 | --- | 39.25 | 63.52 | 24.27 | 500.0 | 1000.0 | 246.0 | H | 283.0 | -17.0 |
| 16297.02 | --- | 38.99 | 63.52 | 24.53 | 500.0 | 1000.0 | 181.0 | V | 152.0 | -12.1 |
| 16297.02 | 51.32 | --- | 63.52 | 12.20 | 500.0 | 1000.0 | 181.0 | V | 152.0 | -12.1 |
| 16888.15 | --- | 42.39 | 63.52 | 21.13 | 500.0 | 1000.0 | 284.0 | V | 269.0 | -11.9 |
| 16888.15 | 55.16 | --- | 63.52 | 8.36 | 500.0 | 1000.0 | 284.0 | V | 269.0 | -11.9 |
| 17332.80 | 54.49 | --- | 63.52 | 9.03 | 500.0 | 1000.0 | 254.0 | V | 218.0 | -10.3 |
| 17332.80 | --- | 41.09 | 63.52 | 22.43 | 500.0 | 1000.0 | 254.0 | V | 218.0 | -10.3 |
| 17718.69 | 53.38 | --- | 63.52 | 10.14 | 500.0 | 1000.0 | 300.0 | H | 234.0 | -9.7 |
| 17718.69 | --- | 40.59 | 63.52 | 22.93 | 500.0 | 1000.0 | 300.0 | H | 234.0 | -9.7 |
| 17866.76 | 54.36 | --- | 63.52 | 9.16 | 500.0 | 1000.0 | 166.0 | V | 121.0 | -7.1 |
| 17866.76 | --- | 41.60 | 63.52 | 21.92 | 500.0 | 1000.0 | 166.0 | V | 121.0 | -7.1 |



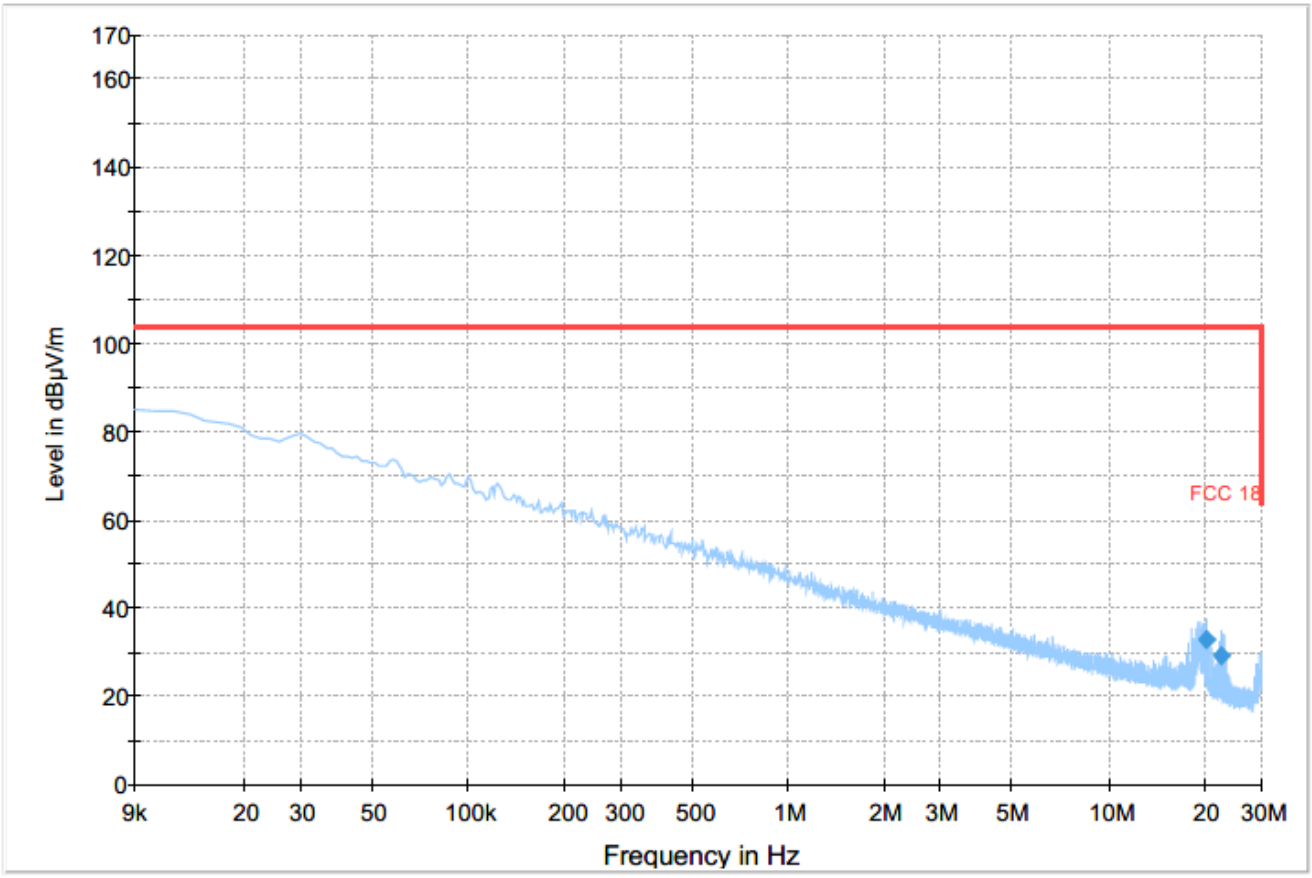
**Plot # 45 Unwanted Emissions: 18-40 GHz**



**Plot # 46 Unwanted Emissions: 9 kHz - 30 MHz**

## Final_Result

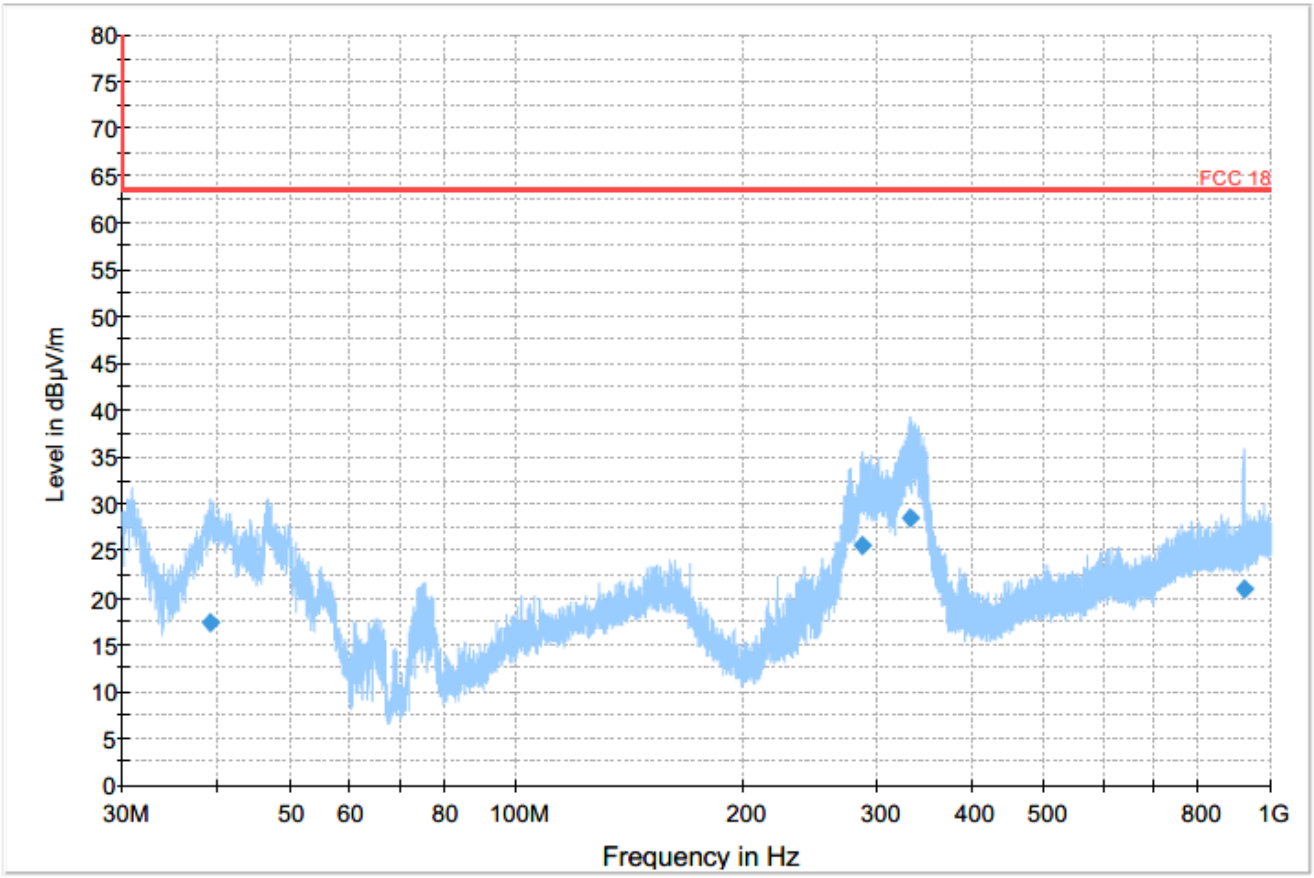
| Frequency (MHz) | CAverage (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| 20.22 | 32.95 | 103.52 | 70.57 | 500.0 | 9.0 | 100.0 | V | 2.0 | 16.5 | |
| 22.58 | 29.19 | 103.52 | 74.33 | 500.0 | 9.0 | 100.0 | V | 60.0 | 16.2 | |



**Plot # 47 Unwanted Emissions 30 MHz – 1GHz**

## Final_Result

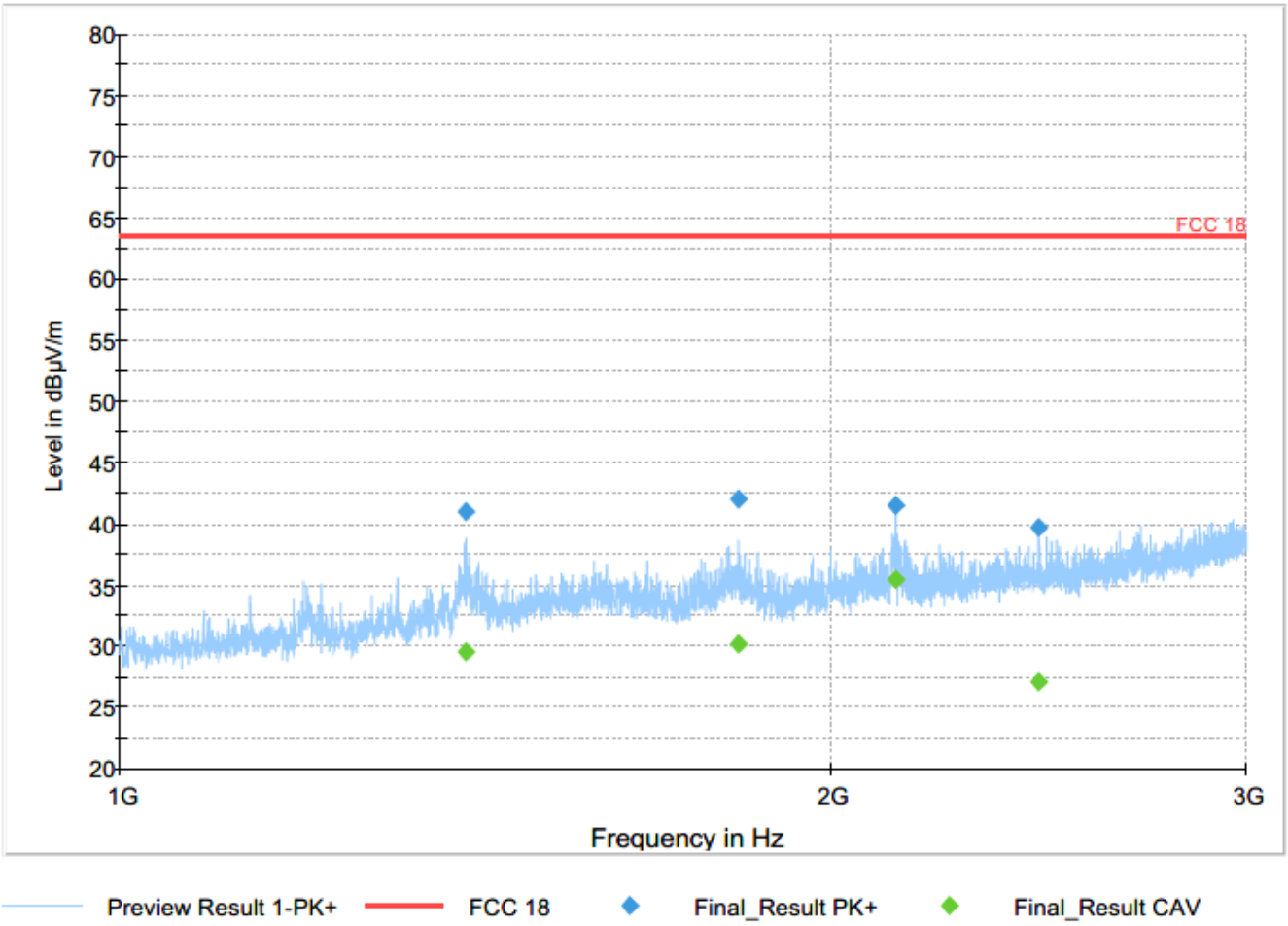
| Frequency (MHz) | CAverage (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|---|---|---|---|---|---|---|---|---|---|
| 39.17 | 17.27 | 63.52 | 46.25 | 500.0 | 120.0 | 107.0 | V | 214.0 | 20.1 |
| 287.54 | 25.62 | 63.52 | 37.90 | 500.0 | 120.0 | 100.0 | V | 228.0 | 21.0 |
| 332.32 | 28.51 | 63.52 | 35.01 | 500.0 | 120.0 | 100.0 | V | 152.0 | 21.6 |
| 920.02 | 20.95 | 63.52 | 42.57 | 500.0 | 120.0 | 177.0 | V | 324.0 | 31.8 |



**Plot # 48 Unwanted Emissions: 1-3 GHz**

## Final Result

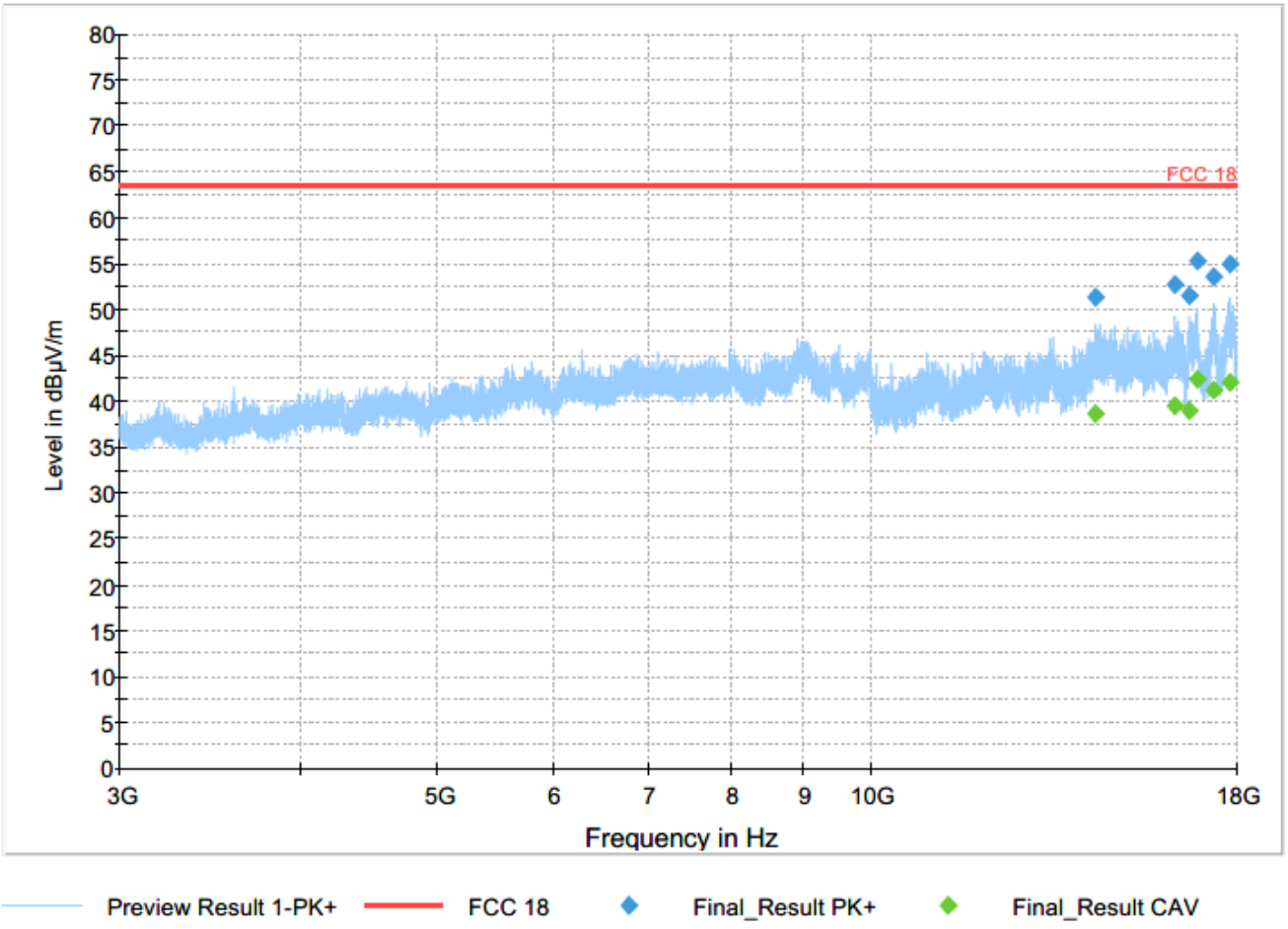
| Frequency (MHz) | MaxPeak (dBµV/m) | CAverage (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1400.00 | --- | 29.54 | 63.52 | 33.98 | 500.0 | 1000.0 | 136.0 | H | 218.0 | -3.3 |
| 1400.00 | 41.04 | --- | 63.52 | 22.48 | 500.0 | 1000.0 | 136.0 | H | 218.0 | -3.3 |
| 1827.75 | --- | 30.21 | 63.52 | 33.31 | 500.0 | 1000.0 | 263.0 | H | 238.0 | -2.1 |
| 1827.75 | 42.08 | --- | 63.52 | 21.44 | 500.0 | 1000.0 | 263.0 | H | 238.0 | -2.1 |
| 2130.75 | 41.56 | --- | 63.52 | 21.96 | 500.0 | 1000.0 | 159.0 | H | 154.0 | -1.2 |
| 2130.75 | --- | 35.47 | 63.52 | 28.05 | 500.0 | 1000.0 | 159.0 | H | 154.0 | -1.2 |
| 2451.25 | 39.66 | --- | 63.52 | 23.86 | 500.0 | 1000.0 | 215.0 | H | 4.0 | 0.0 |
| 2451.25 | --- | 27.09 | 63.52 | 36.43 | 500.0 | 1000.0 | 215.0 | H | 4.0 | 0.0 |



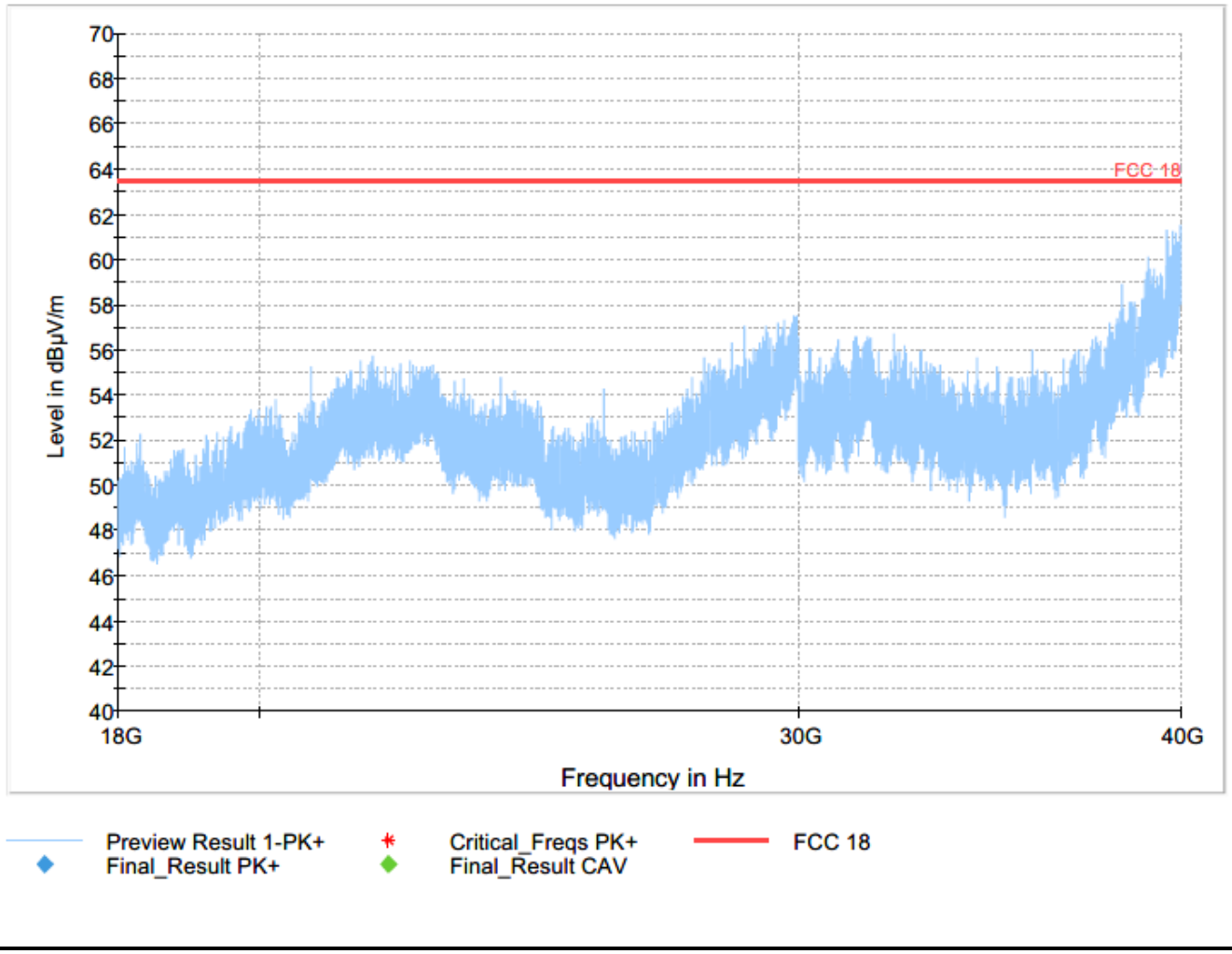
**Plot # 49 Unwanted Emissions: 3 - 18 GHz**

## Final Result

| Frequency (MHz) | MaxPeak (dBµV/m) | CAverage (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|---|---|---|---|---|---|---|---|---|---|---|
| 14369.02 | --- | 38.65 | 63.52 | 24.87 | 500.0 | 1000.0 | 257.0 | V | 218.0 | -16.5 |
| 14369.02 | 51.31 | --- | 63.52 | 12.21 | 500.0 | 1000.0 | 257.0 | V | 218.0 | -16.5 |
| 16318.25 | 52.67 | --- | 63.52 | 10.85 | 500.0 | 1000.0 | 205.0 | V | 311.0 | -12.1 |
| 16318.25 | --- | 39.48 | 63.52 | 24.04 | 500.0 | 1000.0 | 205.0 | V | 311.0 | -12.1 |
| 16710.40 | --- | 38.89 | 63.52 | 24.63 | 500.0 | 1000.0 | 161.0 | V | 9.0 | -12.9 |
| 16710.40 | 51.50 | --- | 63.52 | 12.02 | 500.0 | 1000.0 | 161.0 | V | 9.0 | -12.9 |
| 16897.89 | 55.33 | --- | 63.52 | 8.19 | 500.0 | 1000.0 | 300.0 | V | 92.0 | -11.9 |
| 16897.89 | --- | 42.42 | 63.52 | 21.10 | 500.0 | 1000.0 | 300.0 | V | 92.0 | -11.9 |
| 17334.98 | 53.54 | --- | 63.52 | 9.98 | 500.0 | 1000.0 | 122.0 | H | 163.0 | -10.2 |
| 17334.98 | --- | 41.15 | 63.52 | 22.37 | 500.0 | 1000.0 | 122.0 | H | 163.0 | -10.2 |
| 17800.15 | 55.01 | --- | 63.52 | 8.51 | 500.0 | 1000.0 | 283.0 | H | 161.0 | -7.5 |
| 17800.15 | --- | 42.14 | 63.52 | 21.38 | 500.0 | 1000.0 | 283.0 | H | 161.0 | -7.5 |



**Plot # 50 Unwanted Emissions: 18-40 GHz**



## 8.2 AC Power line Conducted Emissions according to CFR 47 Part 18.307

| Spectrum Analyzer Setting | |
|---|---|
| **Frequency band** | 150 kHz – 30 MHz |
| **Resolution Bandwidth** | 9 kHz |
| **Detector (Exploratory Measurements)** | Peak, Average |
| **Detector (Final Measurements)** | Quasi-Peak, Average |
| **Trace Mode** | Max Hold |
| **Step Size** | 4 kHz |
| **Measurement Time** | 20 ms |

### 8.2.1 Measurement Procedure:

- The EUT is placed on a horizontal ground plane and 40 cm from the vertical ground conducting surface.
- The length of the power lead in excess of the 80 cm separating the EUT from the LISN shall be folded back and forth so as to form a bundle not exceeding 30 to 40 cm in length
- The plug end of the power lead is connected to the 50Uh/50ohm LISN.
- The 6 highest emissions within 20 dB of the limit are noted.

### 8.2.2 Limits:

| Frequency of emission (MHz) | Conducted Limit (dBµV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15-0.5 | 66 to 56* | 56 to 46* |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

*Decreases with the logarithm of the frequency

### 8.2.3 Test Summary:

| Environmental Conditions | |
|---|---|
| Ambient Temperature: | 22° C |
| Relative Humidity: | 41% |
| Atmospheric Pressure: | 1010 mbar |

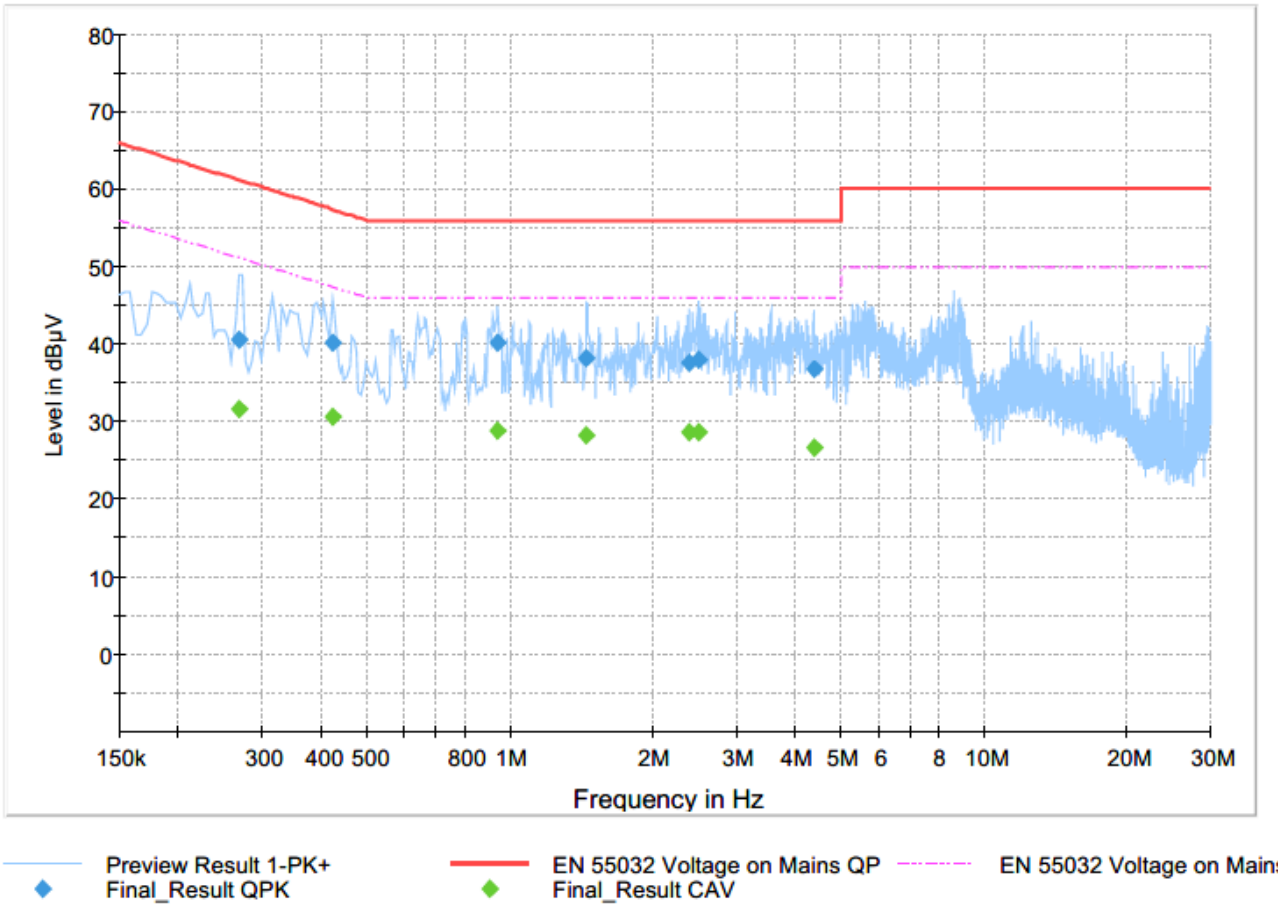
| Test Results | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Plot #** | **EUT Set-Up #** | **EUT operating mode** | **Detector (Peak / AVG / QP)** | **Line Under Test** | **Power Supply Input** | **Comments** | **Result** |
| 1 | U shape | K10 Frequency Resolved Measurement Option | Peak & AVG | Line | 110V AC | Final measurement | Pass |
| 2 | U shape | K10 Frequency Resolved Measurement Option | Peak & AVG | Neutral | 110V AC | Final measurement | Pass |
| 3 | U shape | Single Frequency | Peak & AVG | Line | 110V AC | Final measurement | Pass |
| 4 | U shape | Single Frequency | Peak & AVG | Neutral | 110V AC | Final measurement | Pass |

### 8.2.4 Measurement Plots:

**Plot # 1**

**Final Result**

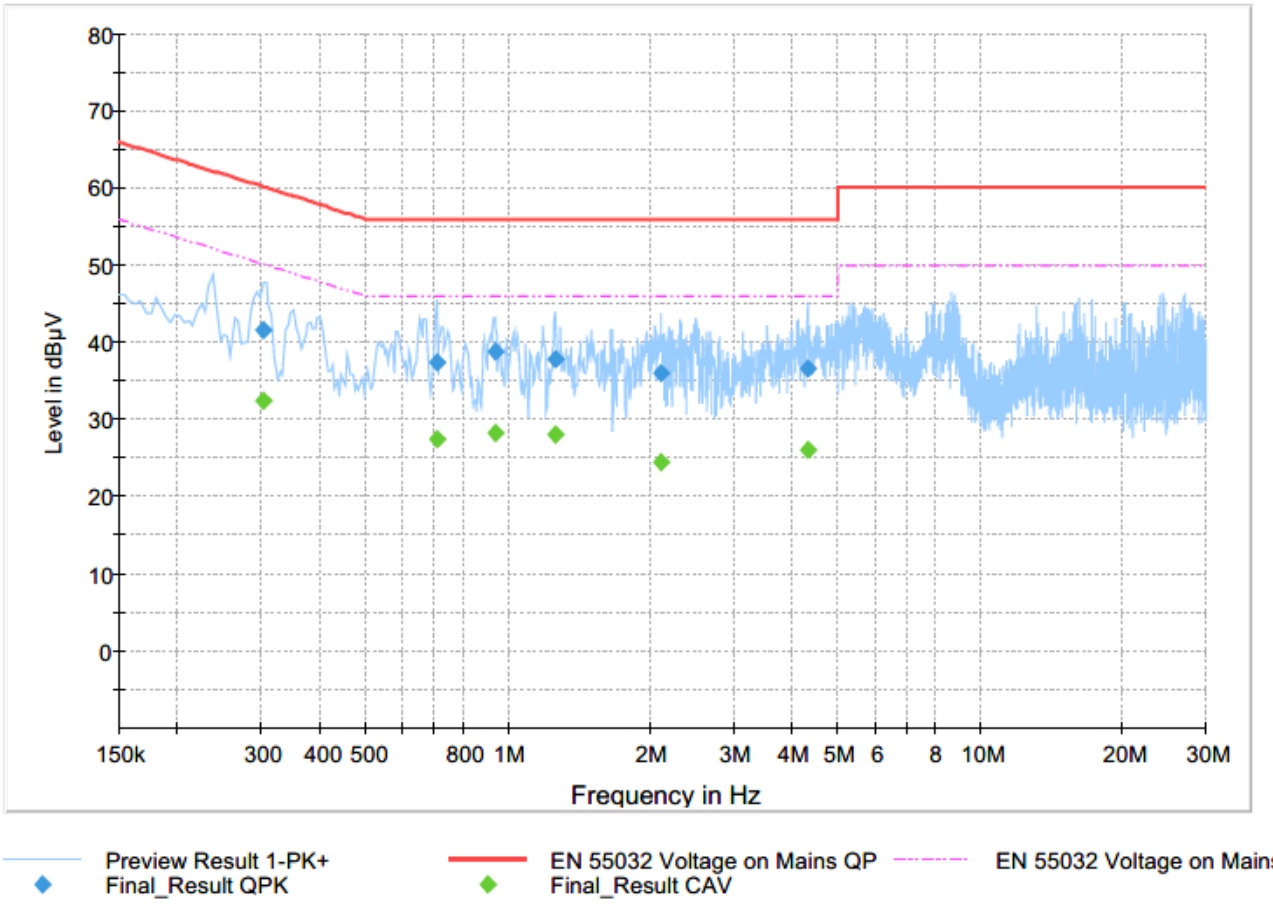
| Frequency (MHz) | QuasiPeak (dBµV) | CAverage (dBµV) | Limit (dBµV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | PE | Corr. (dB) | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.269 | --- | 31.66 | 51.16 | 19.51 | 500.0 | 9.000 | L1 | GND | 10.1 | |
| 0.269 | 40.61 | --- | 61.16 | 20.55 | 500.0 | 9.000 | L1 | GND | 10.1 | |
| 0.422 | --- | 30.64 | 47.41 | 16.77 | 500.0 | 9.000 | L1 | GND | 10.0 | |
| 0.422 | 40.20 | --- | 57.41 | 17.21 | 500.0 | 9.000 | L1 | GND | 10.0 | |
| 0.945 | --- | 28.90 | 46.00 | 17.10 | 500.0 | 9.000 | L1 | GND | 10.1 | |
| 0.945 | 40.09 | --- | 56.00 | 15.91 | 500.0 | 9.000 | L1 | GND | 10.1 | |
| 1.454 | --- | 28.24 | 46.00 | 17.76 | 500.0 | 9.000 | L1 | GND | 10.1 | |
| 1.454 | 38.27 | --- | 56.00 | 17.73 | 500.0 | 9.000 | L1 | GND | 10.1 | |
| 2.393 | --- | 28.61 | 46.00 | 17.39 | 500.0 | 9.000 | L1 | GND | 10.1 | |
| 2.393 | 37.58 | --- | 56.00 | 18.42 | 500.0 | 9.000 | L1 | GND | 10.1 | |
| 2.494 | --- | 28.61 | 46.00 | 17.39 | 500.0 | 9.000 | L1 | GND | 10.1 | |
| 2.494 | 38.06 | --- | 56.00 | 17.94 | 500.0 | 9.000 | L1 | GND | 10.1 | |
| 4.373 | --- | 26.59 | 46.00 | 19.41 | 500.0 | 9.000 | L1 | GND | 10.1 | |
| 4.373 | 36.77 | --- | 56.00 | 19.23 | 500.0 | 9.000 | L1 | GND | 10.1 | |



**Plot # 2**

## Final Result

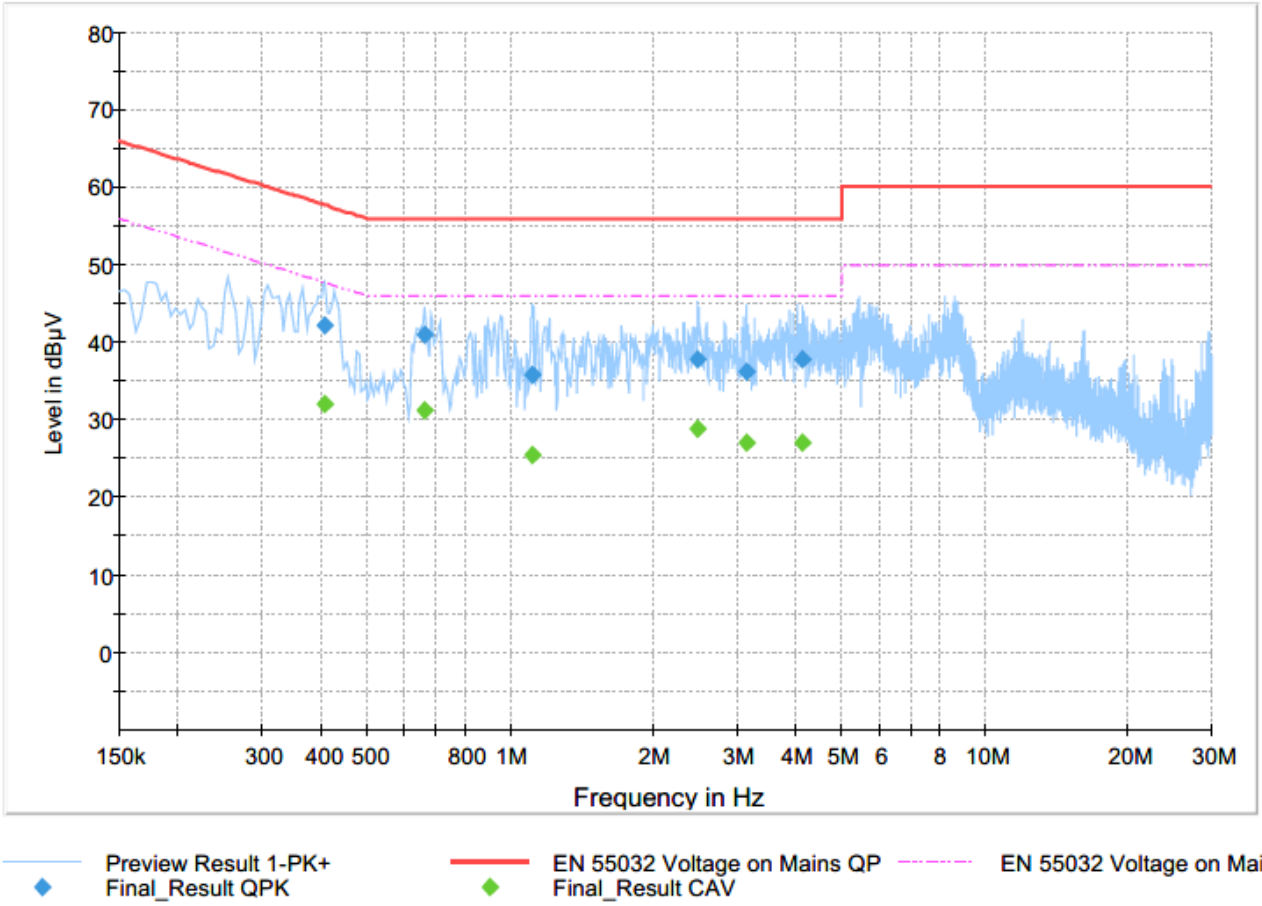
| Frequency (MHz) | QuasiPeak (dBµV) | CAverage (dBµV) | Limit (dBµV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | PE | Corr. (dB) | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.304 | --- | 32.37 | 50.14 | 17.77 | 500.0 | 9.000 | N | GND | 10.1 | |
| 0.304 | 41.61 | --- | 60.14 | 18.53 | 500.0 | 9.000 | N | GND | 10.1 | |
| 0.707 | --- | 27.41 | 46.00 | 18.59 | 500.0 | 9.000 | N | GND | 10.0 | |
| 0.707 | 37.38 | --- | 56.00 | 18.62 | 500.0 | 9.000 | N | GND | 10.0 | |
| 0.940 | --- | 28.28 | 46.00 | 17.72 | 500.0 | 9.000 | N | GND | 10.1 | |
| 0.940 | 38.80 | --- | 56.00 | 17.20 | 500.0 | 9.000 | N | GND | 10.1 | |
| 1.261 | --- | 28.08 | 46.00 | 17.92 | 500.0 | 9.000 | N | GND | 10.1 | |
| 1.261 | 37.84 | --- | 56.00 | 18.16 | 500.0 | 9.000 | N | GND | 10.1 | |
| 2.112 | --- | 24.52 | 46.00 | 21.48 | 500.0 | 9.000 | N | GND | 10.1 | |
| 2.112 | 35.97 | --- | 56.00 | 20.03 | 500.0 | 9.000 | N | GND | 10.1 | |
| 4.320 | --- | 26.01 | 46.00 | 19.99 | 500.0 | 9.000 | N | GND | 10.1 | |
| 4.320 | 36.59 | --- | 56.00 | 19.41 | 500.0 | 9.000 | N | GND | 10.1 | |



**Plot # 3**

## Final Result

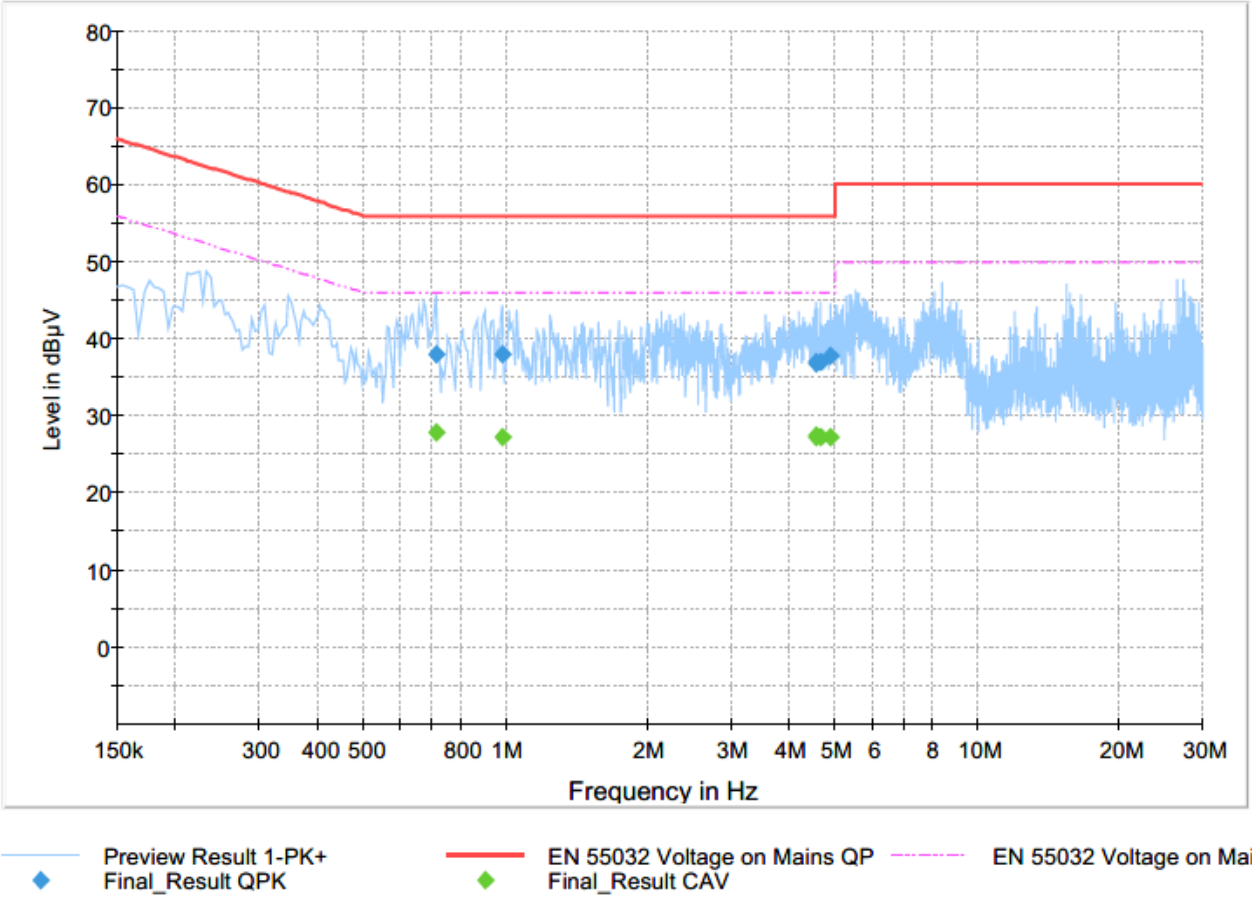
| Frequency (MHz) | QuasiPeak (dBµV) | CAverage (dBµV) | Limit (dBµV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | PE | Corr. (dB) | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.409 | --- | 32.03 | 47.67 | 15.64 | 500.0 | 9.000 | L1 | GND | 10.0 | |
| 0.409 | 42.20 | --- | 57.67 | 15.47 | 500.0 | 9.000 | L1 | GND | 10.0 | |
| 0.664 | --- | 31.24 | 46.00 | 14.76 | 500.0 | 9.000 | L1 | GND | 10.0 | |
| 0.664 | 41.02 | --- | 56.00 | 14.98 | 500.0 | 9.000 | L1 | GND | 10.0 | |
| 1.120 | --- | 25.40 | 46.00 | 20.60 | 500.0 | 9.000 | L1 | GND | 10.1 | |
| 1.120 | 35.71 | --- | 56.00 | 20.29 | 500.0 | 9.000 | L1 | GND | 10.1 | |
| 2.481 | --- | 28.77 | 46.00 | 17.23 | 500.0 | 9.000 | L1 | GND | 10.1 | |
| 2.481 | 37.77 | --- | 56.00 | 18.23 | 500.0 | 9.000 | L1 | GND | 10.1 | |
| 3.144 | --- | 27.06 | 46.00 | 18.94 | 500.0 | 9.000 | L1 | GND | 10.1 | |
| 3.144 | 36.19 | --- | 56.00 | 19.81 | 500.0 | 9.000 | L1 | GND | 10.1 | |
| 4.127 | --- | 27.01 | 46.00 | 18.99 | 500.0 | 9.000 | L1 | GND | 10.1 | |
| 4.127 | 37.80 | --- | 56.00 | 18.20 | 500.0 | 9.000 | L1 | GND | 10.1 | |



**Plot # 4**

## Final_Result

| Frequency (MHz) | QuasiPeak (dBµV) | CAverage (dBµV) | Limit (dBµV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | PE | Corr. (dB) | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.712 | --- | 27.84 | 46.00 | 18.16 | 500.0 | 9.000 | N | GND | 10.0 | |
| 0.712 | 38.02 | --- | 56.00 | 17.98 | 500.0 | 9.000 | N | GND | 10.0 | |
| 0.988 | --- | 27.33 | 46.00 | 18.67 | 500.0 | 9.000 | N | GND | 10.1 | |
| 0.988 | 37.94 | --- | 56.00 | 18.06 | 500.0 | 9.000 | N | GND | 10.1 | |
| 4.544 | --- | 27.21 | 46.00 | 18.79 | 500.0 | 9.000 | N | GND | 10.1 | |
| 4.544 | 36.83 | --- | 56.00 | 19.17 | 500.0 | 9.000 | N | GND | 10.1 | |
| 4.553 | --- | 27.46 | 46.00 | 18.54 | 500.0 | 9.000 | N | GND | 10.1 | |
| 4.553 | 37.06 | --- | 56.00 | 18.94 | 500.0 | 9.000 | N | GND | 10.1 | |
| 4.654 | --- | 27.29 | 46.00 | 18.71 | 500.0 | 9.000 | N | GND | 10.1 | |
| 4.654 | 37.02 | --- | 56.00 | 18.98 | 500.0 | 9.000 | N | GND | 10.1 | |
| 4.891 | --- | 27.27 | 46.00 | 18.73 | 500.0 | 9.000 | N | GND | 10.1 | |
| 4.891 | 37.80 | --- | 56.00 | 18.20 | 500.0 | 9.000 | N | GND | 10.1 | |



## 9 Test setup photos

Setup photos are included in supporting file name: “EMC_ROHDE-003-22001_FCC_18_Setup_Photos”

## 10 Test Equipment And Ancillaries Used For Testing

| Item Name | Manufacturer | Model | Serial # | Calibration Cycle | Last Calibration Date |
|---|---|---|---|---|---|
| Biconlog Antenna | A.H. Systems | BiLA2G | 569 | 2 years | 11/16/2021 |
| Horn Antenna | ETS Lindgren | 3115 | 35111 | 2 years | 09/30/2021 |
| Horn Antenna | ETS Lindgren | 3117-PA | 169547 | 2 years | 09/10/2020 |
| EMI Test Receiver | R&S | ESW44 | 101715 | 2 years | 09/14/2021 |
| Digital Thermometer | Control Company | Model:36934-164 | 191872028 | 2 years | 10/20/2021 |
| Line Impedance Stabilization Network | FCC | FCC-LISN-50-25-2-08 | 08014 | 2 years | 08/31/2021 |
| Horn Antenna | MI-WAVE | 261U-25/383 | N/A | 3 years | 06/11/2020 |
| Horn Antenna | MI-WAVE | 261E-25/387 | N/A | 3 years | 06/11/2020 |
| Horn Antenna | MI-WAVE | 261F-25/378 | N/A | 3 years | 06/11/2020 |
| Horn Antenna | MI-WAVE | 261G-25/387 | N/A | 3 years | 06/11/2020 |
| Horn Antenna | Flann Microwave | 32240-20 | 273388 | 3 years | 08/19/2020 |
| Harmonic Mixer | Radiometer Physics | FS-Z60 | 101025 | 3 years | 01/22/2020 |
| Harmonic Mixer | Radiometer Physics | FS-Z90 | 102088 | 3 years | 02/19/2020 |
| Harmonic Mixer | Radiometer Physics | FS-Z140 | 101145 | 3 years | 02/24/2020 |
| Harmonic Mixer | Radiometer Physics | FS-Z220 | 101037 | 3 years | 03/23/2020 |
| Harmonic Mixer | Radiometer Physics | FS-Z325 | 100943 | 3 years | 02/27/2020 |

**Note:** Equipment used meets the measurement uncertainty requirements as required per applicable standards for 95% confidence levels. Calibration due dates, unless defined specifically, falls on the last day of the month. Items indicated “N/A” for cal status either do not specifically require calibration or is internally characterized before use.

## 11 Revision History

| Date | Report Name | Changes to report | Report prepared by |
|---|---|---|---|
| 2021-06-09 | EMC_ROHDE-003-22001_FCC_18 | Initial Version | Cheng Song |
| 2021-06-21 | EMC_ROHDE-003-22001_FCC_18_Rev1 | Updated typo in Section 10 | Cheng Song |

<<< The End >>>