# FCC §15.255 AND ISED CANADA RSS-210

## CERTIFICATION TEST REPORT

for the

## MEGARADAR V1

**FCC ID: 2AYO6MEGA1**

**IC ID: 28582-MEGA1**

**WLL REPORT# 17557-01 REV 2**

Prepared for:


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**Frederick, Maryland 21703**


Testing Certificate AT-1448

# FCC §15.255 and ISED Canada RSS-210

# Certification Test Report

for the

OmniSight, Inc.

MegaRadar V1

FCC ID: 2AYO6MEGA1

IC ID: 28582-MEGA1

May 6, 2022

WLL Report# 17557-01 Rev 2

Prepared by:

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RF Test Engineer

Reviewed by:

Steven D. Koster
President

# Abstract

This report has been prepared on behalf of OmniSight, Inc. to support the attached Application for Equipment Authorization. The test report and application are submitted for a Fixed Field Disturbance Sensor (Radar) Transmitter under Part 15.255 of the FCC Rules and Regulations and Spectrum Management and Telecommunications Policy and under RSS-210, Issue 10 (12/2019) of Innovation, Science and Economic Development Canada (ISED). This Certification Test Report documents the test configuration and test results for the OmniSight, Inc. MegaRadar V1, in the Low Power Mode. The information provided on this report is only applicable to device herein documented, as the EUT.

Radiated testing below 40 GHz was performed in the Free-space Anechoic Chamber Test-site (FACT) 3m Chamber of Washington Laboratories, Ltd., located at 4840 Winchester Boulevard, Suite #5. Frederick, MD 21703. Site description and site attenuation data are currently being reported to the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD.

Washington Laboratories, Ltd. has been accepted by the FCC and approved by ANAB under Testing Certificate AT-1448 as an independent FCC test laboratory.

The Washington Laboratories, Ltd. ISED Canada number is 3035A.

The OmniSight, Inc. MegaRadar V1 complies with the limits and requirements for a Fixed Field Disturbance Sensor (Radar) Transmitter under Part 15.255 of the FCC Rules and Regulations and Innovation, Science and Economic Development Canada (ISED) RSS-210, Annex J, Issue 10 (12/2019).

| Revision History | Description of Change | Date |
|---|---|---|
| Rev 0 | Initial Release | May 6, 2022 |
| Rev 1 | Amendments per ACB Comments, dated: 9/29/2022 | October 24, 2022 |
| Rev 2 | Amendments to the EUT Block Diagram, per ACB Comments | November 7, 2022 |
| | | |

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# 1 Introduction

## 1.1 Compliance Statement

The OmniSight, Inc. MegaRadar V1 complies with the limits and requirements for a Fixed Field Disturbance Sensor (Radar) Transmitter under Part 15.255 of the FCC Rules and Regulations and Innovation, Science and Economic Development Canada (ISED) RSS-210, Annex J, Issue 10 (12/2019).

## 1.2 Test Scope

Tests for radiated emissions were performed. All measurements were performed in accordance with C63.10-2013 "ANSI Procedures for Compliance Testing of Unlicensed Wireless Devices". The measurement equipment conforms to ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation.

The table below shows the results of the compliance testing for a Fixed Field Disturbance Sensor (Radar) Transmitter, that occupies 500 MHz, or more, bandwidth, and that operates within the 60 to 64 GHz band. Full test results are shown in subsequent sub-sections.

Table 1: Test Summary Table (Low Power Mode)

| FCC Rule Part | ISED Rule Part | Description | Result |
|---|---|---|---|
| §15.207(a) | RSS-Gen(8.8) | AC Mains Conducted Emissions | Pass |
| §15.255(a)(2) | RSS-210(J.1) | Fixed Installation and Use | Pass |
| §2.1049 | RSS-Gen(6.7) | Transmitter Occupied Bandwidth | Evaluated |
| §15.255(c)(3) | RSS-210(J.2.1)(b) | Peak Power (EIRP) | Pass |
| §15.255(c)(3) | RSS-210(J.2.1)(b) | Peak Transmitter Output Power (Conducted) | Pass |
| §15.255(d)(1)<br>§15.255(d)(3) | RSS-210(J.3)(a)<br>RSS-210(J.3)(c) | Unwanted and Spurious Emissions Outside of the 57 GHz – 71 GHz Band | Pass |
| §15.255(d)(2)<br>§15.209(a) | RSS-210(J.3)(b)<br>RSS-Gen(8.9) | Unwanted and Spurious Emissions Below 40 GHz | Pass |
| §15.255(f) | RSS-210(J.6) | Frequency Stability | Pass |
| §15.35(c) | RSS-Gen(8.2) | 100ms Duty Cycle | Evaluated |

## 1.3 Contract Information

| | |
|---|---|
| Customer: | Truck Specialized Trucking Services (OmniSight USA, Inc.) |
| Purchase Order Number: | Advance Deposit Terms; 50% |
| Quotation Number: | 73317A |

## 1.4 Test and Support Personnel

| | |
|---|---|
| Washington Laboratories, LTD | Ryan Mascaro |
| Customer Representative | Carl Rundell |

## 1.5 Test Dates

4/27/2022 – 5/4/2022 (also see Section 4 of this report)

## 1.6 Test Location

All measurements herein were performed at Washington Laboratories, Ltd. test center in Frederick, MD. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. Washington Laboratories, Ltd. has been accepted by the FCC and approved by ANAB under Testing Certificate AT-1448 as an independent FCC test laboratory. The Washington Laboratories, Ltd. ISED Canada number is 3035A.

## 1.7 EUT Digital Emissions

Please know that the digital portion of the EUT is authorized under the SDoC procedure.

The applicant shall maintain the declaration of conformity as provided in Test Report # 17516-01.

The Class B SDoC was competed on 3/24/2022.

# 2 Test Results

## 2.1 AC Mains Conducted Emissions

### 2.1.1 Requirements

Compliance Standard: FCC Part §15.207(a) and RSS-Gen(8.8).

| FCC Compliance Limits | | |
|---|---|---|
| **Frequency Range** | **Quasi-peak** | **Average** |
| 0.15 – 0.5 MHz | 66 to 56 dBµV | 56 to 46 dBµV |
| 0.5 – 5 MHz | 56 dBµV | 46 dBµV |
| 0.5 – 30 MHz | 60 dBµV | 50 dBµV |

### 2.1.2 Test Procedure

The requirements of FCC Part 15 call for the EUT to be placed on an 80cm-high 1 X 1.5-meter non-conductive table above a ground plane. Power to the EUT was provided through a Solar Corporation 50 Ω/50 µH Line Impedance Stabilization Network bonded to a 3 X 2-meter ground plane. The LISN has its AC input supplied from a filtered AC power source. Power was supplied to the peripherals through a second LISN. The peripherals were placed on the table in accordance with ANSI C63.4. Power and data cables were moved about to obtain maximum emissions.

The 50 Ω output of the LISN was connected to the input of the spectrum analyzer and the emissions in the frequency range of 150 kHz to 30 MHz were measured. The detector function was set to quasi-peak, peak, or average as appropriate, and the resolution bandwidth during testing was at least 9 kHz, with all post-detector filtering no less than 10 times the resolution bandwidth. For average measurements, the post-detector filter was set to 10 Hz.

These emissions must meet the limits specified in §15.207 for quasi-peak and average measurements. At frequencies where quasi-peak or peak measurements comply with the average limit, no average measurements need be performed.

Environmental Conditions during Conducted Emissions Testing

| | |
|---|---|
| Ambient Temperature: | 20 °C |
| Relative Humidity: | 49 % |

### 2.1.3 Conducted Data Reduction and Reporting

The comparison between the AC voltage conducted emission levels and the FCC limit is calculated as shown in the following example:

Spectrum Analyzer Voltage: VdBµV

LISN Correction Factor: LISN dB

Cable Correction Factor: CF dB

Electric Field: EdBµV = VdBµV + LISN dB + CF dB

### 2.1.4 Test Data

The EUT complies with the Class B, AC Conducted Emissions requirements.

The EUT was set to a transmit enabled, FMCW-modulated mode for this test.

The final test data appears in Table 2.

Table 2: AC Mains Conducted Emissions Test Data

| **NEUTRAL** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Frequency (MHz)** | **Level QP (dBμV)** | **Level AVG (dBμV)** | **Cable Loss (dB)** | **LISN Corr (dB)** | **Level QP Corr (dBμV)** | **Level Avg Corr (dBμV)** | **Limit QP (dBμV)** | **Limit AVG (dBμV)** | **Margin QP (dB)** | **Margin AVG (dB)** |
| 0.150 | 35.2 | 24.3 | 10.2 | 0.6 | 46.0 | 35.1 | 66.0 | 56.0 | -20.0 | -17.9 |
| 0.372 | 22.5 | 18.3 | 10.2 | 0.3 | 33.0 | 28.8 | 58.5 | 48.5 | -25.4 | -19.7 |
| 0.821 | 13.9 | 9.0 | 10.3 | 0.3 | 24.5 | 19.6 | 56.0 | 46.0 | -31.5 | -26.4 |
| 1.767 | 16.0 | 10.3 | 10.2 | 0.3 | 26.5 | 20.8 | 56.0 | 46.0 | -29.5 | -25.2 |
| 27.660 | 18.9 | 17.6 | 11.8 | 2.8 | 33.6 | 32.3 | 60.0 | 50.0 | -26.4 | -17.7 |
| 29.148 | 20.9 | 16.0 | 11.9 | 3.1 | 35.9 | 31.0 | 60.0 | 50.0 | -24.1 | -19.0 |
| | | | | | | | | | | |
| **PHASE / L1** | | | | | | | | | | |
| **Frequency (MHz)** | **Level QP (dBμV)** | **Level AVG (dBμV)** | **Cable Loss (dB)** | **LISN Corr (dB)** | **Level QP Corr (dBμV)** | **Level Avg Corr (dBμV)** | **Limit QP (dBμV)** | **Limit AVG (dBμV)** | **Margin QP (dB)** | **Margin AVG (dB)** |
| 0.151 | 34.6 | 23.8 | 10.2 | 0.5 | 45.2 | 34.4 | 65.9 | 55.9 | -20.7 | -21.5 |
| 0.369 | 23.6 | 21.2 | 10.2 | 0.3 | 34.1 | 31.7 | 58.5 | 48.5 | -24.5 | -16.9 |
| 0.447 | 15.0 | 10.0 | 10.2 | 0.3 | 25.5 | 20.5 | 56.9 | 46.9 | -31.5 | -26.5 |
| 24.305 | 14.0 | 11.3 | 11.6 | 1.8 | 27.4 | 24.7 | 60.0 | 50.0 | -32.6 | -25.3 |
| 26.551 | 19.1 | 16.0 | 11.8 | 2.3 | 33.1 | 30.0 | 60.0 | 50.0 | -26.9 | -20.0 |
| 29.912 | 22.6 | 21.2 | 12.0 | 2.9 | 37.5 | 36.1 | 60.0 | 50.0 | -22.5 | -13.9 |

## 2.2 RDR255 – Fixed Use Operation

### 2.2.1 Requirements

Compliance Standard: FCC Part §15.255(a)(2) and RSS-210(J.1).

KDB Publication 388624 D02: Pre-Approval Guidance List, v17r05 requires that applications for Field Disturbance Sensors and/or Radar Devices, to be filed under FCC Section §15.255, must maintain an Operational Description exhibit that includes a detailed explanation of how the fixed operation requirement of Section §15.255(a)(2) is satisfied. If certification is being requested for non-fixed operation as a Short-Range Interactive Motion Sensor (SRIMS), then a comprehensive justification shall be provided in the Operational Description exhibit.

### 2.2.2 Compliance

The applicant has declared that this device is for Fixed Use Only.

The EUT shall be mounted in a fashion that provides a minimum separation distance that is ≥ the compliance distance that has been demonstrated in the RF Exposure (MPE) Exhibit.

## 2.3 Transmitter Occupied Bandwidth

### 2.3.1 Requirements

Compliance Standard: FCC Part §2.1049 and RSS-Gen (6.7).

Under this provision, the Occupied Bandwidth of the fundamental, modulated transmitter, shall be evaluated. The 20dB and the 99% channel bandwidth shall be recorded.

### 2.3.2 Test Procedure

The OBW measurement was performed in accordance with ANSI C36.10-2013, Section 6.9: “Occupied bandwidth tests”. In this case, the 99% and the 20dB bandwidth measurements were taken. This test was performed as a radiated test, at a distance of 50cm.

### 2.3.3 Test Data

The EUT complies with the requirements this section.

The EUT was set to a transmit enabled, FMCW-modulated mode for this test.

Table 3 and Figure 1 through Figure 3 provide the final test data.

Table 3: Occupied Bandwidth Test Results

| Channel | Frequency | 20dB OBW | 99% OBW | Limit |
|---|---|---|---|---|
| Low | 60.250 GHz | 518.511 MHz | 496.076 MHz | N/A |
| Center | 61.750 GHz | 510.580 MHz | 491.415 MHz | N/A |
| High | 63.500 GHz | 521.606 MHz | 498.354 MHz | N/A |

Figure 1: Occupied Bandwidth – Low Channel

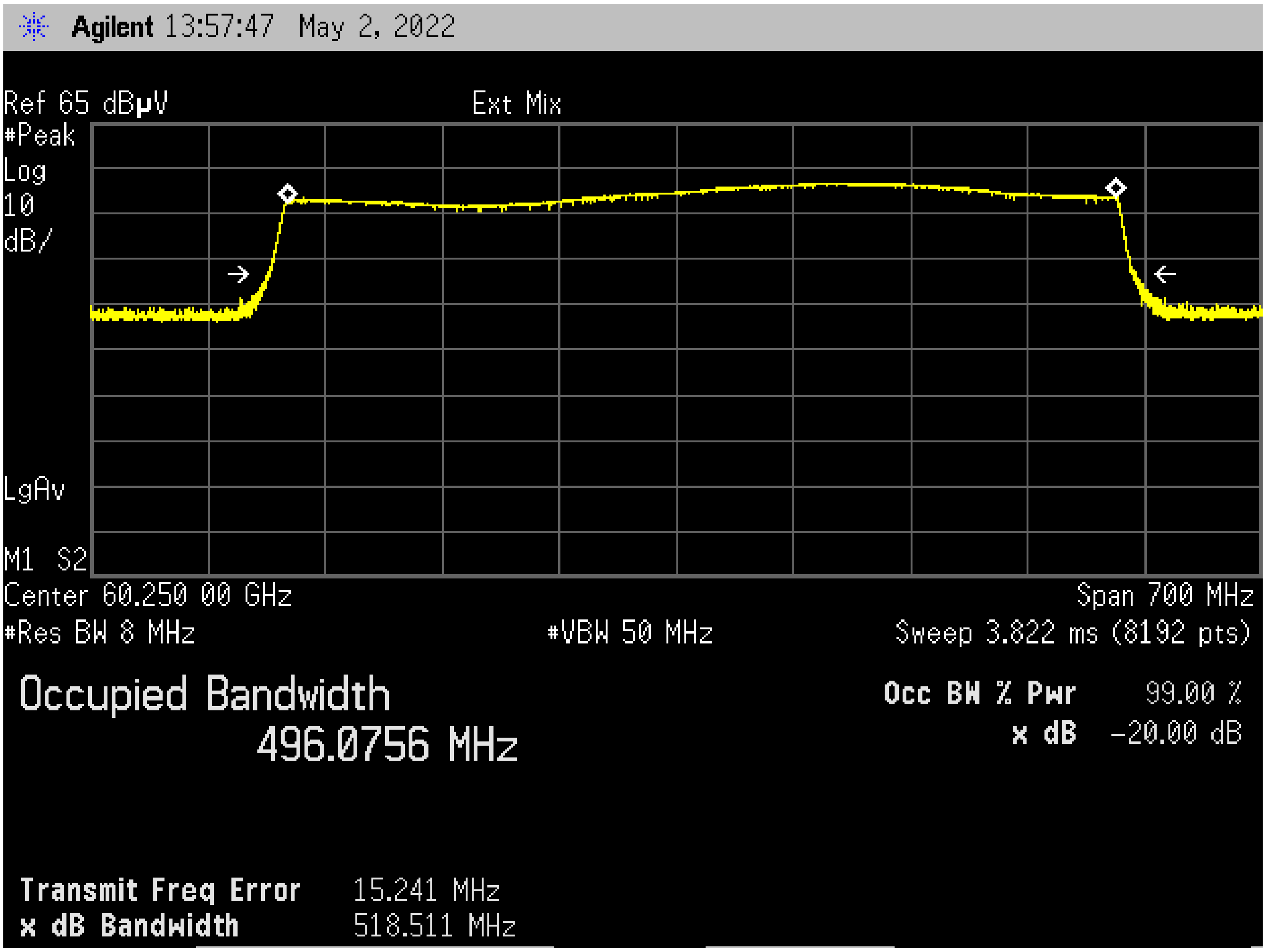


Figure 2: Occupied Bandwidth – Center Channel

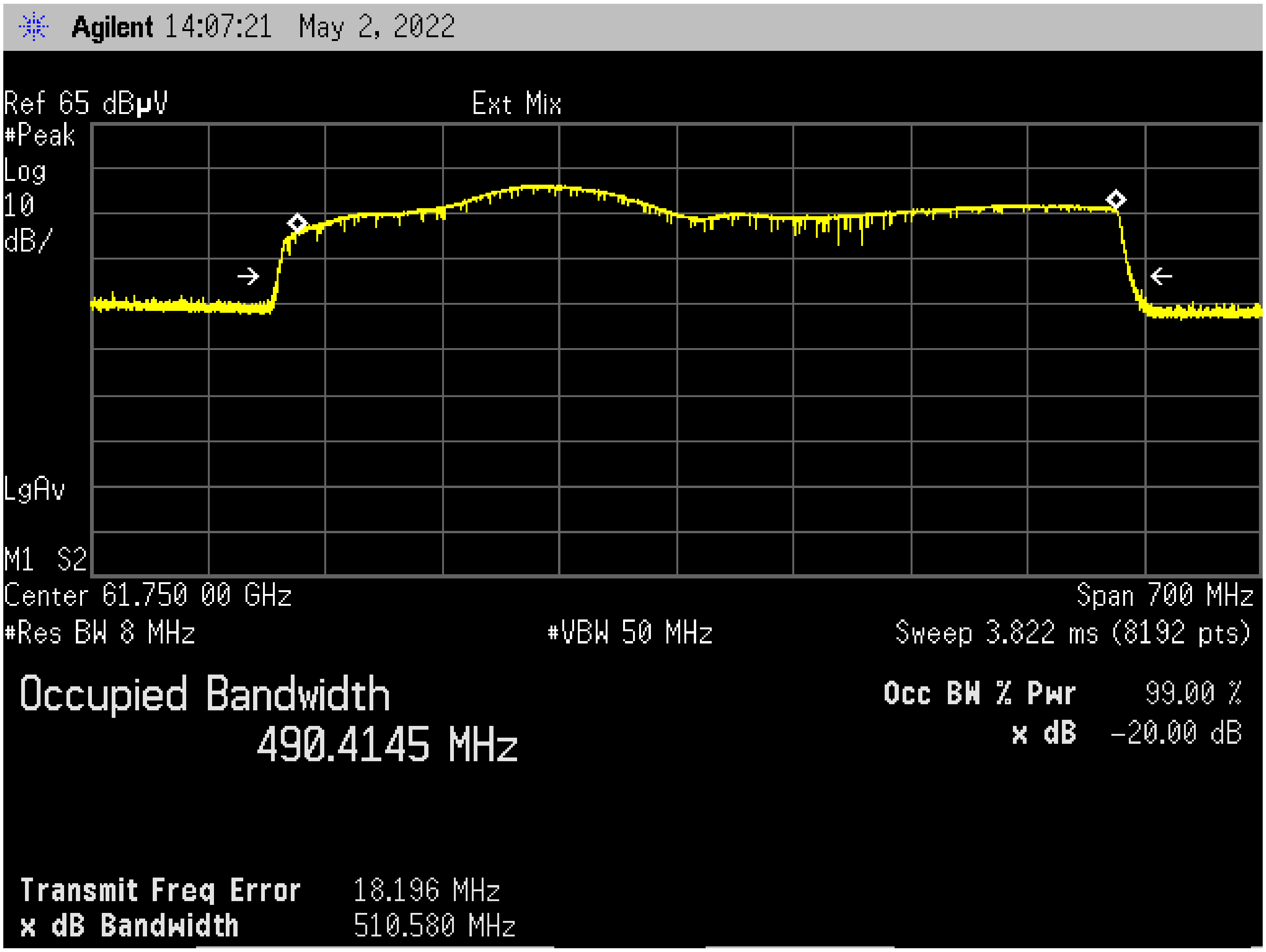
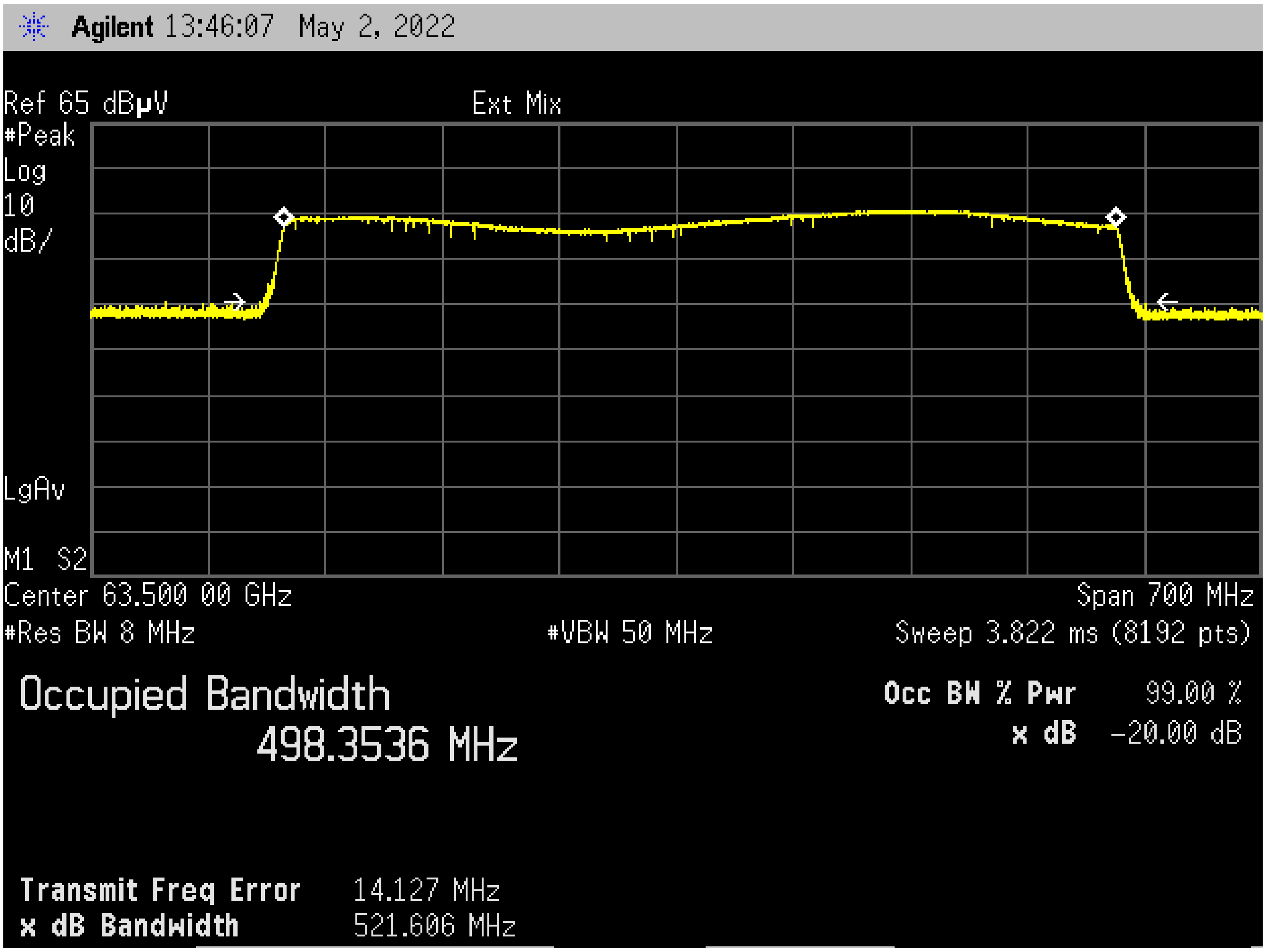


Figure 3: Occupied Bandwidth – High Channel



## 2.4 Peak Transmitter Power

### 2.4.1 Requirements

Compliance Standard: FCC Part §15.255(c)(3) and RSS-210(J.2.1) (b).

Under this provision, for Fixed Field Disturbance Sensors that occupy more than 500 MHz, the peak transmitter output power shall not exceed -10 dBm, and the peak EIRP shall not exceed 10 dBm.

### 2.4.2 Test Procedure

The transmitter power shall be measured with an RF detector that has a detection bandwidth that encompasses the 57-71 GHz band and has a video bandwidth of at least 10 MHz. Additionally, the peak conducted output power shall be calculated from the formulas denoted on the following page of this test report. The EUT was placed on an 80cm high, 1m X 1.5m non-conductive test-table in a Free-space Anechoic Chamber Test-site (FACT) Chamber. Overall, this test was performed in accordance with the procedure outlined in ANSI C63.10 (2013), Section 9.11, “Measurement of the fundamental emission using an RF detector”.

### 2.4.3 Test Data

The EUT complies with the requirements this section.

The EUT was set to a transmit enabled, FMCW-modulated mode for this test.

Table 4 provides the final EIRP test data.

Table 5 provides the calculated, conducted output power test data.

Figure 4 through Figure 9 provide the plots from the DSO.

Table 4: Transmitter Power (EIRP) Test Results from DSO Measurements

| Frequency (GHz) | DSO Level (µV) | Substitution Signal Generator (dBm) | EUT Antenna Gain (dBi) | Corrected EIRP (dBm) | Limit (dBm) | Margin (dB) | Emission Type |
|---|---|---|---|---|---|---|---|
| 60.250 | 720.0 | -10.8 | 7.0 | -3.8 | 10.0 | -13.8 | Peak |
| 61.750 | 800.0 | -11.6 | 7.0 | -4.6 | 10.0 | -14.6 | Peak |
| 63.500 | 720.0 | -10.7 | 7.0 | -3.7 | 10.0 | -13.7 | Peak |

Table 5: Conducted Peak Output Power (Calculated) Test Results

| **Frequency (GHz)** | **$EIRP_{LOG}$ (dBm)** | **$EIRP_{LIN}$ (W)** | **EUT Antenna $Gain_{LIN}$** | **$Power_{LIN}$ (mW)** | **$Power_{LOG}$ (dBm)** | **Limit (dBm)** | **Margin (dB)** |
|---|---|---|---|---|---|---|---|
| 60.250 | -3.80 | 0.000417 | 5.012 | 0.083 | -10.8 | -10.0 | -0.8 |
| 61.750 | -4.60 | 0.000347 | 5.012 | 0.069 | -11.6 | -10.0 | -1.6 |
| 63.500 | -3.70 | 0.000427 | 5.012 | 0.085 | -10.7 | -10.0 | -0.7 |

The Peak Transmitter Conducted Output Power is calculated to comply with the -10 dBm limit.

where:

$EIRP_{LOG}$ = the corrected EIRP from Table 4.

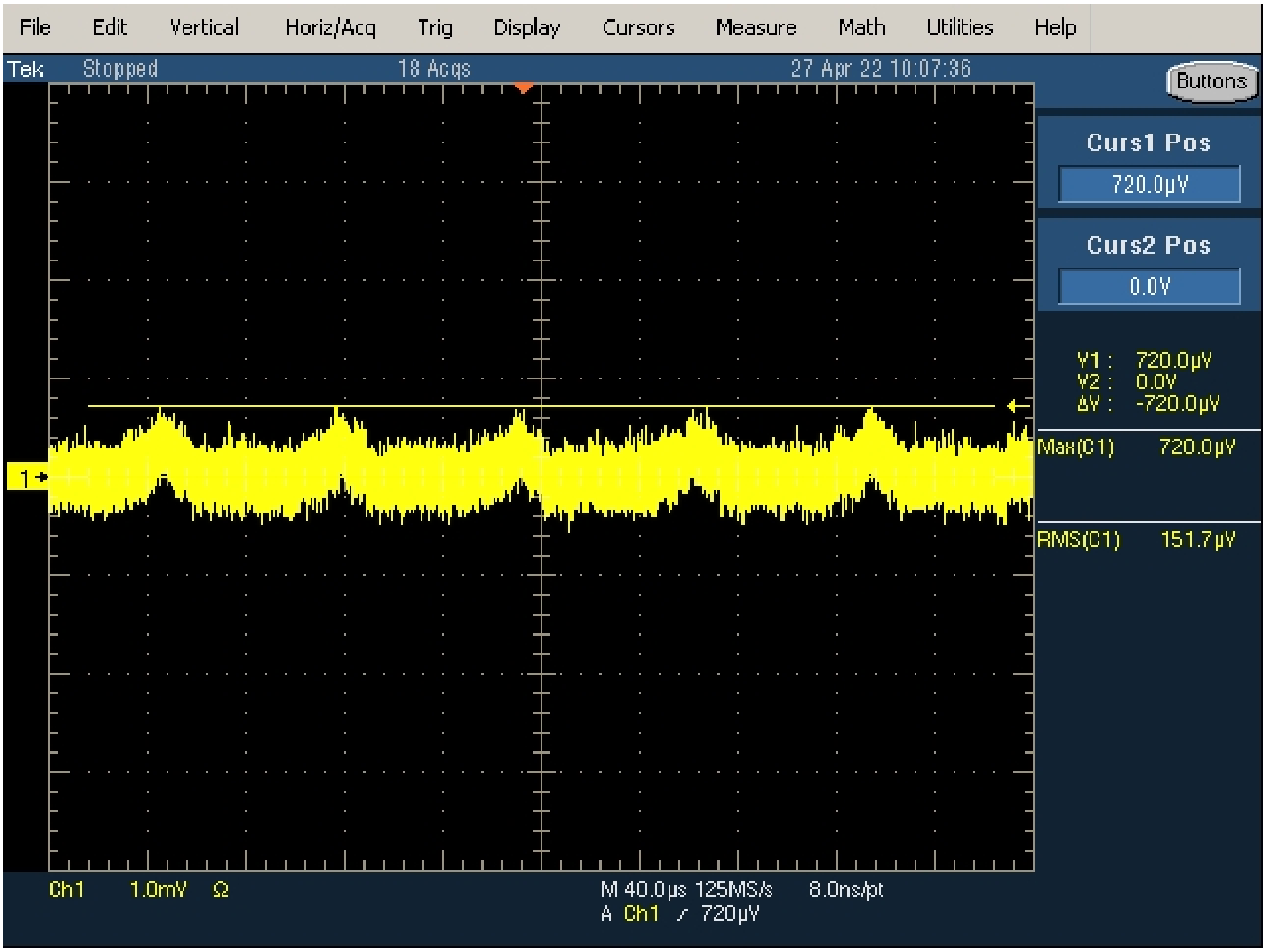
$EIRP_{LIN}$ = $10^{((EIRP_{LOG} - 30) \div 10)}$

$Gain_{LIN}$ = $10^{(7dBi \div 10)}$

$Power_{LIN}$ = $1000(EIRP_{LIN} \div Gain_{LIN})$

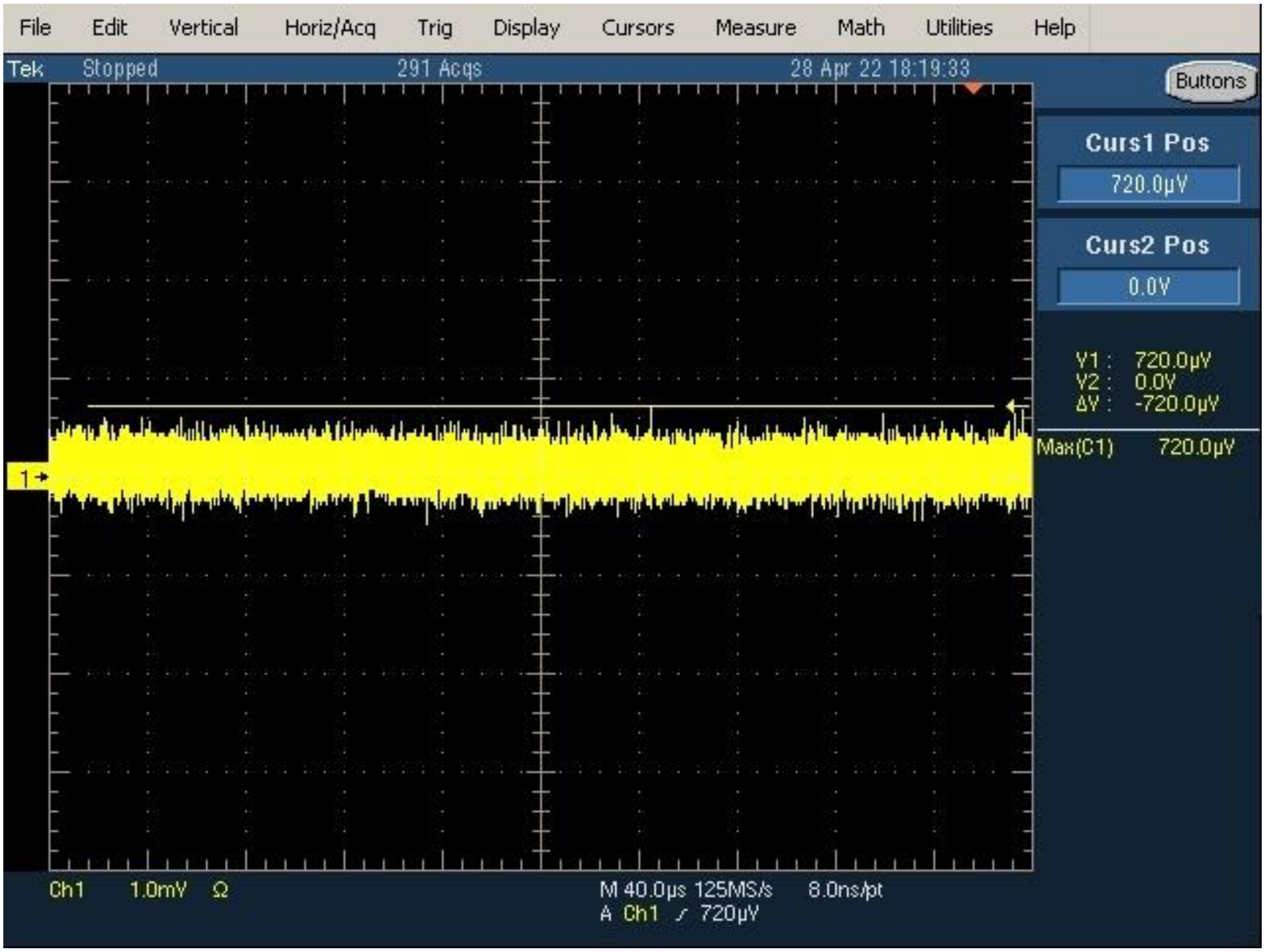
$Power_{LOG}$ = $10LOG(Power_{LIN})$

Figure 4: EUT Transmitter Power via RF Detector – Low Channel



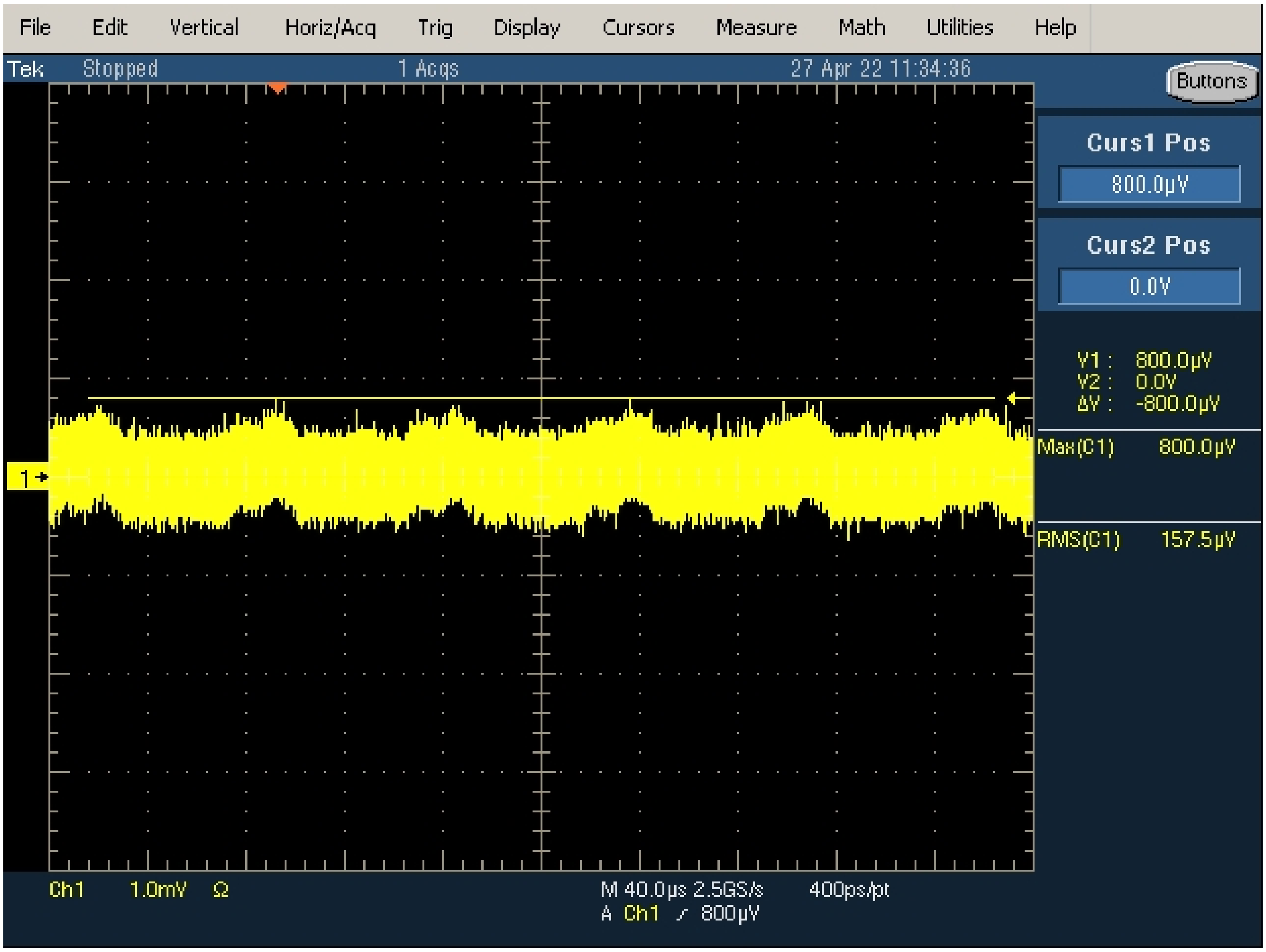

This plot represents the time-domain amplitude that was measured on the DSO, when the mmWave test equipment was placed in the main beam of the EUT transmitter. In this case, the test distance was 5mm. This distance produced the highest voltage reading on the DSO: 720uV Peak.

Figure 5: Substitution Method – Low Channel via RF Detector from Signal Generator



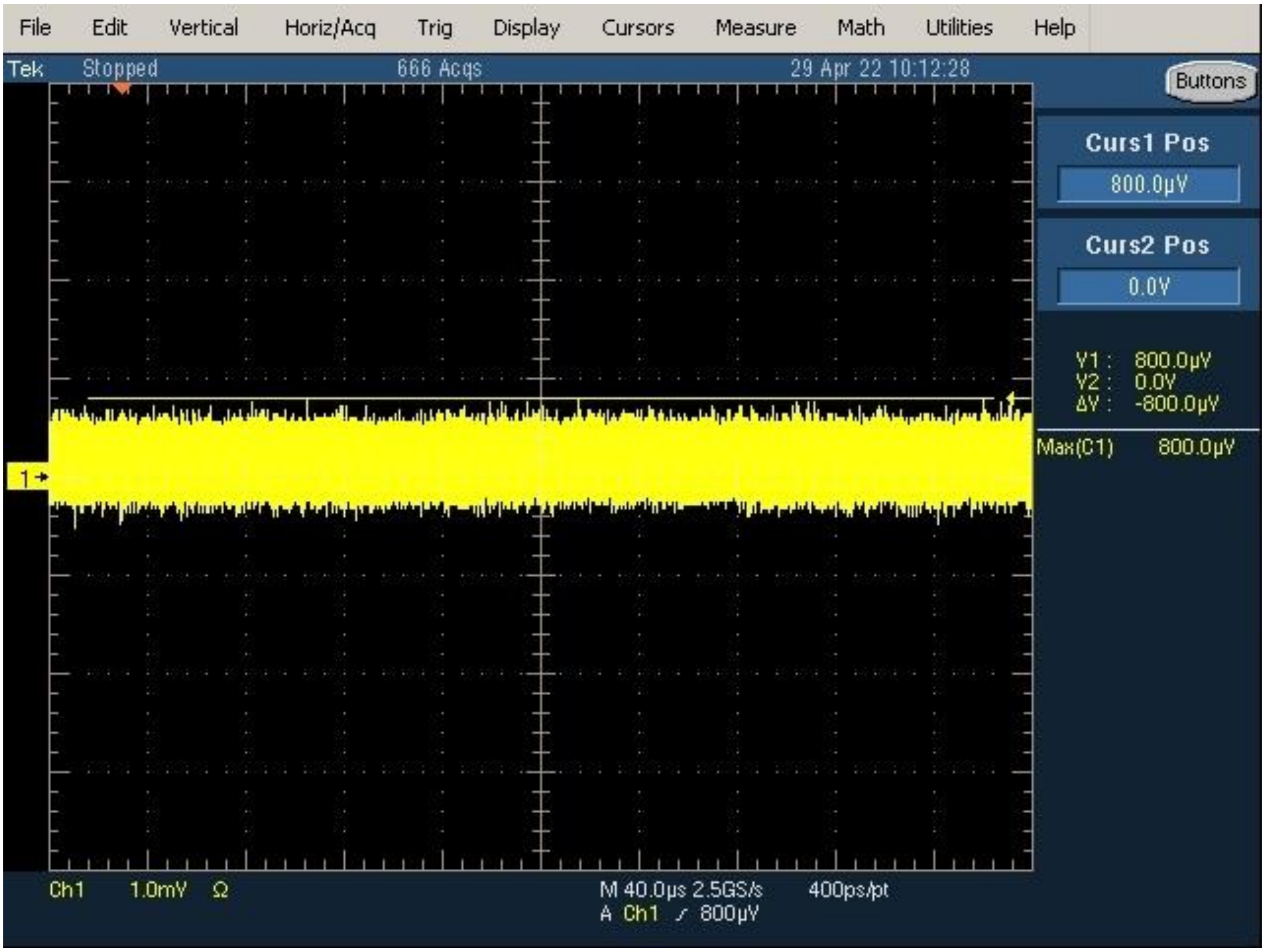

This plot represents the time-domain amplitude that was measured on the DSO, when the mmWave test equipment was connected directly to the substitution source. The source (a signal generator) was set to output a CW at 60.25 GHz. The output of the signal generator was connected to the input of the mmWave test equipment, and the amplitude was increased until the voltage reading on the DSO matched 720uV. Once the DSO reached the equivalent peak level, the output power of the signal generator was recorded. In this case, the amplitude was -10.8 dBm (see Table 4).

Figure 6: EUT Transmitter Power via RF Detector – Center Channel



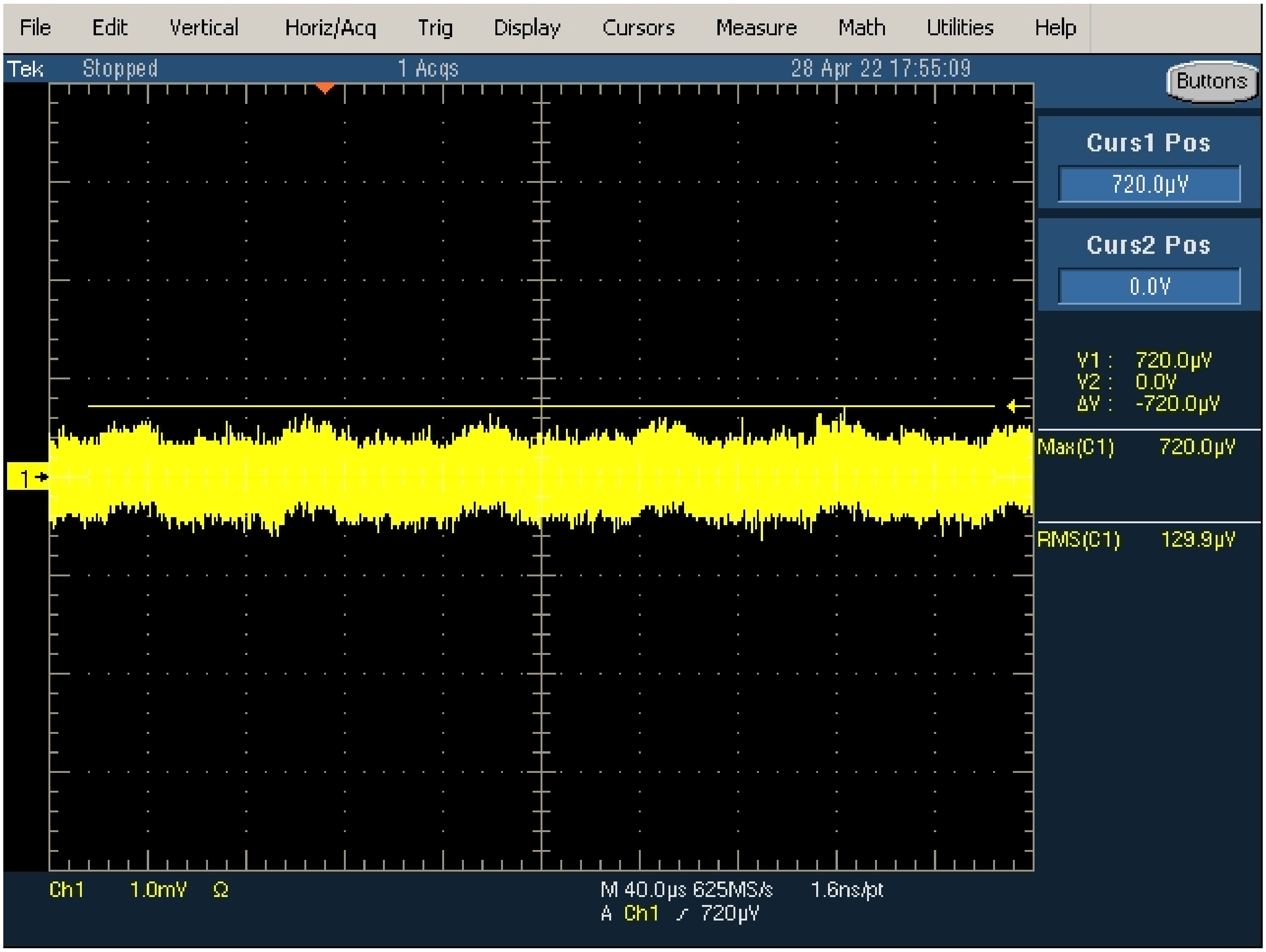

This plot represents the time-domain amplitude that was measured on the DSO, when the mmWave test equipment was placed in the main beam of the EUT transmitter. In this case, the test distance was 5mm. This distance produced the highest voltage reading on the DSO: 800uV Peak.

Figure 7: Substitution Method – Center Channel via RF Detector from Signal Generator



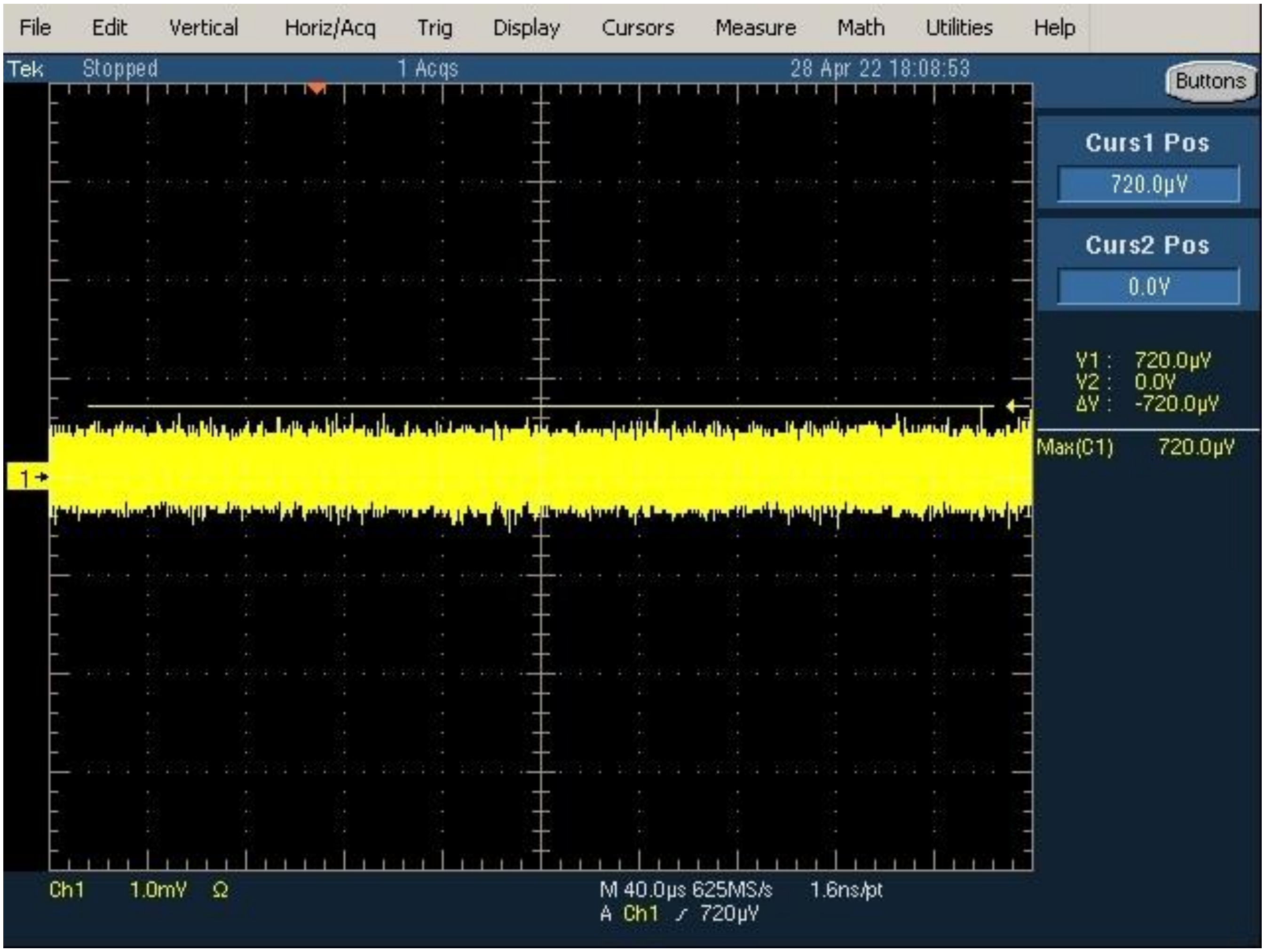

This plot represents the time-domain amplitude that was measured on the DSO, when the mmWave test equipment was connected directly to the substitution source. The source (a signal generator) was set to output a CW at 61.750 GHz. The output of the signal generator was connected to the input of the mmWave test equipment, and the amplitude was increased until the voltage reading on the DSO matched 800uV. Once the DSO reached the equivalent peak level, the output power of the signal generator was recorded. In this case, the amplitude was -11.6 dBm (see Table 4).

Figure 8: EUT Transmitter Power via RF Detector – High Channel




This plot represents the time-domain amplitude that was measured on the DSO, when the mmWave test equipment was placed in the main beam of the EUT transmitter. In this case, the test distance was 5mm. This distance produced the highest voltage reading on the DSO: 720uV Peak.

Figure 9: Substitution Method – High Channel via RF Detector from Signal Generator




This plot represents the time-domain amplitude that was measured on the DSO, when the mmWave test equipment was connected directly to the substitution source. The source (a signal generator) was set to output a CW at 63.500 GHz. The output of the signal generator was connected to the input of the mmWave test equipment, and the amplitude was increased until the voltage reading on the DSO matched 720uV. Once the DSO reached the equivalent peak level, the output power of the signal generator was recorded. In this case, the amplitude was -10.7 dBm (see Table 4).

## 2.5 Spurious Emissions, 40 GHz – 200 GHz

### 2.5.1 Requirements

Compliance Standard: FCC Part §15.255(d)(1), §15.255(d)(3), and RSS-210(J.3)(a), RSS-210(J.3)(c).

Under this provision, the power density of any emissions outside of the 57 GHz – 71 GHz band shall consist solely of spurious emissions. The level of emissions above 40 GHz shall not exceed 90 pW/cm$^2$ when measured at a distance of 3-meters.

### 2.5.2 Test Procedure

Radiated spurious emissions shall be evaluated and measured withing the frequency range of 40 GHz to 200 GHz. The EUT was placed on an 80cm high, non-conductive testing surface. The EUT shall be positioned in accordance with the field strength evaluation described in Section 3.2 of this report, as a means to produce the worst-case emissions.

### 2.5.3 Test Data

The EUT complies with the requirements this section.

There were no significant transmitter spurious emissions detected in this frequency range.

The data provided below represents measurements of the energy taken at the noise floor.

The EUT was set to transmit a CW for this test.

Table 8 and Figure 10 through Figure 36 provide the final test data.

To achieve the desired sensitivity at these frequencies, a reduced test distance was employed. We have calculated that a test distance of 50 cm is adequate for measurements below 90 GHz, and a test distance of 10 cm is adequate for measurements above 90 GHz. As the frequency increases, the near-field far-field intersection collapses in a linear fashion. These prescribed measurement distances remain in the far-field of the radiating element, with regard to frequency wavelength and free space impedance.

For convenience, we will present the power density limits (pico-watts per square centimeter) in terms of microvolts per meter. This allows us to perform analysis using field strength rather than power density.

First, the relationship between power density S ($W/m^2$) and field strength (volts per meter) is:

$S = E^2/Z_o \ W/m^2$

where, $Z_o = 377$ ohms

Thus, $E = SQRT(Z_o * S)$ V/m

*The limit is expressed as 90 $pW/cm^2$*

Therefore,
90 pW = 90 E-12 Watts

And,
$1cm^2 = 1e\text{-}4\ m^2$

Therefore,
$90\ pW/cm^2 = 90e\text{-}12/1e\text{-}4 = 90e\text{-}8\ W/m^2$

E = SQRT(377 X 90E-8) V/m

E = 0.01842 V/m

E = 18420.1 uV/m

E = 20LOG(18420.1) = 85.3 dBuV/m at 3m

The field strength readings can be converted to a distance other than 3m by the following equation:

Distance Correction Factor (dB) = 20LOG($D_{Measure}$ ÷ 3m)

Where $D_{Measure}$ is the actual test distance of the measurement.

To convert the radiated electric energy, as measured on the spectrum analyzer, from dBuV to dBuV/m, the Antenna Factor (dB/m) is added to the voltage in dBuV.

Standard gain horns were used with nominal mid-band gain of 10dBi.

To convert the antenna gain to an antenna factor, the following equation is employed:

AF (dB/m) = 10LOG(9.73 ÷ λ * SQRT(G(*numeric*))

The AF of the standard gain horns, as they relate to frequency are provided below.

Table 6: Standard Gain Antennas – Antenna Factors

| **Frequency (GHz)** | **Ant Gain (dBi)** | **Antenna Gain (numeric)** | **Antenna Factor (dB/m)** |
|---|---|---|---|
| 40.0 | 10 | 10 | 41.0 |
| 75.0 | 10 | 10 | 43.7 |
| 92.0 | 10 | 10 | 44.6 |
| 141.0 | 10 | 10 | 46.5 |

The mid-band mixer losses are provided below.

Table 7: Mid-band Mixer Losses

| **Frequency (GHz)** | **Mixer Loss (dB)** |
|---|---|
| 40.0 | 32 |
| 75.0 | 43 |
| 92.0 | 47 |
| 141.0 | 59 |

Finally, the radiated field strength values at the measurement distances shown are provided in the following table.

Table 8: Radiated Spurious Emissions Test Results (40 GHz – 200 GHz)

| Frequency (GHz) | SA Level (dBuV) | Antenna Factor (dB/m) | Mixer Loss (dB) | Corr. Level (dBuV/m) | 3m Limit (dBuV/m) | Measurement Distance | Distance Correction Factor (dB) | Corrected Level (dBuV/m) | Margin dB |
|---|---|---|---|---|---|---|---|---|---|
| 40.77 | 19.1 | 41.0 | 32.0 | 92.1 | 85.3 | 0.050 | 35.6 | 56.5 | -29 |
| 75.93 | 18.8 | 43.7 | 43.0 | 105.5 | 85.3 | 0.050 | 35.6 | 69.9 | -15 |
| 92.09 | 20.2 | 44.6 | 47.0 | 111.8 | 85.3 | 0.010 | 49.5 | 62.3 | -23 |
| 141.13 | 18.5 | 46.5 | 59.0 | 123.9 | 85.3 | 0.010 | 49.5 | 74.4 | -11 |

All measurements were made using a Peak detector.

The measured frequencies provided above were selected based on the worst-case emission, from their respective evaluation band. That is, there are four evaluation mm-wave bands (U, E, F, and G) to get from 40 GHz to 220 GHz. The emission, or noise-floor energy, with the highest amplitude was elected to show compliance.

The measurement distance from 40 GHz to 90 GHz was 50cm.

The measurement distance from 90 GHz to 200 GHz was 10cm.

Lastly, there were no EUT spurious emissions that exceeded the level of the fundamental transmitter.

Figure 10: Low Channel, Spurious Emissions (40 – 50 GHz)

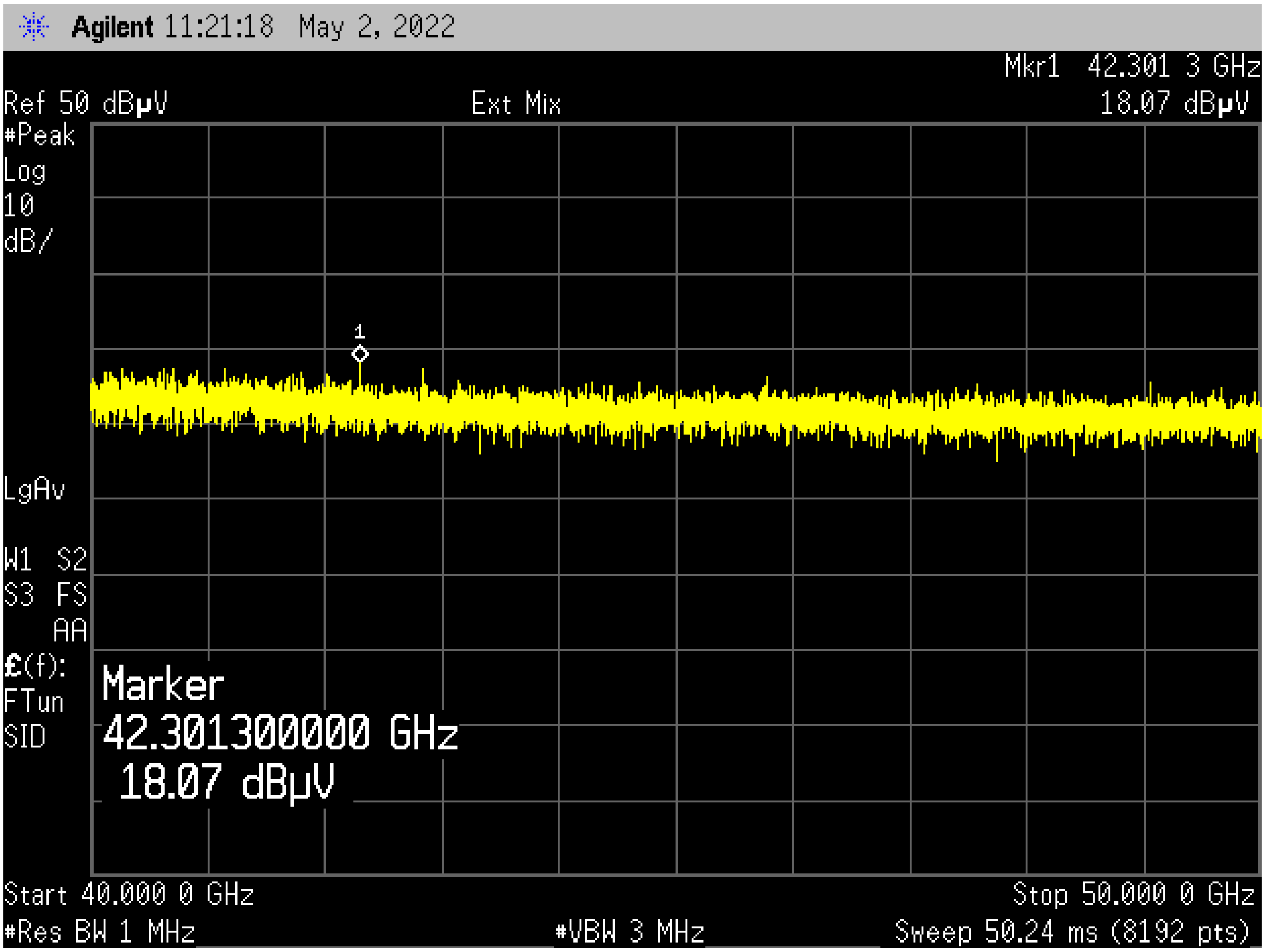


Figure 11: Low Channel, Spurious Emissions (50 – 60 GHz)

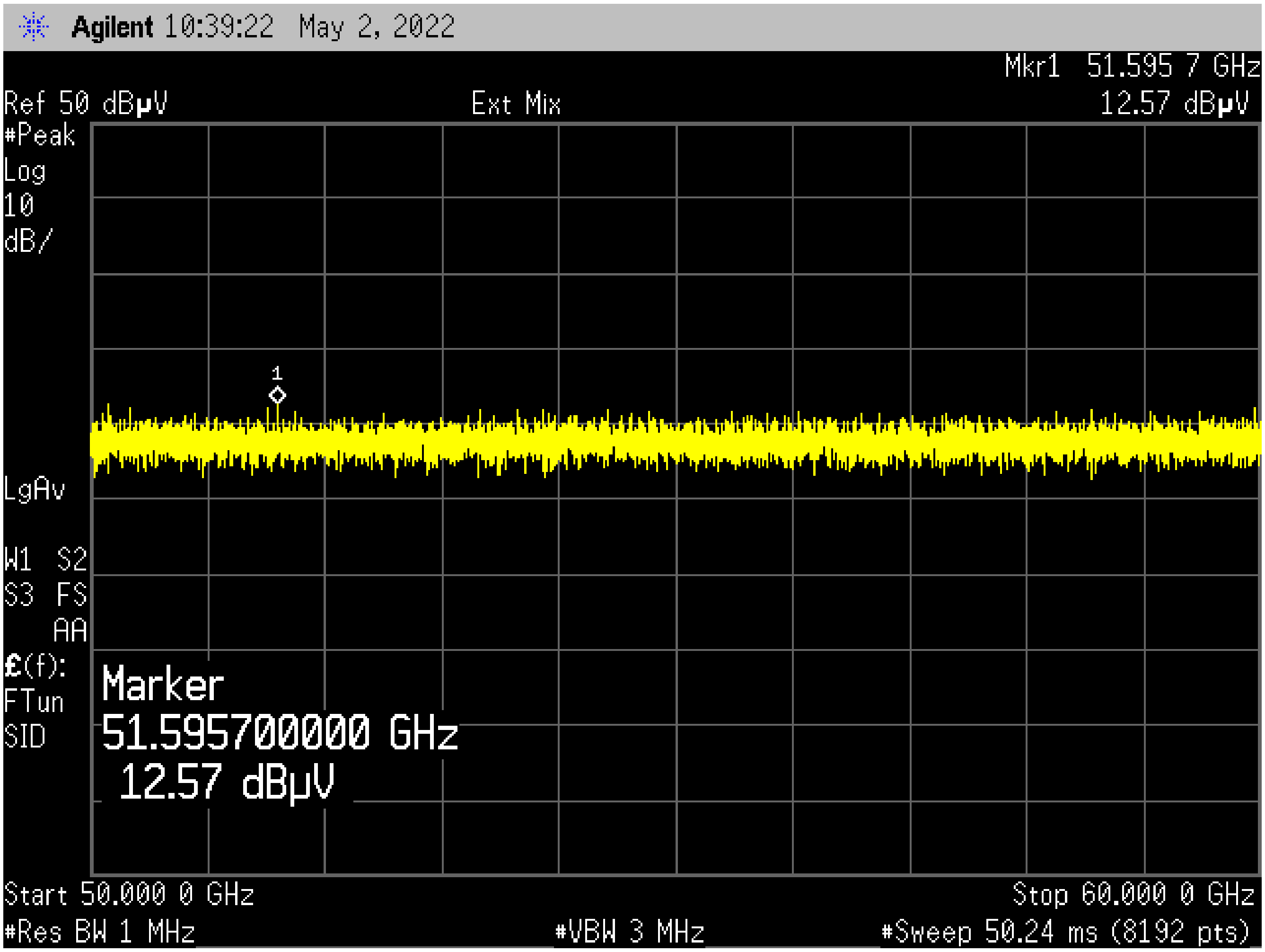


Figure 12: Low Channel, Spurious Emissions (60 – 70 GHz)

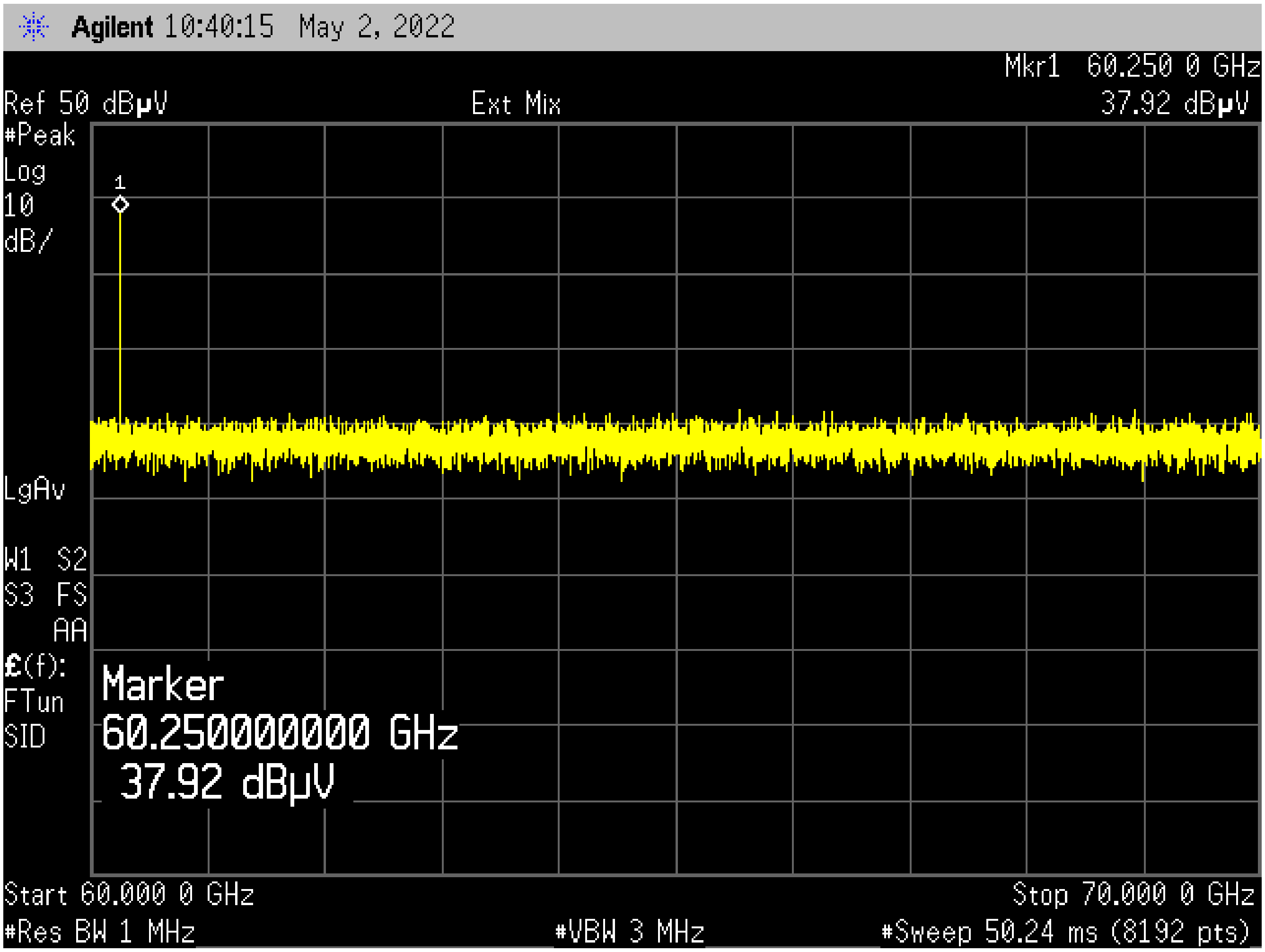


Figure 13: Low Channel, Spurious Emissions (70 – 80 GHz)

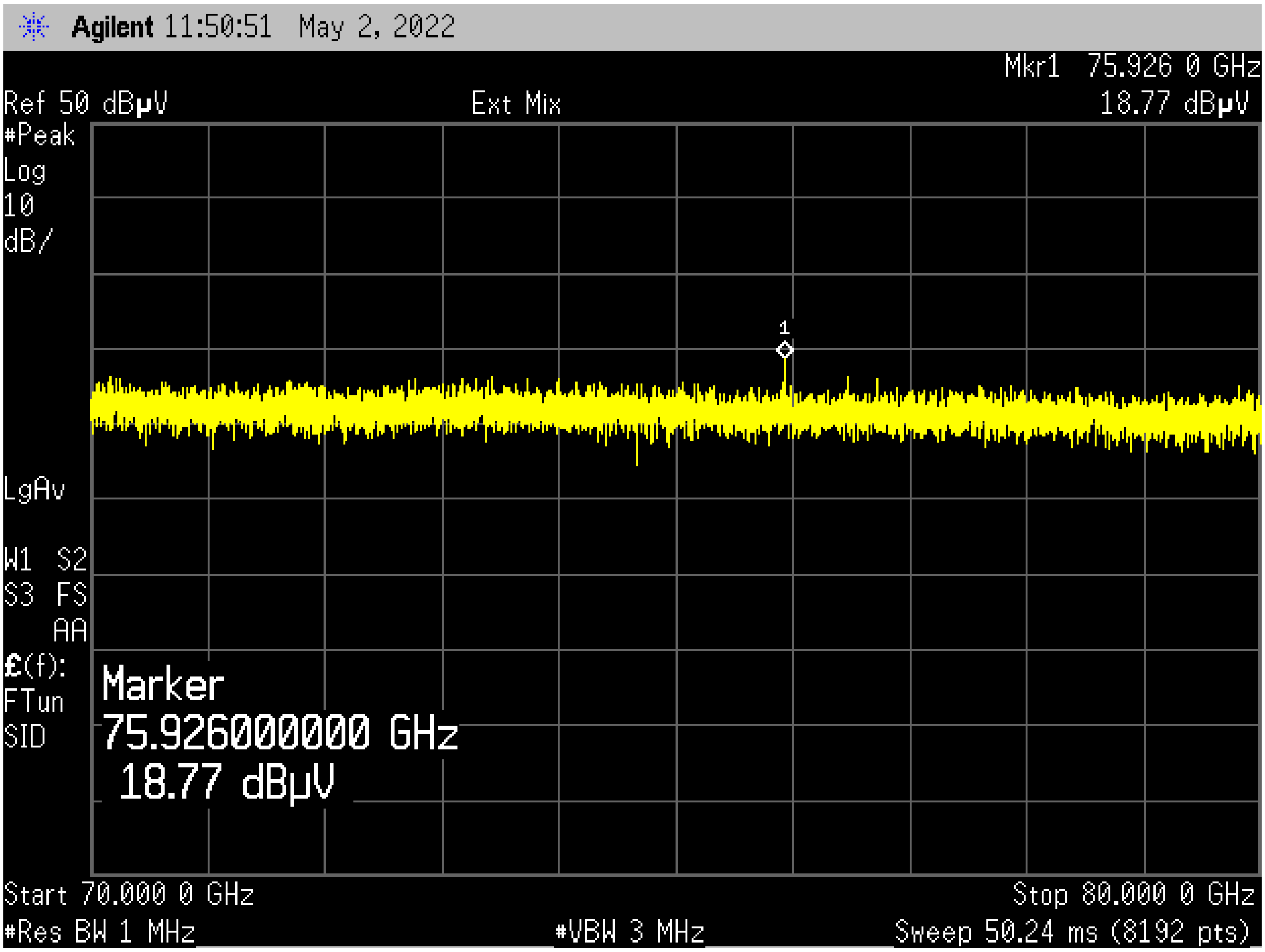


Figure 14: Low Channel, Spurious Emissions (80 – 90 GHz)

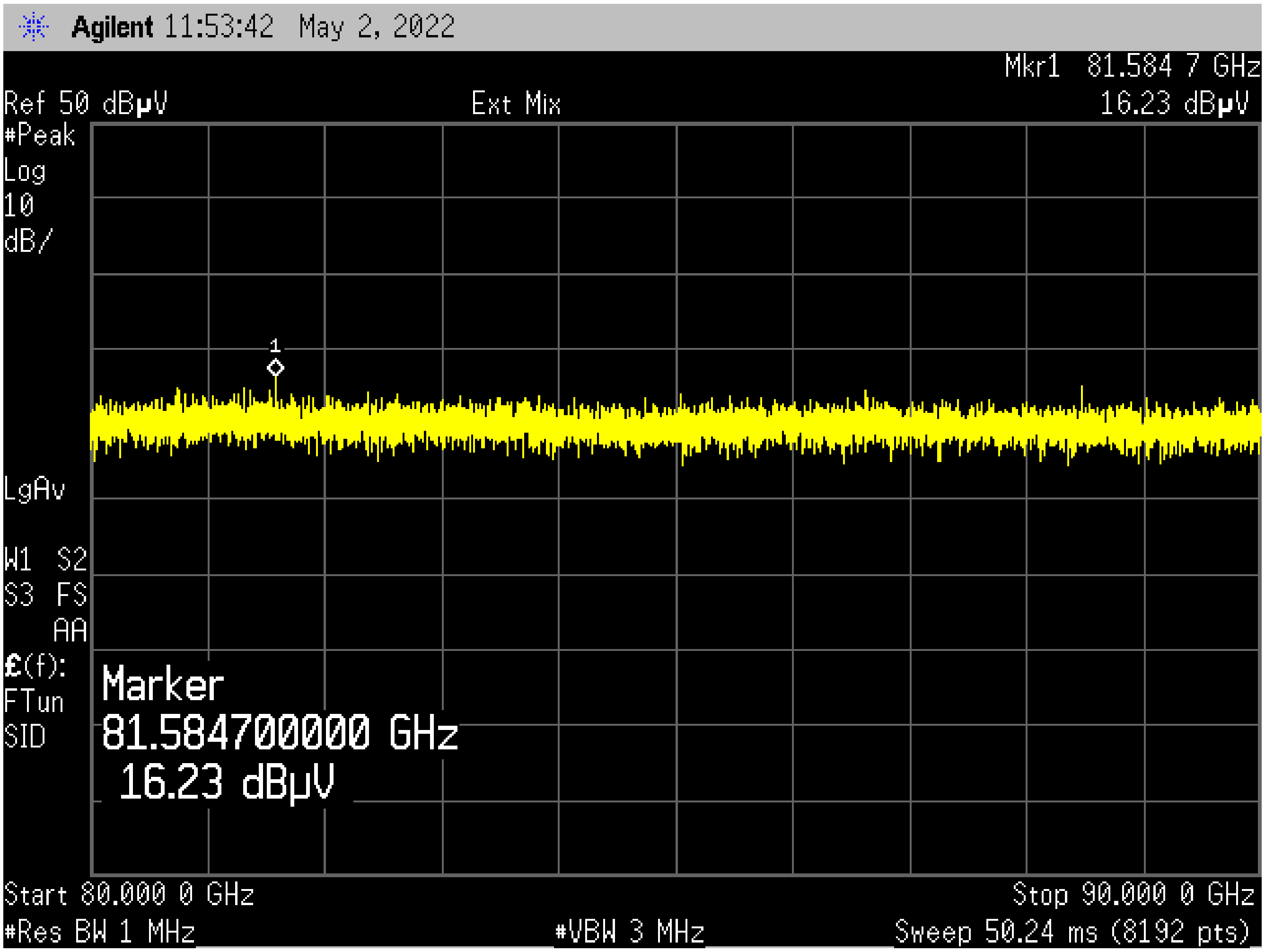


Figure 15: Low Channel, Spurious Emissions (90 – 115 GHz)

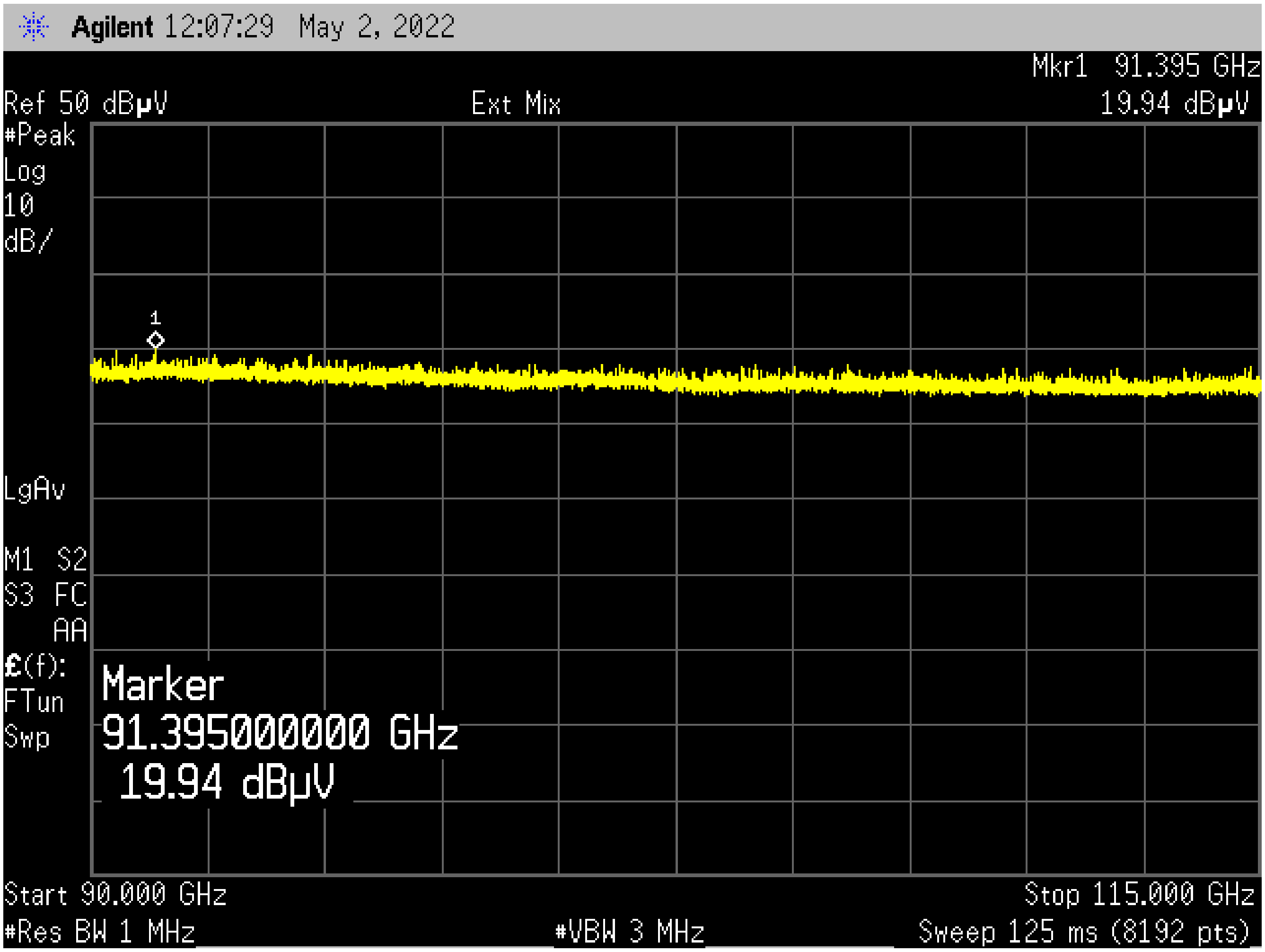


Figure 16: Low Channel, Spurious Emissions (115 – 140 GHz)

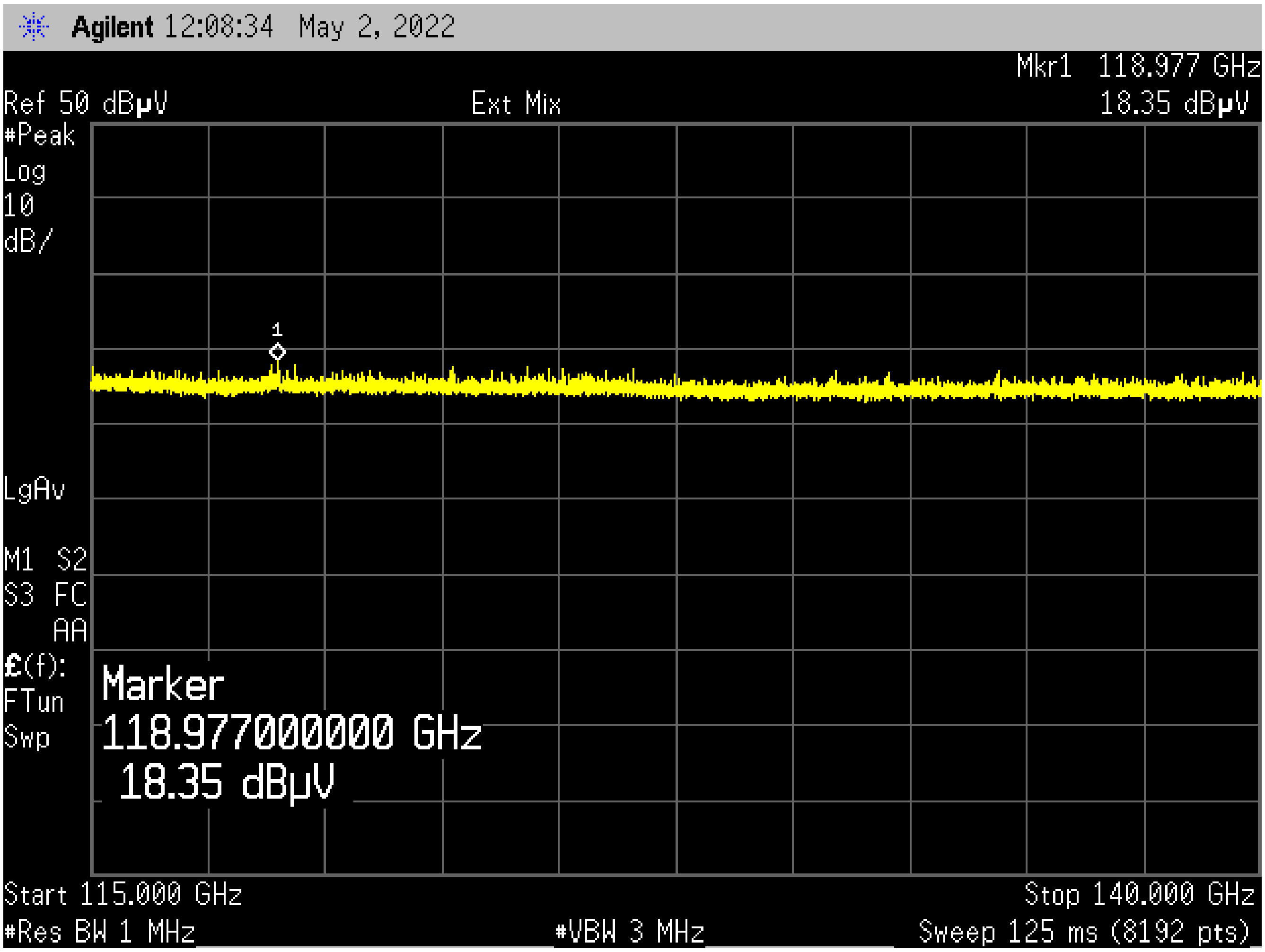


Figure 17: Low Channel, Spurious Emissions (140 – 180 GHz)

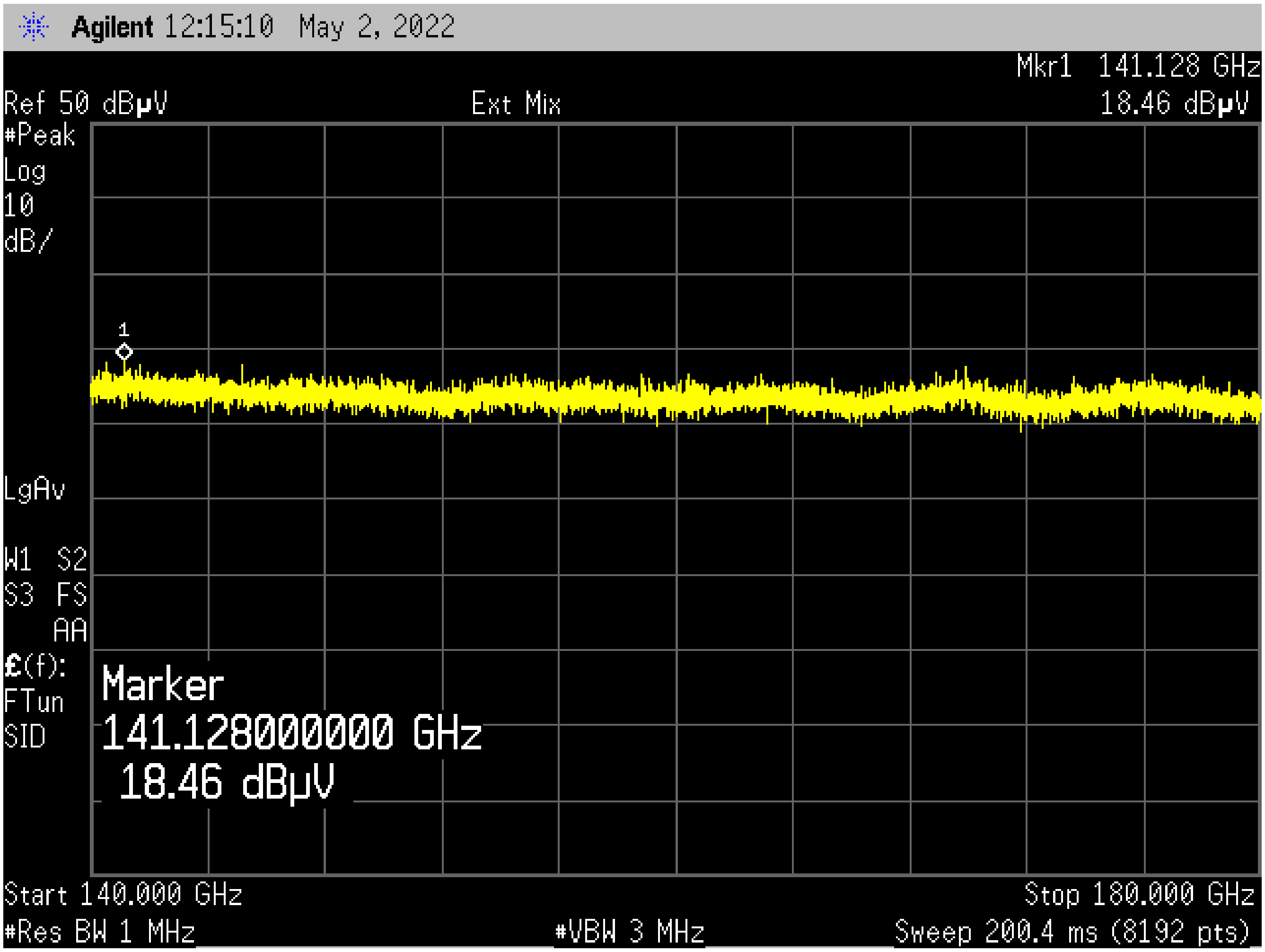


Figure 18: Low Channel, Spurious Emissions (180 – 220 GHz)

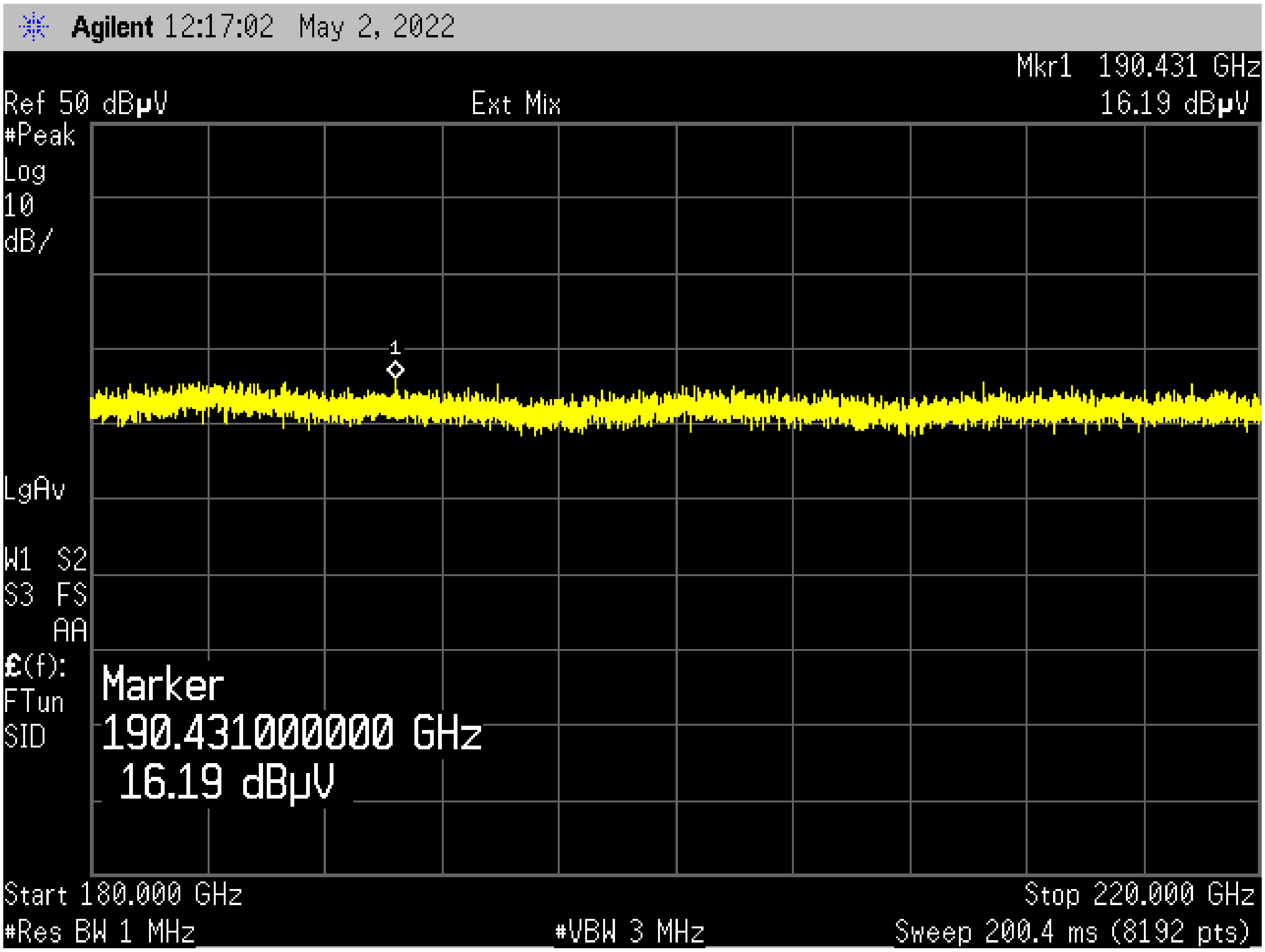


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Figure 19: Center Channel, Spurious Emissions (40 – 50 GHz)

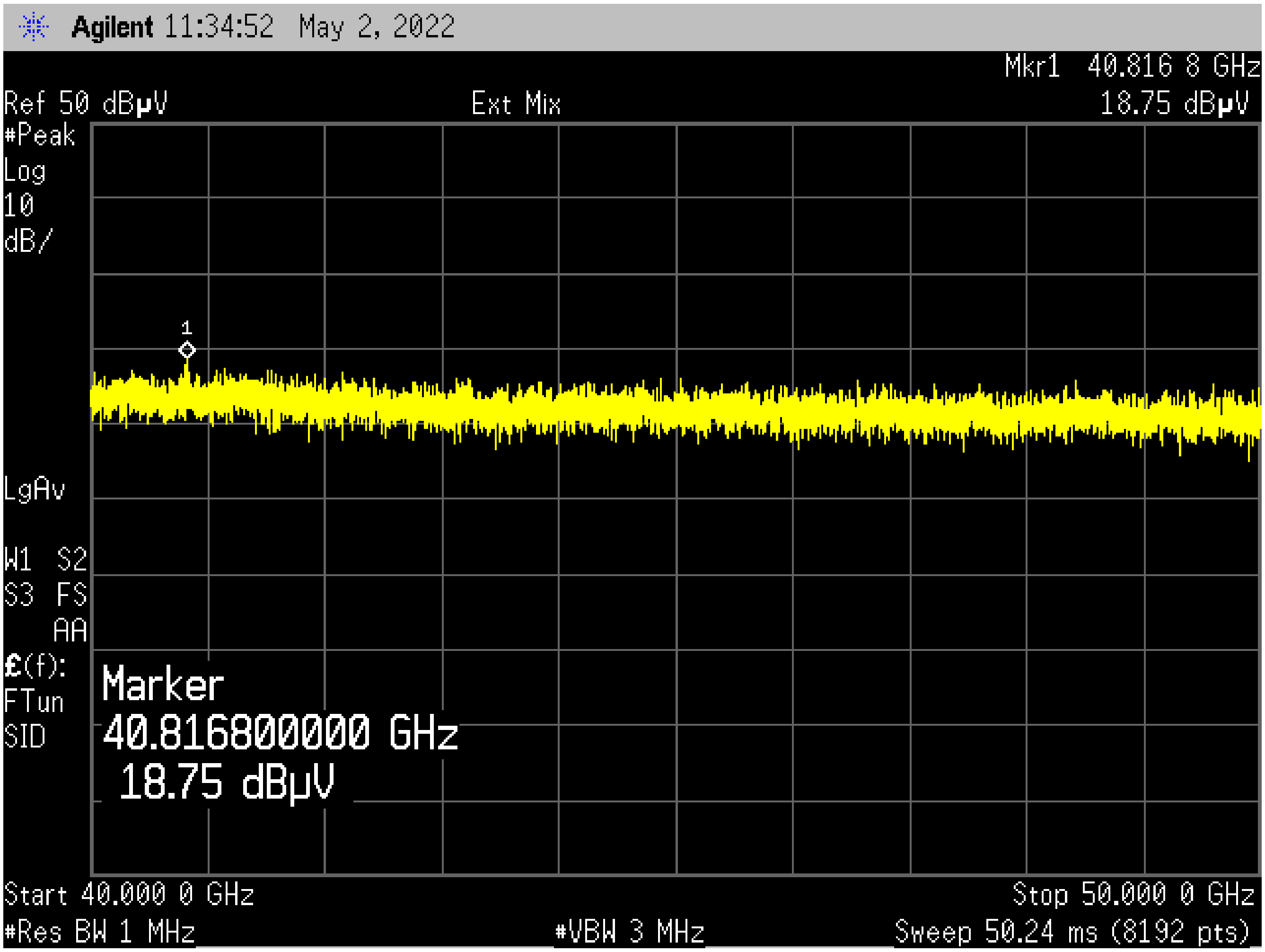

Figure 20: Center Channel, Spurious Emissions (50 – 60 GHz)

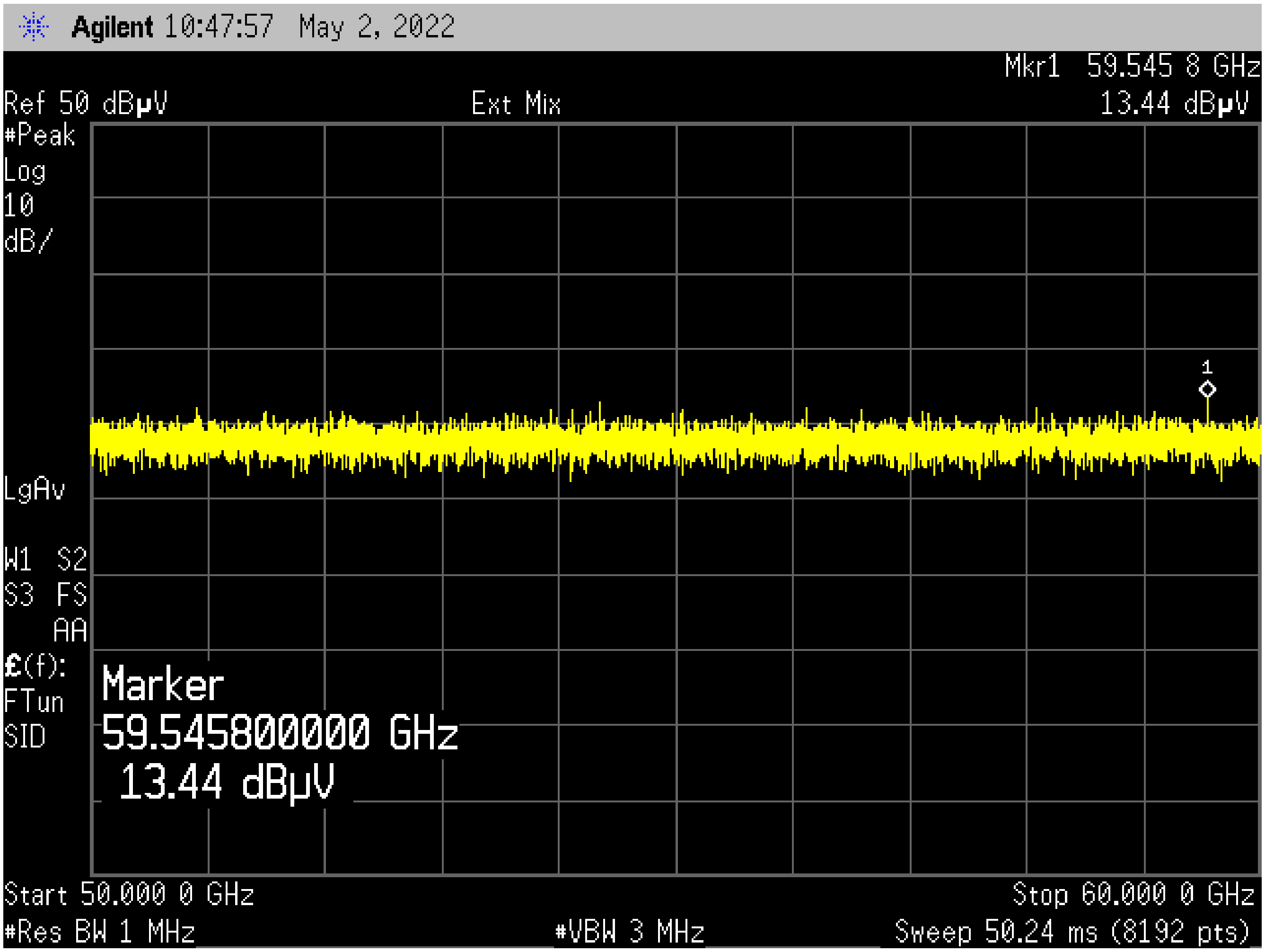

Figure 21: Center Channel, Spurious Emissions (60– 70 GHz)

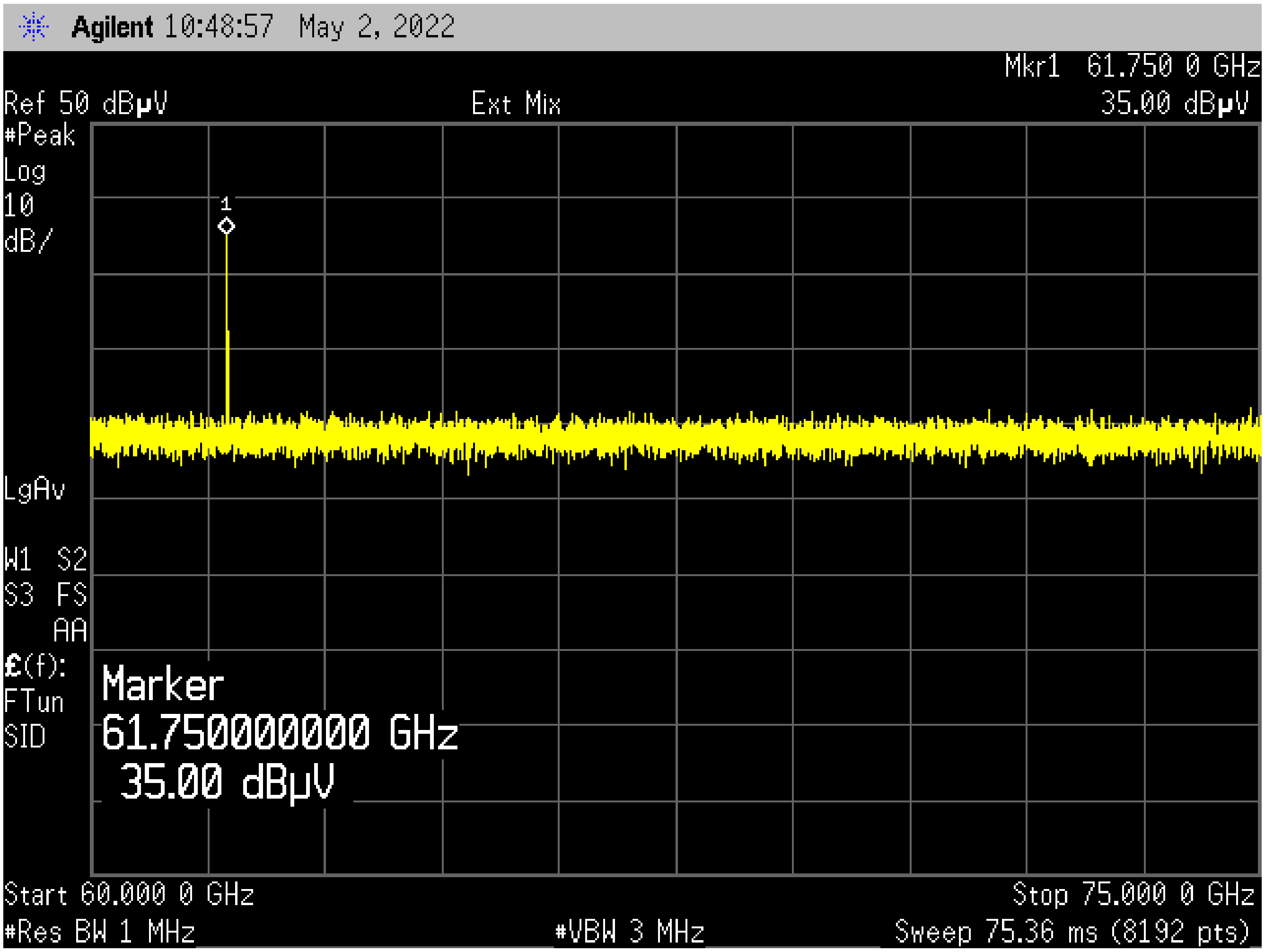

Figure 22: Center Channel, Spurious Emissions (70 – 80 GHz)

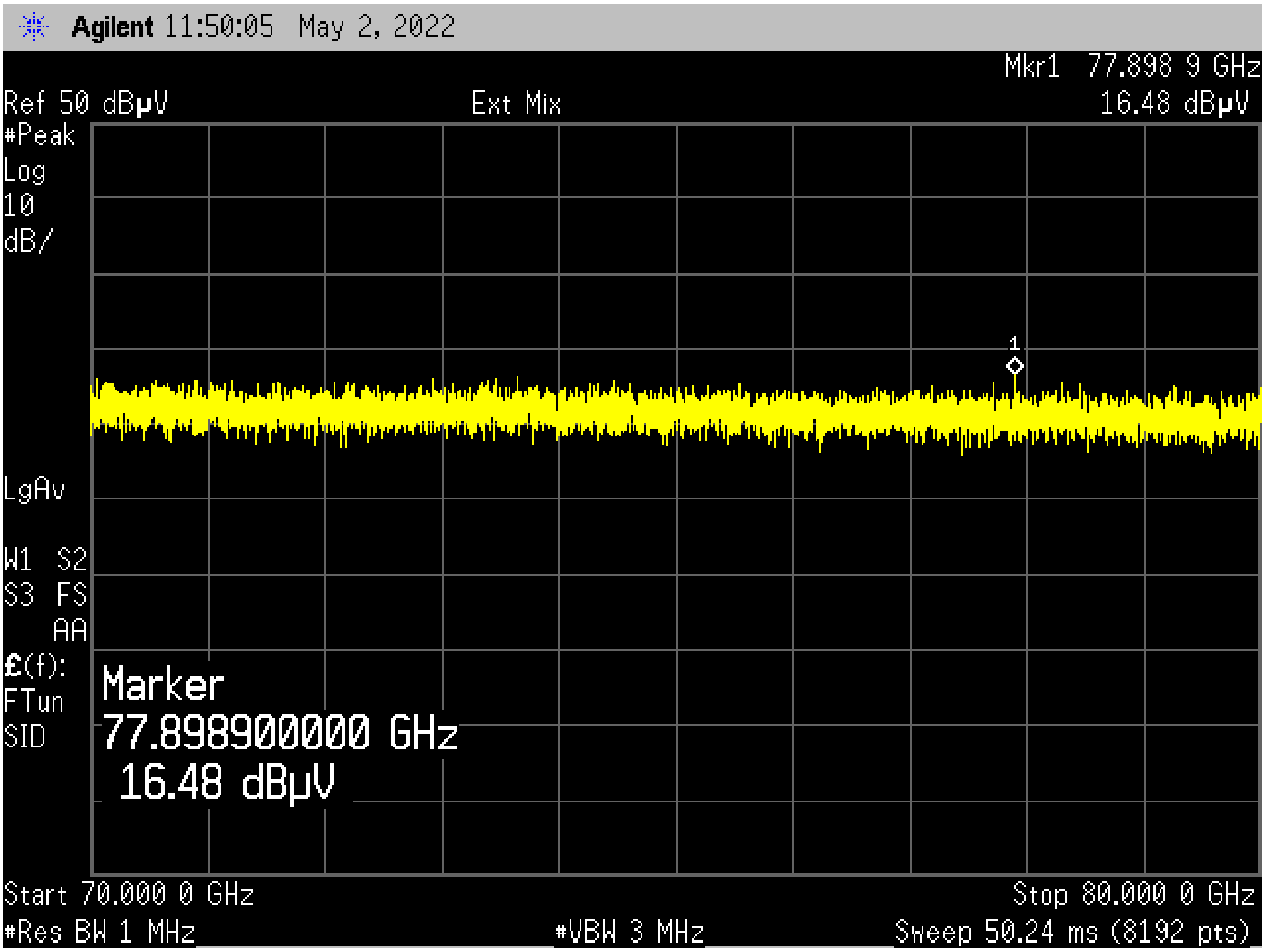

Figure 23: Center Channel, Spurious Emissions (80– 90 GHz)

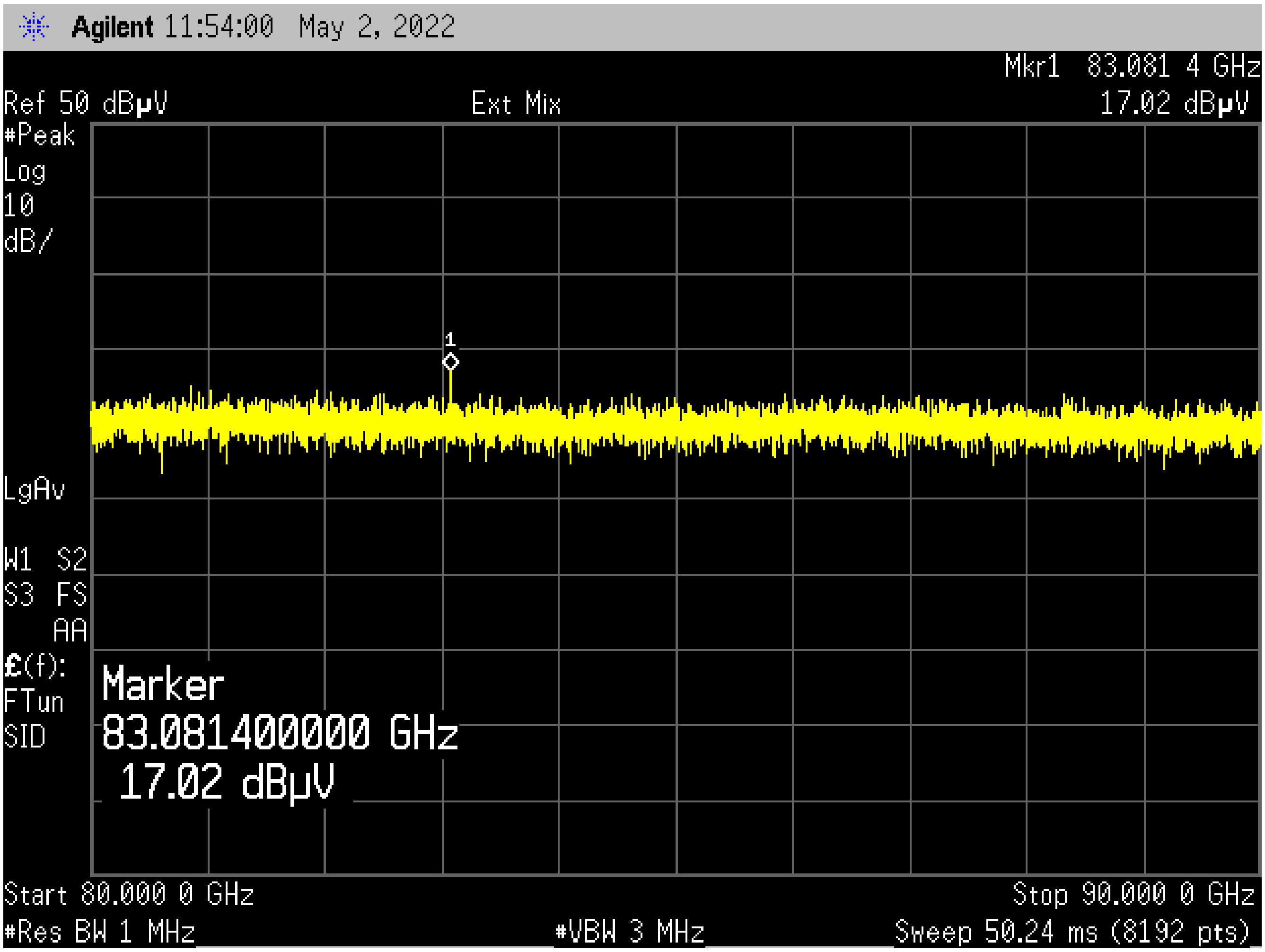

Figure 24: Center Channel, Spurious Emissions (90 – 115 GHz)

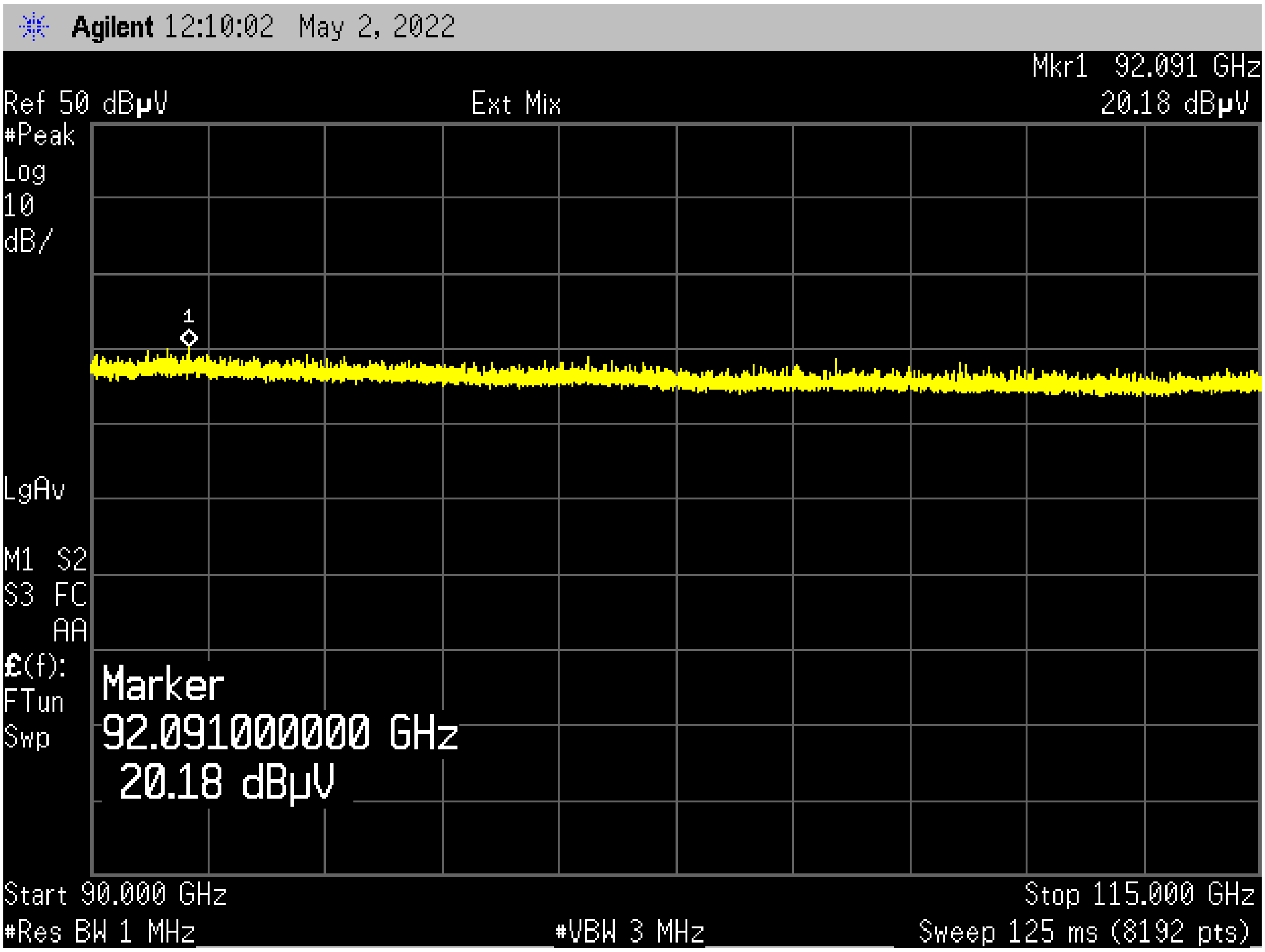

Figure 25: Center Channel, Spurious Emissions (115– 140 GHz)

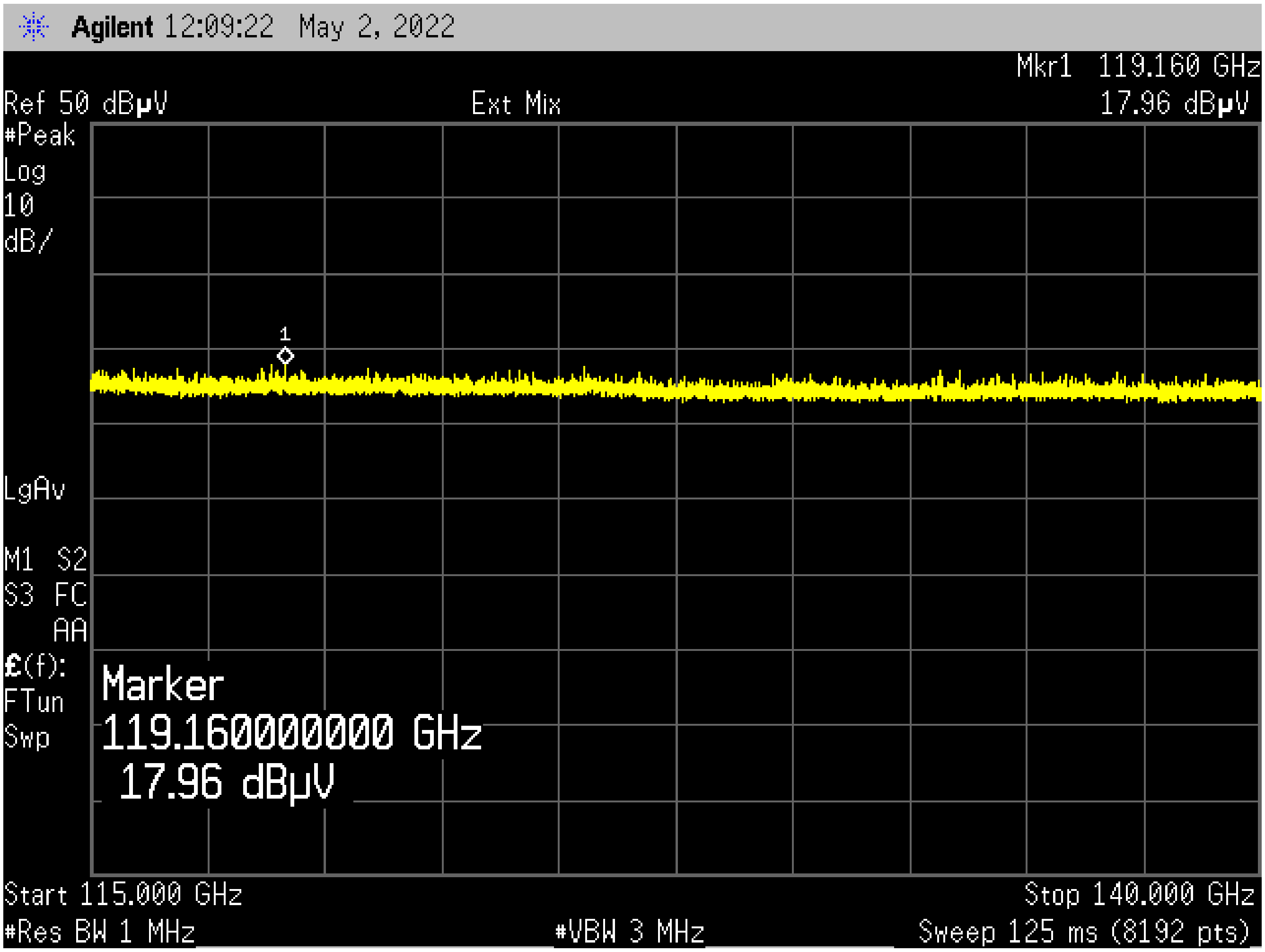

Figure 26: Center Channel, Spurious Emissions (140 – 180 GHz)

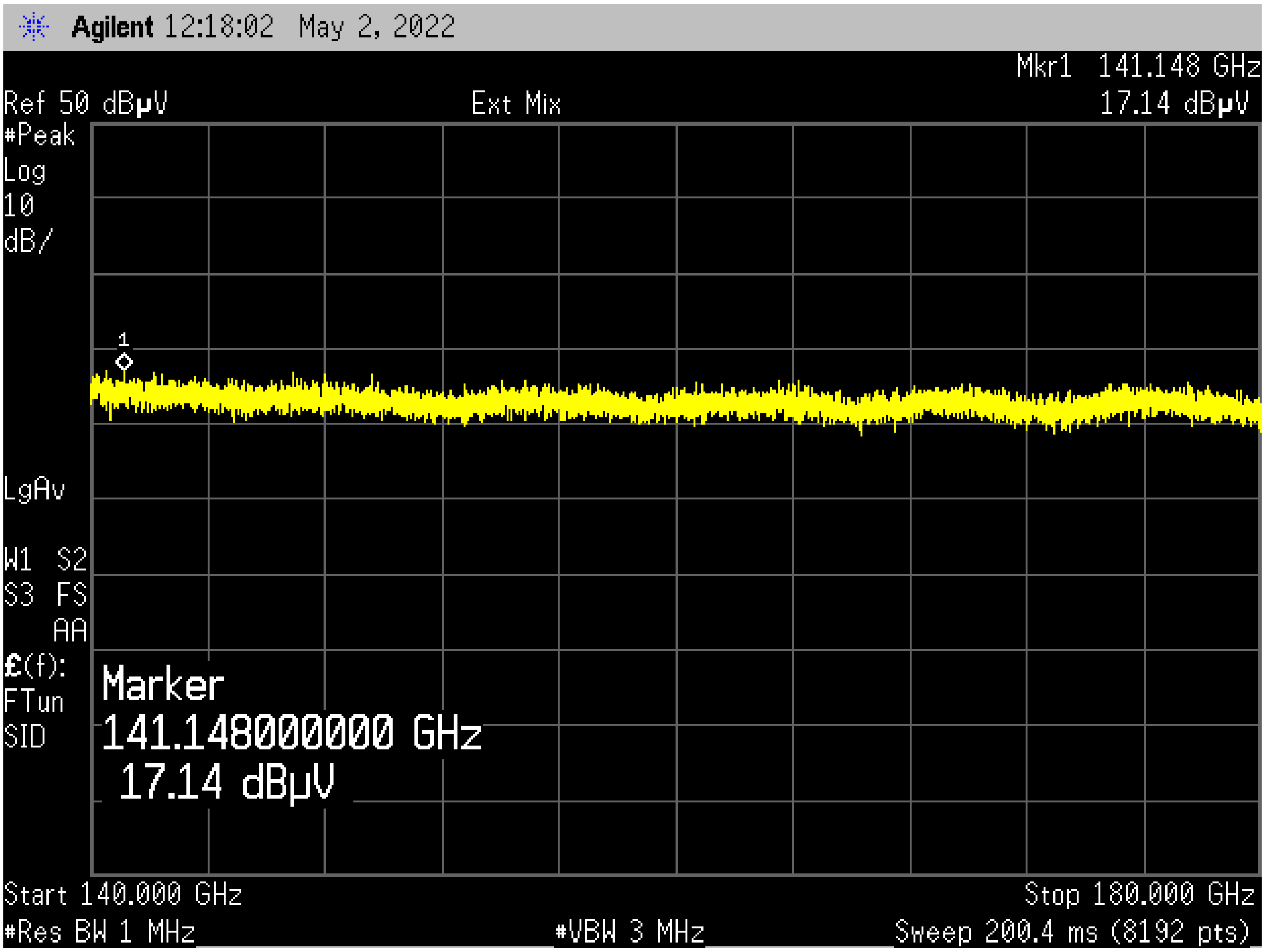

Figure 27: Center Channel, Spurious Emissions (180– 220 GHz)

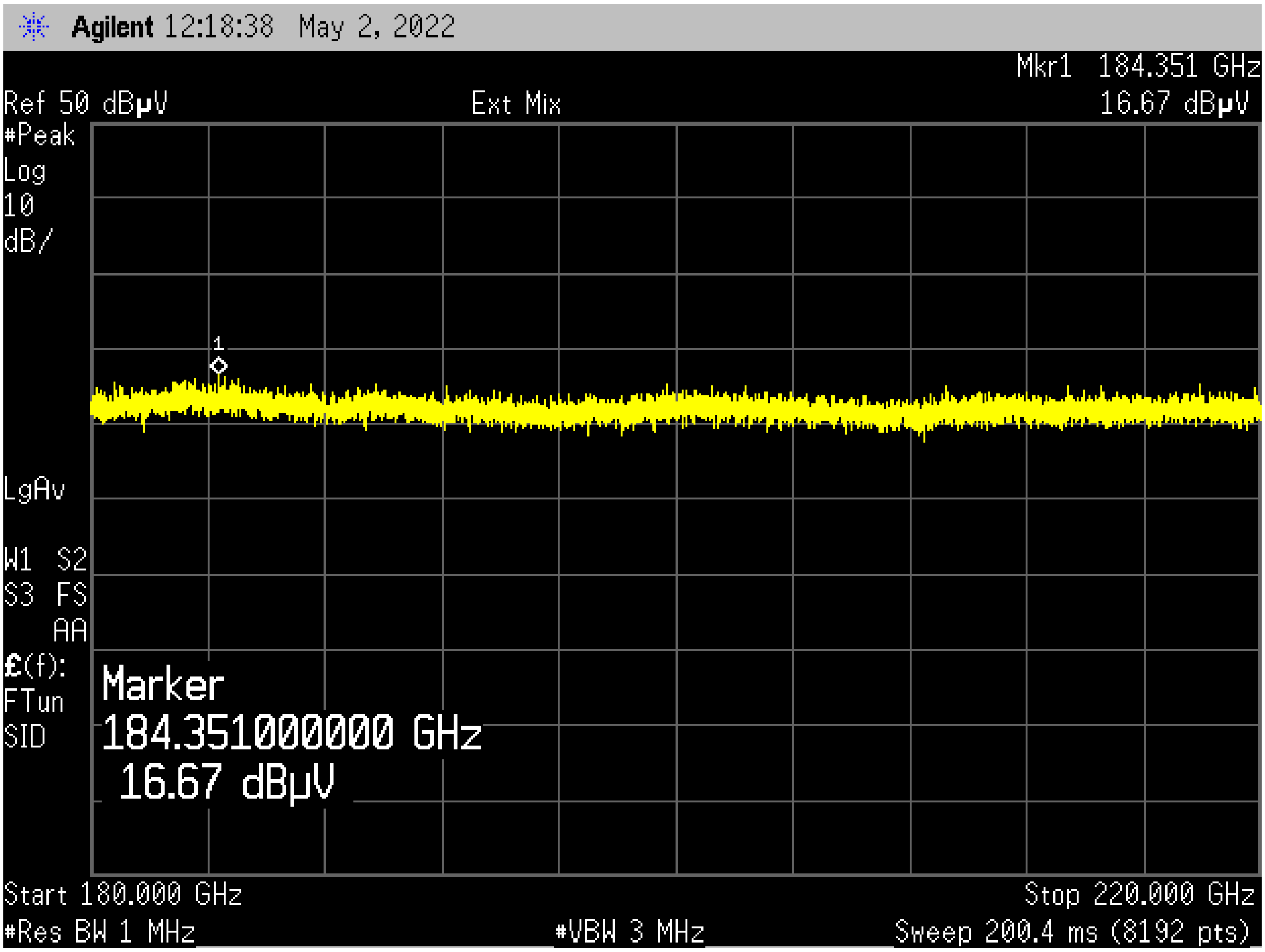

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Figure 28: High Channel, Spurious Emissions (40 – 60 GHz)

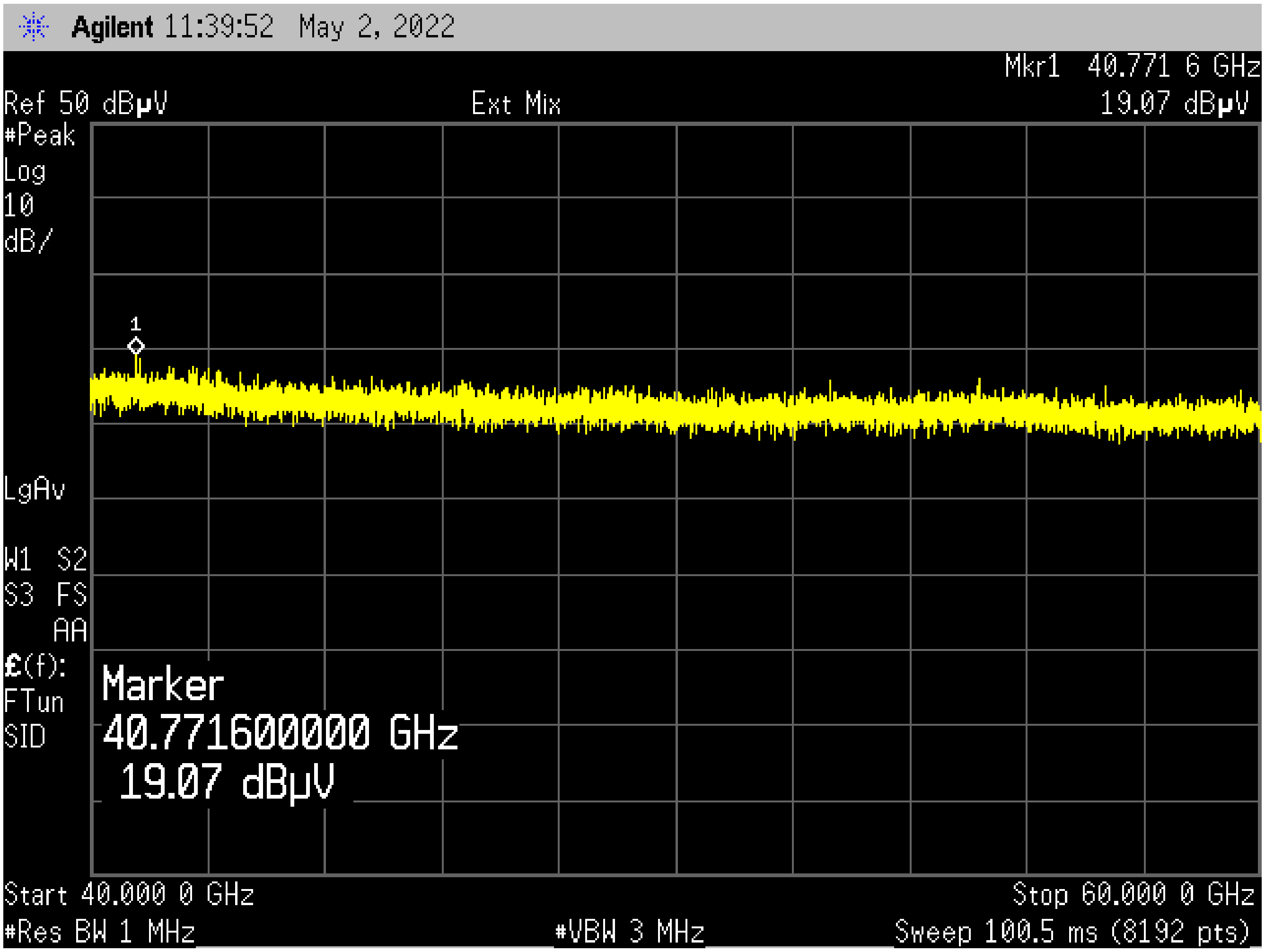


Figure 29: High Channel, Spurious Emissions (50 – 60 GHz)

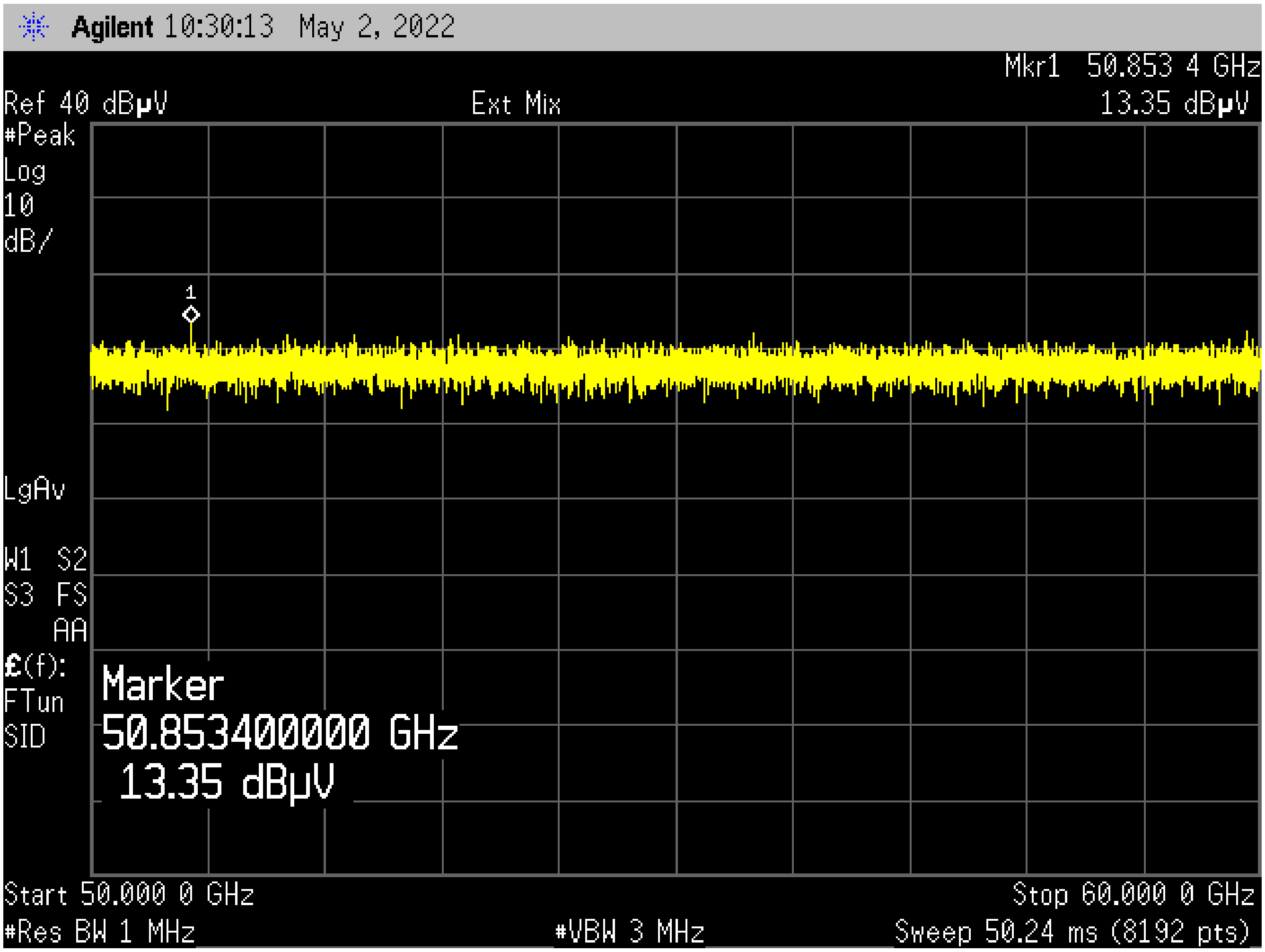


Figure 30: High Channel, Spurious Emissions (60– 70 GHz)

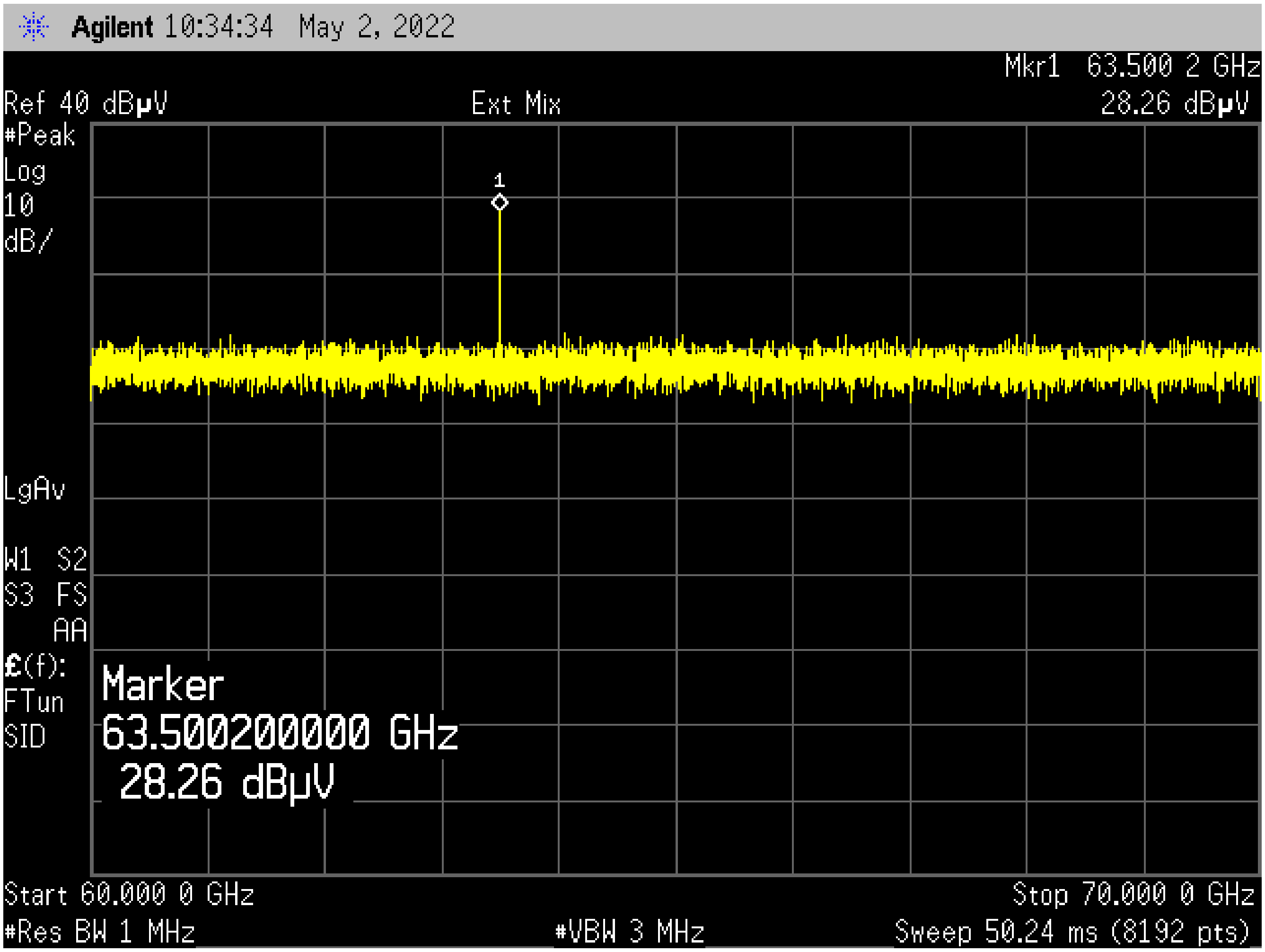


Figure 31: High Channel, Spurious Emissions (70 – 80 GHz)

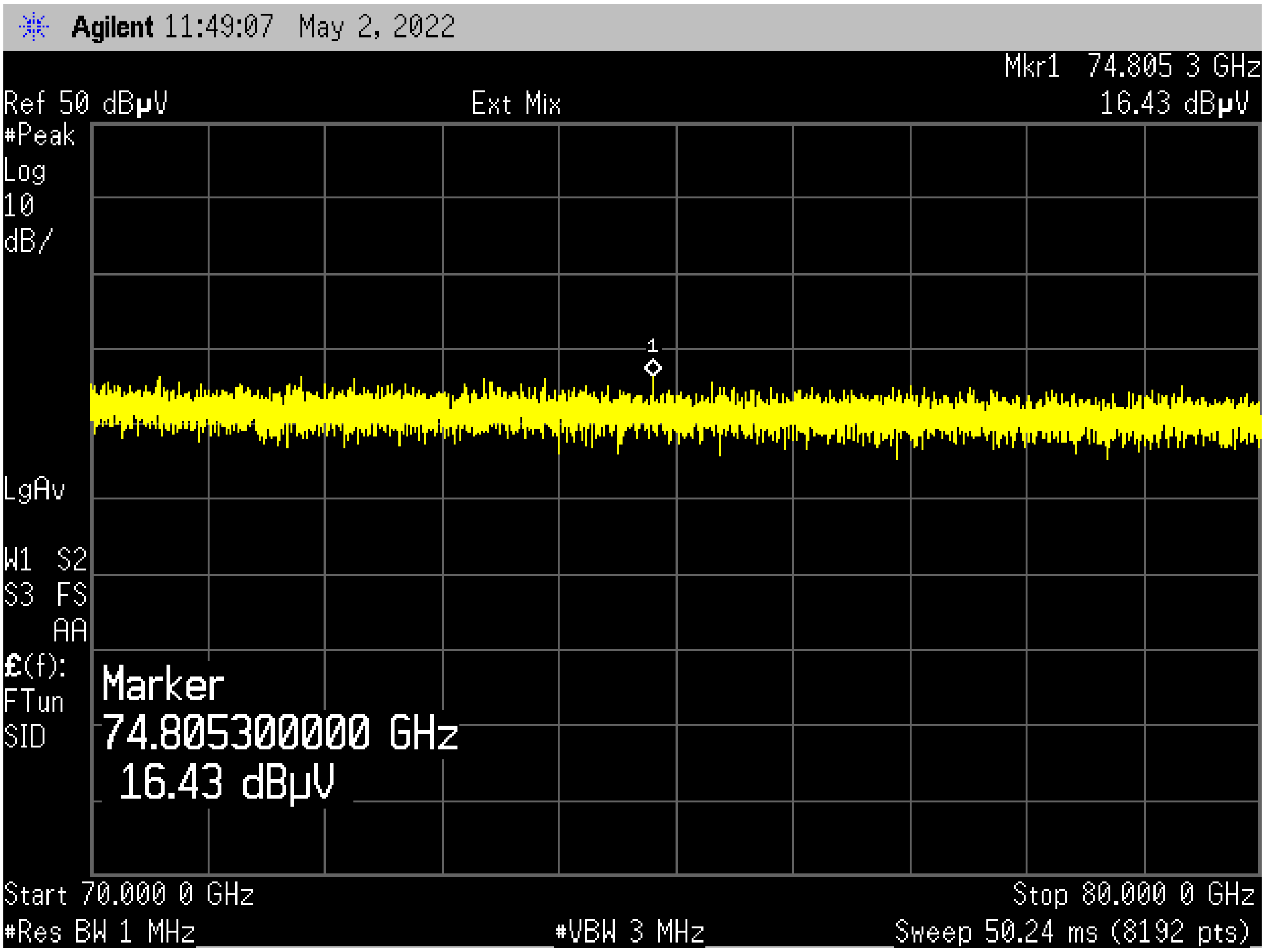


Figure 32: High Channel, Spurious Emissions (80– 90 GHz)

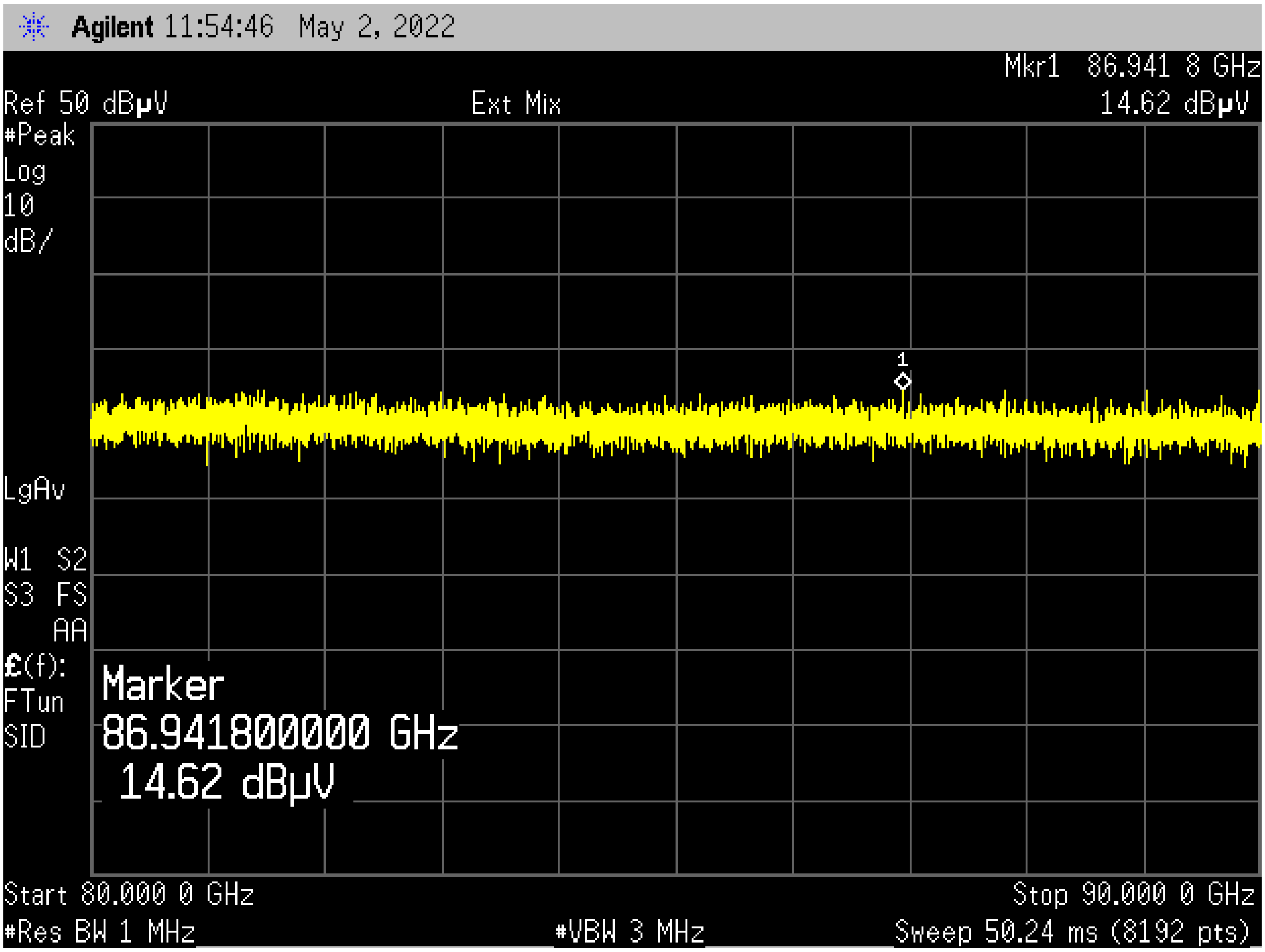


Figure 33: High Channel, Spurious Emissions (90 – 115 GHz)

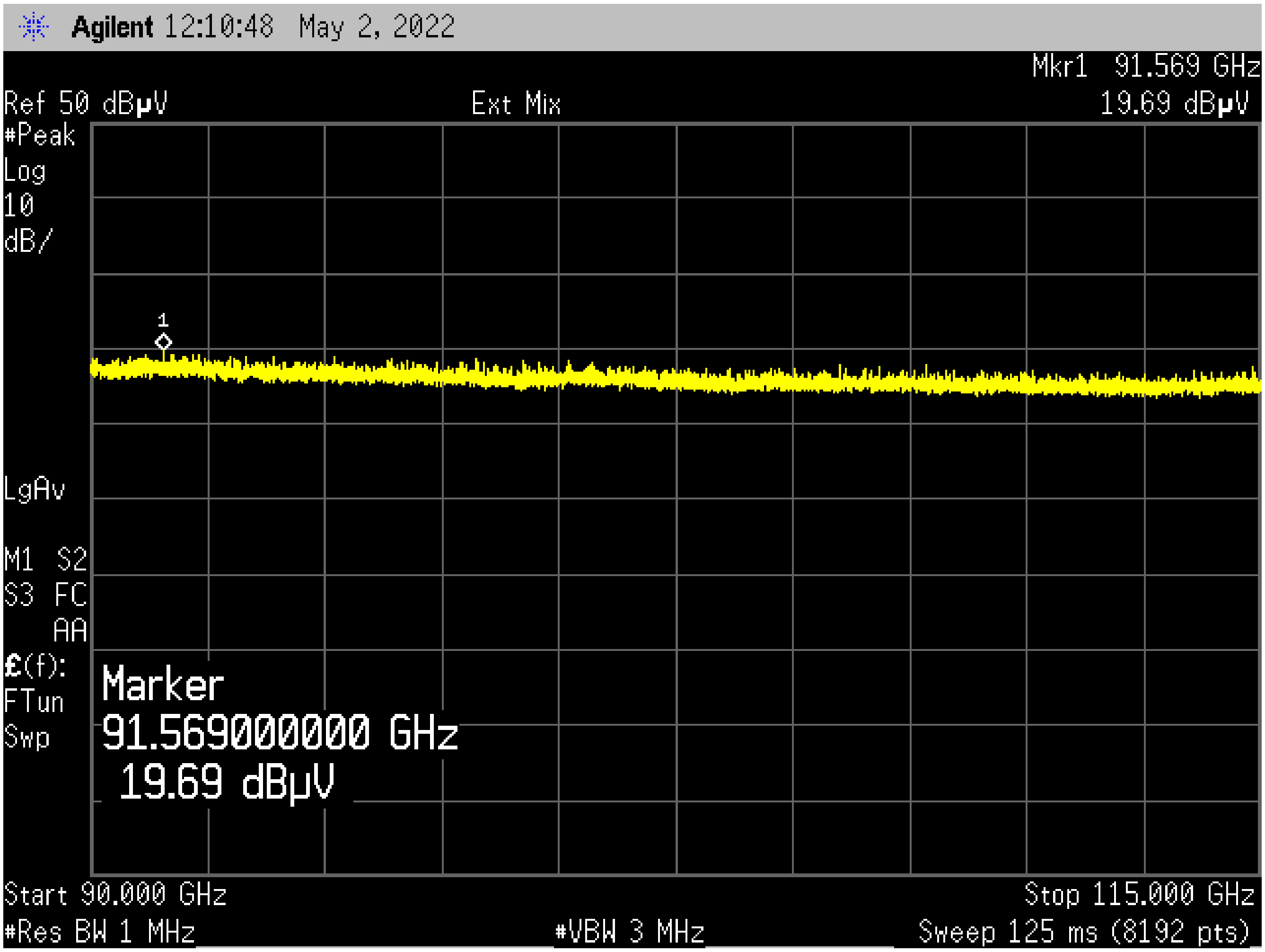


Figure 34: High Channel, Spurious Emissions (115– 140 GHz)

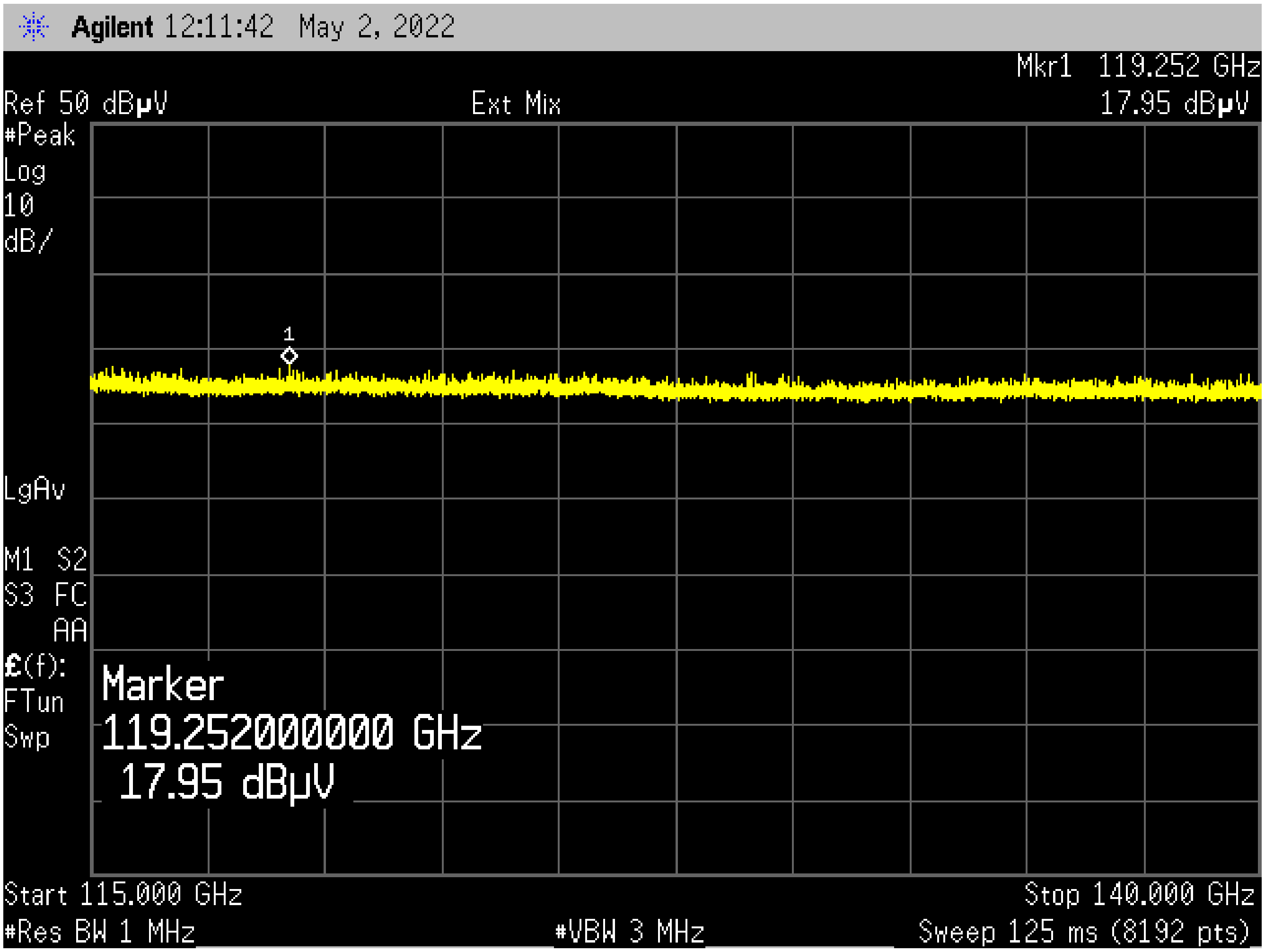


Figure 35: High Channel, Spurious Emissions (140 – 180 GHz)

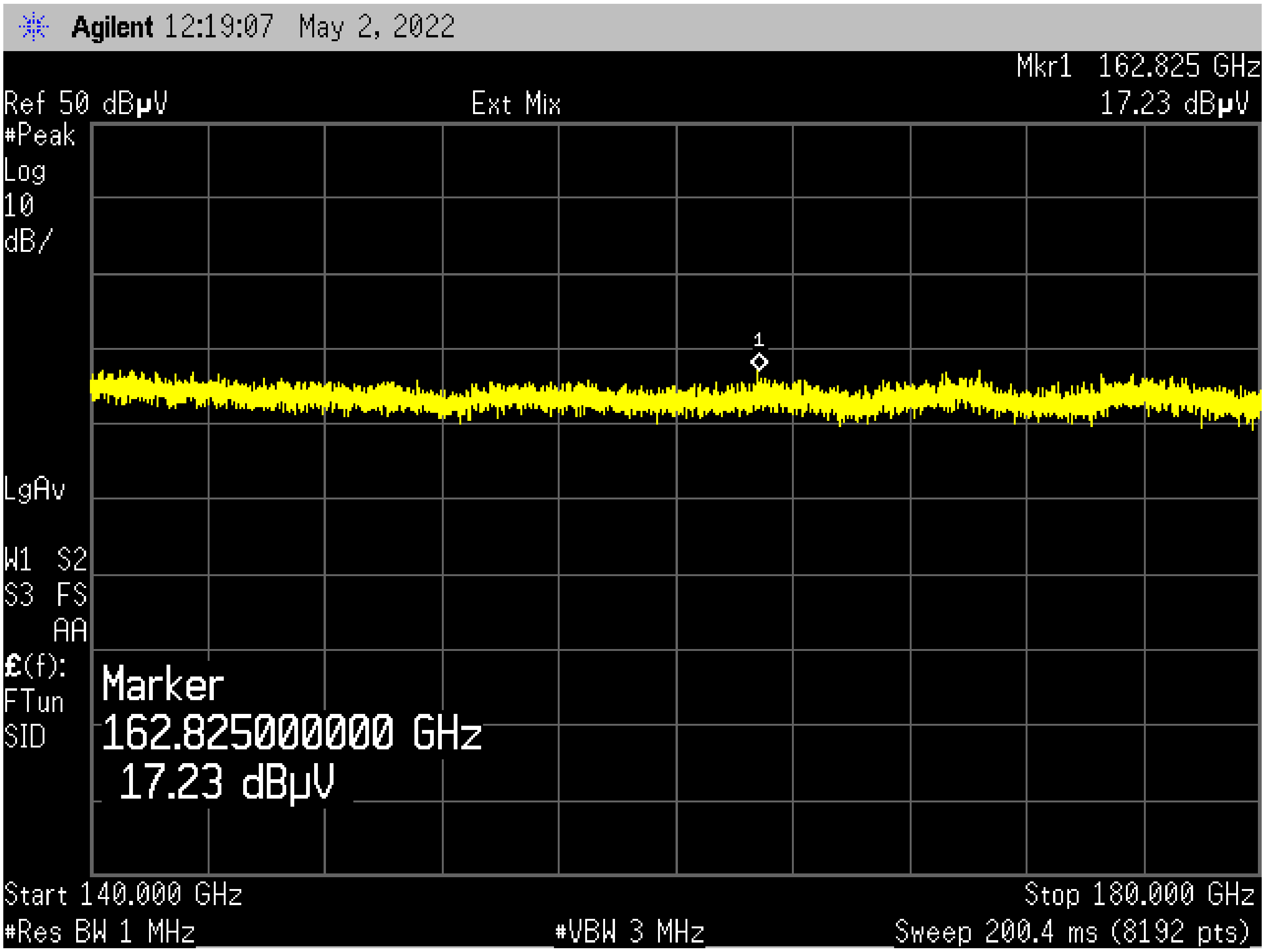
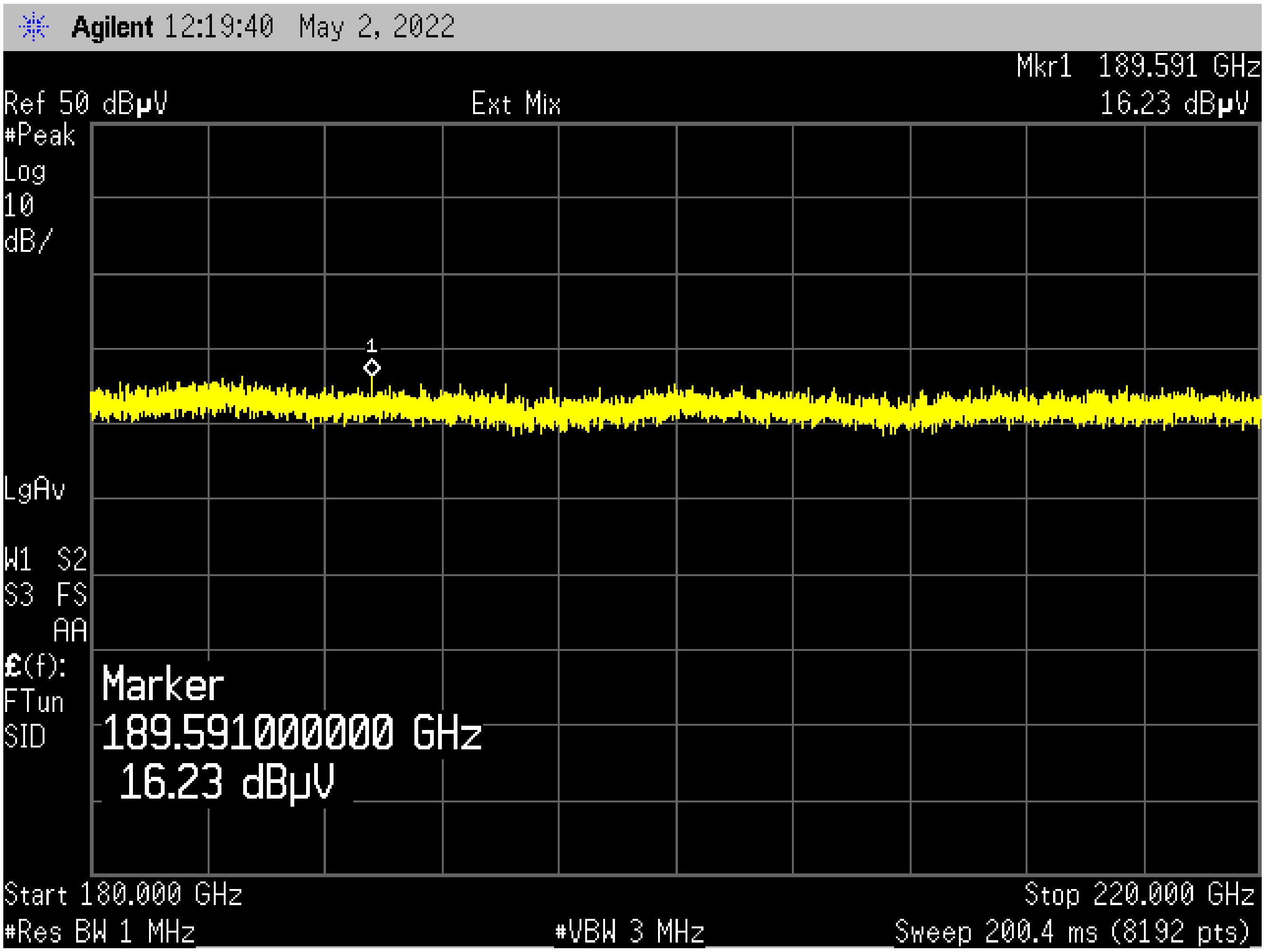


Figure 36: High Channel, Spurious Emissions (180– 220 GHz)



## 2.6 Spurious Emissions Below 40 GHz

### 2.6.1 Requirements

Compliance Standard: FCC Part §15.255(d)(2), §15.209(a) and RSS-210(J.3(b), RSS-Gen(8.9).

Under this provision, radiated emissions below 40 GHz shall not exceed the general limits as defined in FCC Part §15.209(a).

| FCC Compliance Limits | | |
|---|---|---|
| **Frequency Range** | **3m Limit** | |
| 30 – 88 MHz | 100 µV/m (QP) | |
| 88 – 216 MHz | 150 µV/m (QP) | |
| 216 – 960 MHz | 200 µV/m (QP) | |
| > 960 MHz | 500 µV/m (AVG) | 5000 µV/m (Peak) |

### 2.6.2 Test Procedure

The requirements of FCC Part 15 and ICES-003 call for the EUT to be placed on a 1m X 1.5m non-conductive motorized turntable at a height of 80cm for radiated testing of frequencies up to 1000 MHz, and a height of 1.5m for testing of frequencies above 1000 MHz. Please note that the radiated emissions measured during this testing, were performed at a distance of 3-meters.

An initial pre-scan of the EUT was performed to identify any emissions that exceed, or come within 6dB of, the applicable limit. This pre-scan was performed a with the employment of a spectrum analyzer peak detector function. The highest amplitude (worst-case) emissions noted during the pre-scan were selected for final compliance measurements.

The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. Broadband log periodic and double-ridged horn antennas were mounted on an antenna mast to determine the height of maximum emissions. The height of the antenna was varied between 1 and 4 meters. The output of the antenna was connected to the input of the spectrum analyzer and the emissions in the frequency range of 30 MHz to 40 GHz were evaluated. The EUT peripherals were placed on the table in accordance with ANSI C63.4. Cables were varied in position to produce maximum emissions. Both the horizontal and vertical field components were measured.

The detector function was set to quasi-peak for measurements below 1 GHz. The measurement bandwidth of the spectrum analyzer system was set to at least 120 kHz, with all post-detector filtering no less than 10 times the measurement bandwidth. For measurements above 1 GHz, both the peak and the average levels are recorded, using a measurement bandwidth of 1 MHz. For average measurements, a video bandwidth setting of 10 Hz was used, in the case of video averaging; otherwise, an EMI AVG detector shall be employed.

### 2.6.3 Radiated Data Reduction and Reporting

To convert the raw spectrum analyzer radiated data into a form that can be compared with the FCC limits, it is necessary to account for various calibration factors that are supplied with the antenna(s) and other measurement equipment. These factors include the antenna factor ((AF)(in dB/m)), cable loss factors ((CF)(in dB)), and the pre-amplifier gain [if applicable] ((G)(in dB)). These correction values are algebraically added to the raw Spectrum Analyzer Voltage (in dBµV) to obtain the corrected radiated electric field, which shall be the final corrected logarithm amplitude ((Corr. Meas.)(in dBµV/m)). This logarithm amplitude is then compared to the FCC limit, which has been converted to a unit of log in dBµV/m.

<u>Example:</u>

| | |
|---|---|
| Spectrum Analyzer Voltage: | VdBµV (SA) |
| Antenna Correction Factor: | AFdB/m |
| Cable Correction Factor: | CFdB |
| Pre-Amplifier Gain (if applicable): | GdB |
| Electric Field: | EdBµV/m = V dBµV (SA) + AFdB/m + CFdB - GdB |
| To convert from linear units of measure: | dBuV/m = 20LOG(uV/m) |
| To convert FCC limits, based on $D_{Measure}$: | 3m Limit = 10m Limit + 20LOG(10/3) |

Environmental Conditions During Radiated Emissions Testing

| | |
|---|---|
| Ambient Temperature: | 19.9 °C |
| Relative Humidity: | 48% |

### 2.6.4 Test Data

The EUT complies with the requirements this section.

The EUT was set to a transmit enabled, FMCW-modulated mode for this test.

There were no emissions detected in the frequency range of 18 GHz – 40 GHz.

Table 9 and Table 10, and Figure 37 and Figure 38 provide the final test data.

Table 9: Radiated Emission Test Data (30 MHz – 1 GHz)

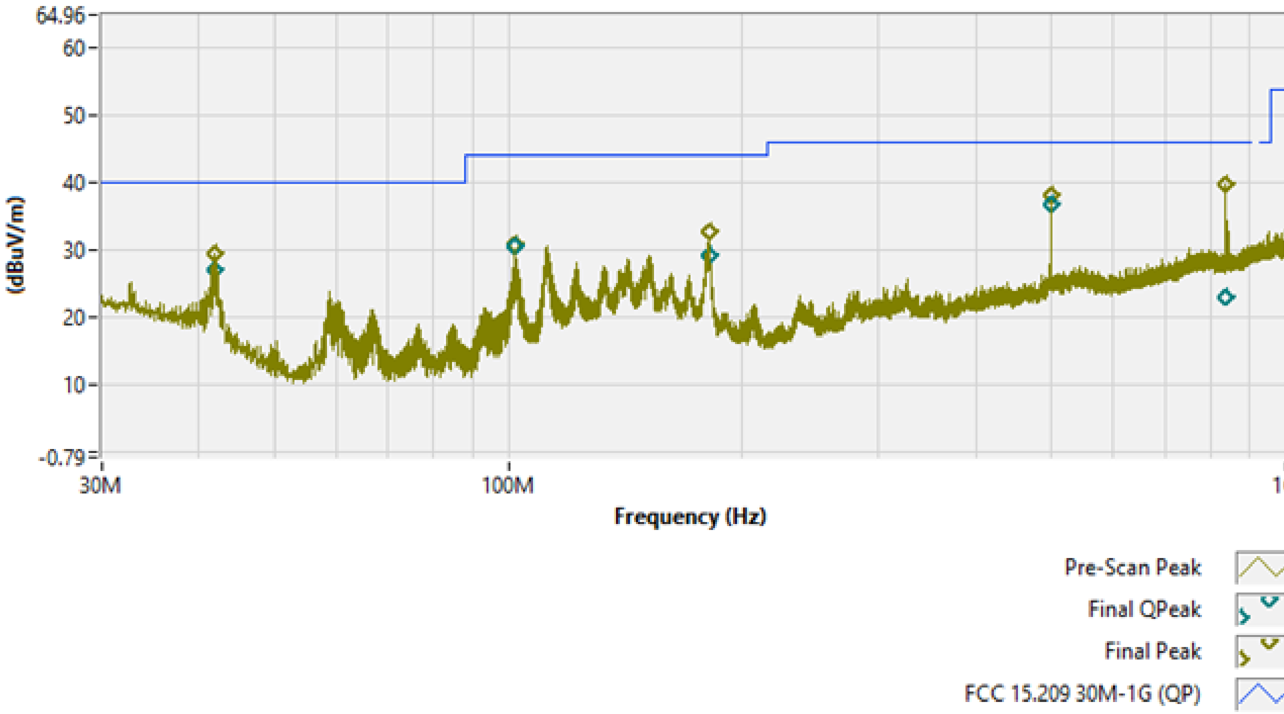
| Frequency (MHz) | Detector | Corr. Meas. (dBuV/m) | Limit (dBuV/m) | Delta (dB) | Turn Table (deg) | Antenna (cm) |
|---|---|---|---|---|---|---|
| 41.952 | Peak | 29.409 | -- | -- | 180 | Vert, 150 |
| | QP | 27.056 | 40 | -12.944 | 180 | Vert, 120 |
| 101.892 | Peak | 36.736 | -- | -- | 90 | Horiz, 360 |
| | QP | 33.516 | 44 | -10.484 | 90 | Horiz, 360 |
| 180.991 | Peak | 32.968 | -- | -- | 90 | Horiz, 150 |
| | QP | 29.336 | 44 | -14.664 | 180 | Vert, 240 |
| 500.03 | Peak | 39.12 | -- | -- | 180 | Horiz, 360 |
| | QP | 37.655 | 46 | -8.345 | 180 | Horiz, 360 |
| 835.825 | Peak | 39.681 | -- | -- | 90 | Vert, 150 |
| | QP | 23.107 | 46 | -22.893 | 90 | Vert, 240 |

Table 10: Radiated Emission Test Data (1 GHz – 18 GHz)

| Frequency (GHz) | Detector | Corr. Meas. (dBuV/m) | Limit (dBuV/m) | Delta (dB) | Turn Table (deg) | Antenna (cm) |
|---|---|---|---|---|---|---|
| 2.420 | Peak | 97.404 | -- | -- | 0 | Vert, 360 |
| 4.960 | Peak | 48.565 | 74 | -25.43 | 90 | Vert, 360 |
| | Avg | 35.099 | 54 | -18.90 | 0 | Vert, 220 |
| 5.840 | Peak | 62.210 | 74 | -11.79 | 90 | Horiz, 240 |
| | Avg | 36.063 | 54 | -17.94 | 90 | Horiz, 240 |
| 7.344 | Peak | 67.492 | 74 | 11.89 | 90 | Vert, 230 |
| | Avg | 38.892 | 54 | -15.10 | 0 | Vert, 260 |
| 13.962 | Peak | 68.595 | 74 | -5.40 | 180 | Horiz, 230 |
| | Avg | 53.569 | 54 | -0.43 | 90 | Horiz, 360 |
| 14.734 | Peak | 73.443 | 74 | -0.55 | 180 | Vert, 230 |
| | Avg | 49.537 | 54 | -4.46 | 90 | Vert, 250 |
| 17.097 | Peak | 66.765 | 74 | -7.23 | 0 | Vert, 230 |
| | Avg | 49.599 | 54 | -4.40 | 0 | Vert, 350 |

Figure 37: Radiated Emissions Test Data (30 MHz – 1 GHz)

**Pre-scan and Final Data (Vertical)**




**Pre-scan and Final Data (Horizontal)**

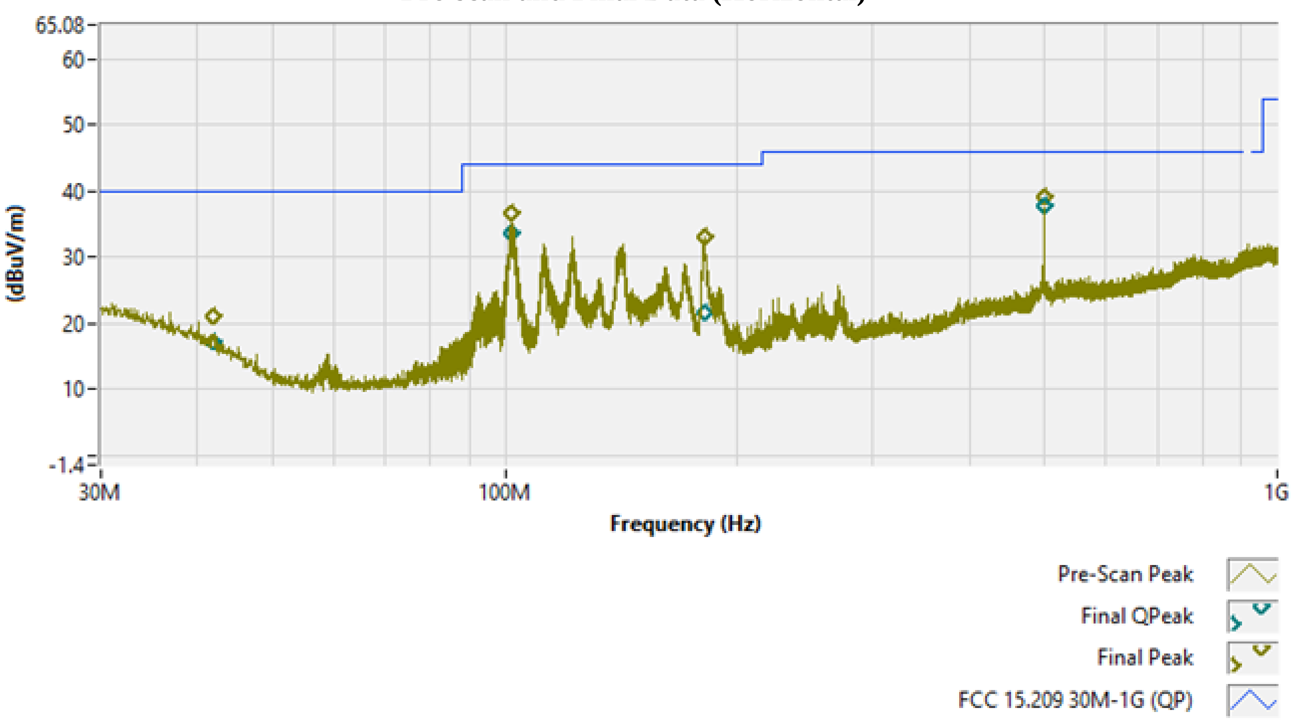
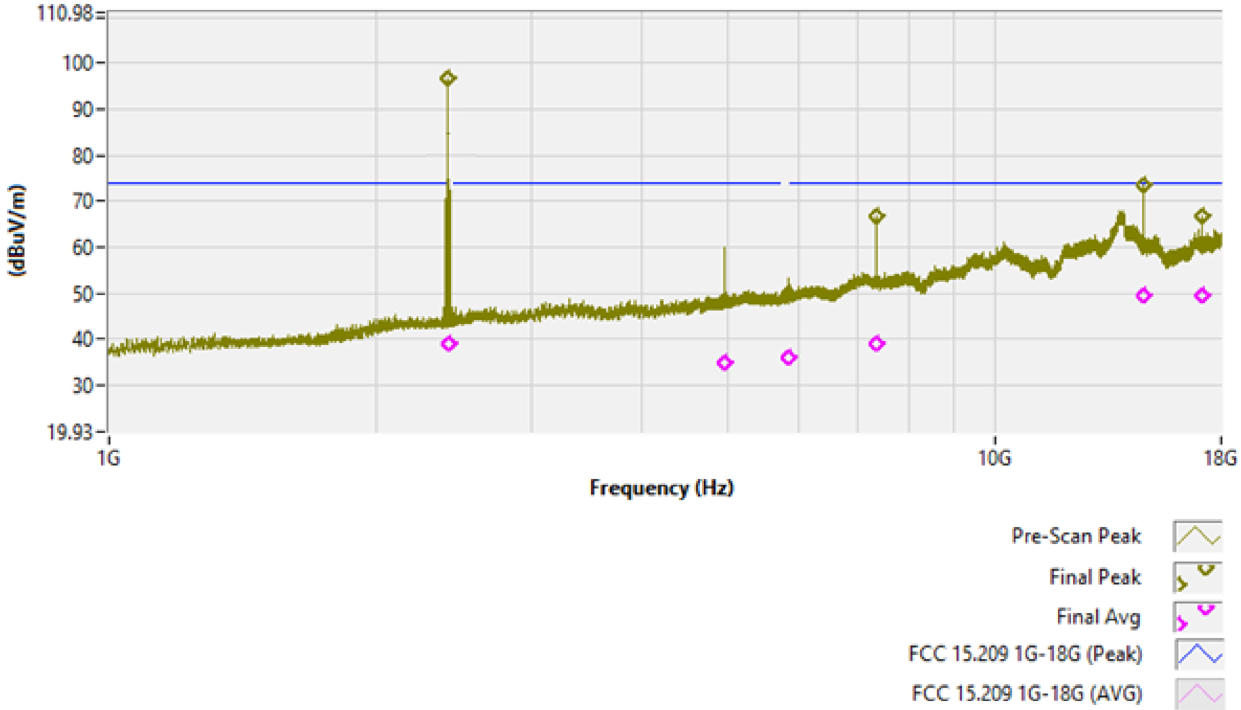
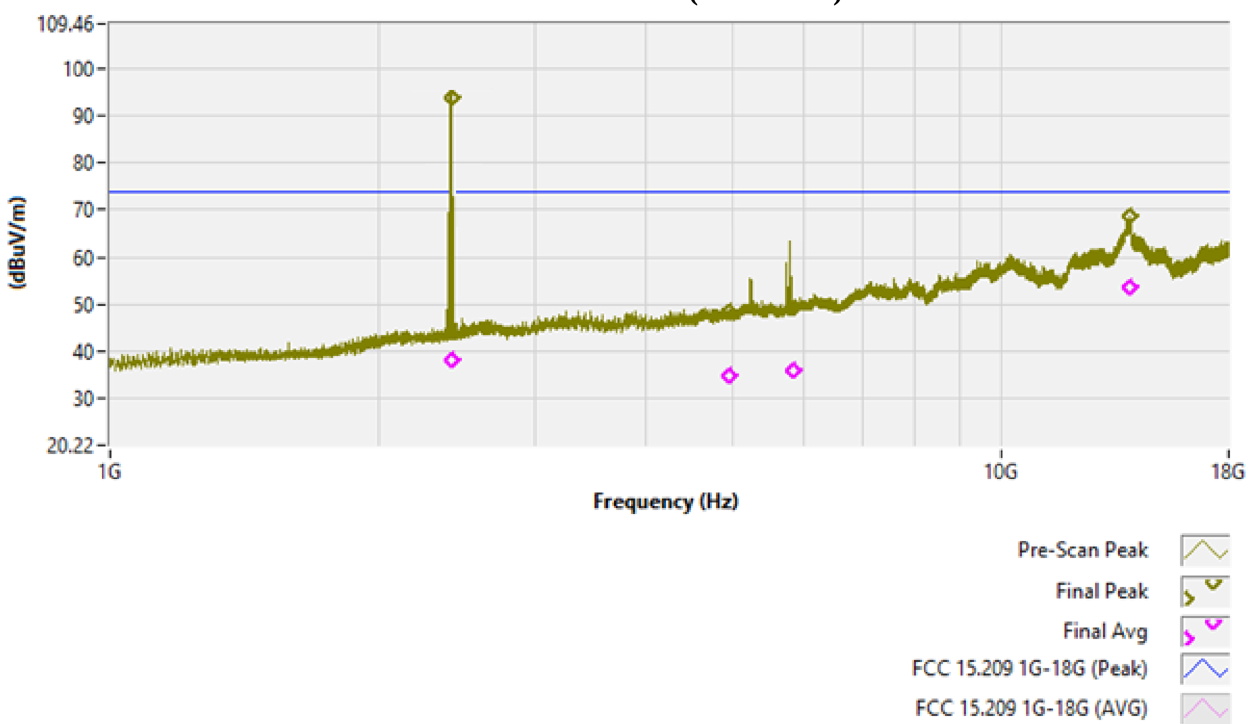


Figure 38: Radiated Emissions Test Data (1 GHz – 18 GHz)

**Pre-scan and Final Data (Vertical)**




**Pre-scan and Final Data (Horizontal)**



## 2.7 Frequency Stability

### 2.7.1 Requirements

Compliance Standard: FCC Part §15.255(f) and RSS-210(J.6).

Under this provision, fundamental emissions must be contained within the frequency bands specified in FCC Part 15.255(c)(2) during all conditions of operation. The EUT shall maintain this frequency stability when operated over the temperature range of -20 to +50 degrees Celsius. Additionally, the input voltage shall be varied to the order of 85% to 115% of rated input voltage.

### 2.7.2 Test Procedure

The EUT transmitter center channel of 61.250 GHz shall be used for this test. To show compliance, a strict deviation/tolerance limit shall be employed. This limit is defined as 0.01% of 61.250 GHz.
Further, (0.01% )*61250000000 = 6125000 Hz = 6.125 MHz.

The frequency stability of the EUT was evaluated using an environmental chamber, capable of varying temperature across the range of –20° to +50° centigrade. Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10° centigrade through the range. Only the portion of the transmitter containing the frequency determining, and stabilizing, circuitry need be subjected to the temperature variation test. The support equipment shall be removed from the temperature variation.

### 2.7.3 Test Data

The EUT complies with the requirements this section.

The EUT was set to transmit a CW for this test.

Table 11 provides the final test data.

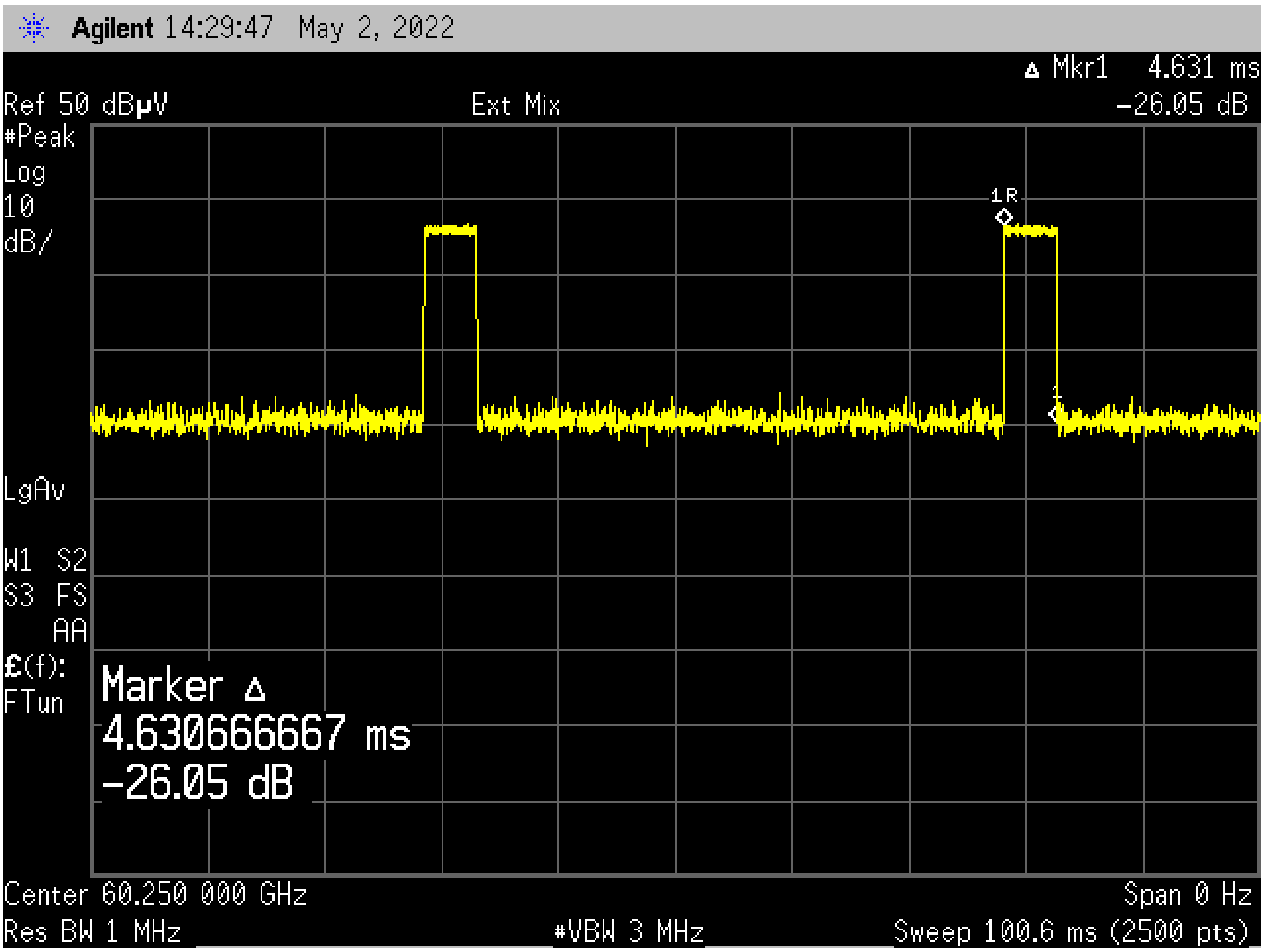
Table 11: Frequency Stability Test Data

| Temperature (C) | Frequency (MHz) | Deviation (Hz) | Limit (+/- Hz) | Pass/Fail |
|---|---|---|---|---|
| **Start-Up** | | | | |
| **Temperature (C)** | **Frequency (MHz)** | **Deviation (Hz)** | **Limit (+/- Hz)** | **Pass/Fail** |
| 21.2 (ambient) | 61749.621500 | 0 | 6174962 | **NA** |
| -20 | 61753.320900 | 3699400 | 6174962 | Pass |
| -10 | 61752.550900 | 2929400 | 6174962 | Pass |
| 0 | 61751.619300 | 1997800 | 6174962 | Pass |
| 10 | 61750.937700 | 1316200 | 6174962 | Pass |
| 20 | 61750.333800 | 712300 | 6174962 | Pass |
| 30 | 61749.522400 | -99100 | 6174962 | Pass |
| 40 | 61749.121900 | -499600 | 6174962 | Pass |
| 50 | 61749.043500 | -578000 | 6174962 | Pass |
| | | | | |
| **2-Minutes** | | | | |
| **Temperature (C)** | **Frequency (MHz)** | **Deviation (Hz)** | **Limit (+/- Hz)** | **Pass/Fail** |
| -20 | 61753.292900 | 3671400 | 6174962 | Pass |
| -10 | 61752.562200 | 2940700 | 6174962 | Pass |
| 0 | 61751.600800 | 1979300 | 6174962 | Pass |
| 10 | 61750.933300 | 1311800 | 6174962 | Pass |
| 20 | 61751.003800 | 1382300 | 6174962 | Pass |
| 30 | 61750.072400 | 450900 | 6174962 | Pass |
| 40 | 61749.156600 | -464900 | 6174962 | Pass |
| 50 | 61749.998000 | 376500 | 6174962 | Pass |
| | | | | |
| **5-Minutes** | | | | |
| **Temperature (C)** | **Frequency (MHz)** | **Deviation (Hz)** | **Limit (+/- Hz)** | **Pass/Fail** |
| -20 | 61754.096900 | 4475400 | 6174962 | Pass |
| -10 | 61752.500000 | 2878500 | 6174962 | Pass |
| 0 | 61751.698800 | 2077300 | 6174962 | Pass |
| 10 | 61751.022200 | 1400700 | 6174962 | Pass |
| 20 | 61751.004400 | 1382900 | 6174962 | Pass |
| 30 | 61750.072200 | 450700 | 6174962 | Pass |
| 40 | 61749.351600 | -269900 | 6174962 | Pass |
| 50 | 61749.098000 | -523500 | 6174962 | Pass |
| | | | | |
| **10-Minutes** | | | | |
| **Temperature (C)** | **Frequency (MHz)** | **Deviation (Hz)** | **Limit (+/- Hz)** | **Pass/Fail** |
| -20 | 61755.020900 | 5399400 | 6174962 | Pass |
| -10 | 61749.550900 | -70600 | 6174962 | Pass |
| 0 | 61749.719300 | 97800 | 6174962 | Pass |
| 10 | 61749.737700 | 116200 | 6174962 | Pass |
| 20 | 61749.833800 | 212300 | 6174962 | Pass |
| 30 | 61751.022400 | 1400900 | 6174962 | Pass |
| 40 | 61749.021900 | -599600 | 6174962 | Pass |
| 50 | 61749.041100 | -580400 | 6174962 | Pass |

## 2.8 Transmitter Duty Cycle Correction Factor (DCCF)

When the average-mode field strength of a pulsed transmitter is measured, a DCCF shall be applied to the Peak value, and compared to the applicable Average limits. Under the provisions of §15.35(c) and RSS-Gen(8.2), the duty cycle measurement shall be made in reference to a 100 ms period.

Figure 39: Transmitter Pulse On-Time (Duty Cycle)



The transmitter timing was observed over a 100 ms sweep. In this case, a repeatable pulse train was greater than the measurement period. As such, the cycle time ($T$cycle) shall be declared as 100 ms.

As depicted in Figure 24, the total transmitter on-time is made of two sub-pulses.
The worst case on-time ($t$on) is: 2(4.63) = 9.26 ms.

<u>The duty cycle can be calculated from the following formula:</u>

$t_{on} \div T_{cycle} = \Delta$

9.26 ÷ 100 = 0.0926

$\Delta = 9.3\%$

Where $\Delta$ is the final duty cycle.

<u>The duty cycle correction factor can be calculated from the following formula:</u>

$20LOG(\Delta) = \delta$

20LOG(0.093) = –20.63

$\delta$ = 20.7 dB (worst-case)

Where $\delta$ is the final DCCF.

*(Reference ANSI C63.10-2013, Section 7.5)*

# 3 Equipment Under Test

## 3.1 EUT Identification & Description

The OmniSight, Inc., MegaRadar V1 is a Frequency-Modulated Continuous-Wave (FMCW) Radar which is capable of transmitting in the 60.0 GHz range. The transmission signal is modulated in frequency and operates at a duty cycle necessary for the level of detail and range desired. Periodically the signal broadcasts, which sweeps across a set frequency range. The differences in the phase, or frequency, of the received signal is used to estimate range, doppler shift, and angle of arrival. The intended use is for infrastructure tracking of vehicles, pedestrians, or bicycles in (or around) areas of interest which may include downtown cities, parking areas, on/off ramps, intersections, and other important areas. When software is used to limit the output power, the EUT operates in the 60 – 64 GHz range and the modulated channels occupy more than 500 MHz (bandwidth).

## 3.2 Testing Algorithm

The EUT was controlled and configured by the applicant via connectivity to the Internet. The EUT was tested powered on, with the transmitter enabled during each test. The EUT transmit signal was evaluated in three orthogonal planes (x, y, and z) to determine the worst-case field plane orientation. The receive-antenna/mmWave measurement equipment, denoted in Section 4 of this report, was also varied in polarity (vertical and horizontal). Based on these exploratory measurements, the measurement positioning that produced the highest fundamental amplitude was used for the final compliance/reporting test data. The worst-case emissions are provided in this report. There are no other transmitter timing schemes, or configurations, that would produce an emission that exceeds the levels of the emissions provided in this test report. This test report covers the software setting for the Low Power Mode.

## 3.3 Test Configuration

The MegaRadar V1 is powered by ~ +53 VDC, via a POE switch, which was connected to the public mains 120 VAC, 60 Hz supply. The EUT was provided to the test laboratory in one sample, containing an operational mode that employs a continuous chirp profile that allows for the detection of objects in its field of view. The EUT was configurable through software changes only, via remote control of the device through a web-based portal.

The EUT was configured for testing, as depicted in Figure 40.

Table 12 through Table 15 provide further details pertaining to the EUT.

Table 12: EUT System Configuration List

| Name / Description | Model Number | Part Number | Serial Number | Rev. # |
|---|---|---|---|---|
| Jetson Nano | N/A | N/A | N/A | N/A |
| NO-IR Camera | RPi NoIR Camera | Unknown | N/A | 2 |

Table 13: Support Equipment (for testing)

| Name / Description | Manufacturer | Model Number | Customer Supplied Calibration Data |
|---|---|---|---|
| POE Switch | N/A | N/A | N/A |

Table 14: Cable Configuration

| Ref. | Port on EUT | Cable Description | Qty. | Length | Shielded | Termination |
|---|---|---|---|---|---|---|
| 1 | POE | CAT5 or CAT6 | N/A | N/A | N/A | N/A |

Figure 40: EUT Test Configuration Diagram

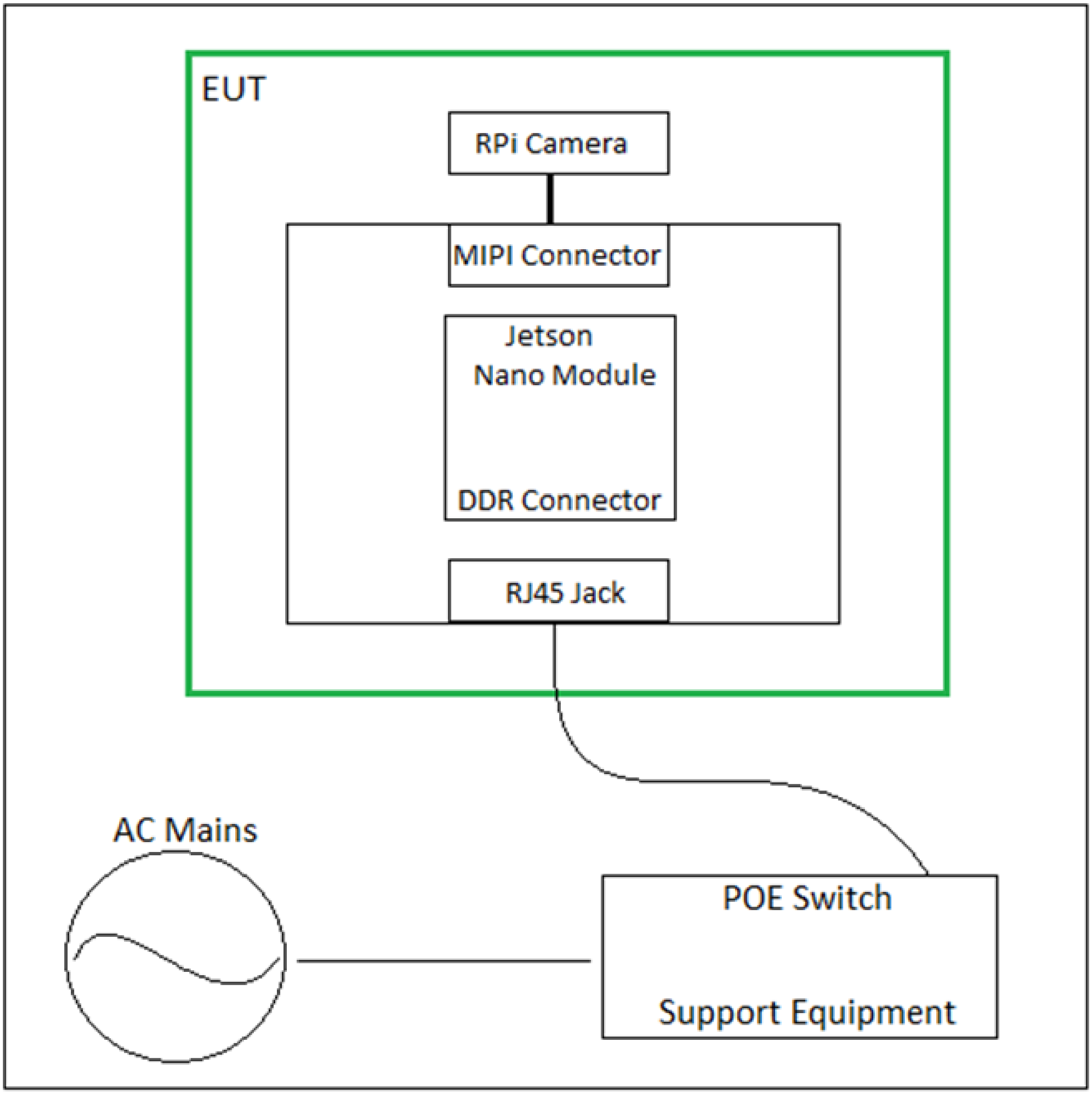


Table 15: Radio Device Summary (Low Power Mode)

| | | |
|---|---|---|
| Manufacturer/Applicant: | OmniSight, Inc. | |
| Marketing Brand: | Truck Specialized Parking Services | |
| EUT FCC ID: | 2AYO6MEGA1 | |
| IC ID: | 28582-MEGA1 | |
| EUT Name: | MegaRadar V1 | |
| Serial Number of Unit Tested: | Not Declared by Applicant | |
| TX Frequency Range: | 60.250 – 63.500 GHz (these are the center of the carrier) | |
| Peak EIRP: | -3.7 dBm | |
| Peak Conducted Power: | -10.7 dBm | |
| Modulation: | FMCW | |
| Occupied Bandwidth: | 20dB | 521.61 MHz |
| | 99% | 498.35 MHz |
| ISED Emissions Designator: | 498MF3D | |
| Keying: | Automatic | |
| Type of Information: | Radar, Ranging, Imaging | |
| Number of Modulated Channels: | Not Declared by Applicant | |
| Power Output Level Settings: | Fixed, via Software during production | |
| Antenna Type: | PCB Trace, Collection | |
| Multiple Antennas (60 GHz): | 3 TX; 4 RX | |
| Maximum Antenna Gain (60 GHz): | 7 dBi | |
| Interface Cables: | See Table 12 of this Report | |
| Maximum Data Rate | Not Declared by Applicant | |
| Software/Firmware: | Low Power Mode (tune-up tolerance: ±2.2 dB) | |
| Pulsed Transmitter: | Yes | |
| Transmitter Timing/Duty Cycle: | 9.3 % | |
| Power Source & Voltage: | +53 VDC via POE | |
| ISED – RSS-102, Annex A: | +0.063 W/m$^2$ | |
| Highest Spurious Emission: | 140.840 GHz at 10cm: 4.46 dBm EIRP (noise floor) | |
| | 5.77 GHz at 3m: 64.195 dBuV/m (Peak) | |

## 3.4 Measurements

### 3.4.1 References

ANSI C63.2 (Jan-2016) Specifications for Electromagnetic Noise and Field Strength Instrumentation

ANSI C63.4 (Jan 2014) American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

ANSI C63.10 (Jun 2013) American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

## 3.5 Measurement Uncertainty

All results reported herein relate only to the equipment tested. The basis for uncertainty calculation uses ANSI/NCSL Z540-2-1997 (R2002) with a type B evaluation of the standard uncertainty. Elements contributing to the standard uncertainty are combined using the method described in Equation 1 to arrive at the total standard uncertainty. The standard uncertainty is multiplied by the coverage factor to determine the expanded uncertainty which is generally accepted for use in commercial, industrial, and regulatory applications and when health and safety are concerned (see Equation 2). A coverage factor was selected to yield a 95% confidence in the uncertainty estimation.

Equation 1: Standard Uncertainty

$$u_c = \pm\sqrt{\frac{a^2}{{div_a}^2} + \frac{b^2}{{div_b}^2} + \frac{c^2}{{div_c}^2} + \ldots\ldots}$$

Where:

| | |
|---|---|
| uc | = standard uncertainty |
| a, b, c,.. | = individual uncertainty elements |
| Diva, b, c | = the individual uncertainty element divisor based on the probability distribution |
| Divisor | = 1.732 for rectangular distribution |
| Divisor | = 2 for normal distribution |
| Divisor | = 1.414 for trapezoid distribution |

Equation 2: Expanded Uncertainty

$$U = ku_c$$

Where:

U = expanded uncertainty
k = coverage factor
k ≤ 2 for 95% coverage (ANSI/NCSL Z540-2 Annex G)
uc = standard uncertainty

The measurement uncertainty complies with the maximum allowed uncertainty from CISPR 16-4-2. Measurement uncertainty is not used to adjust the measurements to determine compliance. The expanded uncertainty values for the various scopes in the WLL accreditation are provided in Table 16 below.

Table 16: Expanded Uncertainty List

| **Scope** | **Standard(s)** | **Expanded Uncertainty** |
|---|---|---|
| Conducted Emissions | CISPR11, CISPR22, CISPR32, CISPR14, FCC Part 15 | ± 2.63 dB |
| Radiated Emissions | CISPR11, CISPR22, CISPR32, CISPR14, FCC Part 15 | ± 4.55 dB |

# 4 Test Equipment

Table 17 shows a list of the test equipment used for measurements, along with the calibration information.

Table 17: Test Equipment List

| Test Name: **AC Mains Conducted Emissions** | | Test Date: | **5/3/2022** |
|---|---|---|---|
| **Asset #** | **Manufacturer/Model** | **Description** | **Cal. Due** |
| 00125 | SOLAR, 8028-50-TS-24-BNC | LISN | 9/14/2022 |
| 00126 | SOLAR, 8028-50-TS-24-BNC | LISN | 9/14/2022 |
| 00895 | HP, 11947A | TRANSIENT LIMITER | 2/21/2023 |
| 00823 | AGILENT, EXA | SPECTRUM ANALYZER | 5/27/2022 |
| 00330 | WLL, CE CABLE | BNC, RF COAXIAL CABLE | 5/12/2022 |

| Test Name: **3m Radiated Emissions** | | Test Date: **5/2/2022 & 5/3/2022** | |
|---|---|---|---|
| **Asset #** | **Manufacturer/Model** | **Description** | **Cal. Due** |
| 00942 | AGILENT, MXA | SPECTRUM ANALYZER | 9/29/2022 |
| 00644 | SUNOL SCIENCES CORP. | ANTENNA, LOGPERIOD | 11/9/2022 |
| 00626 | ARA, DRG-118/A | ANTENNA, HORN | 8/20/2023 |
| 00627 | AGILENT, 8449B | RF PRE-AMPLIFIER | 9/22/2022 |
| 00276 | ELECTRO-METRICS, BPA-1000 | RF PRE-AMPLIFIER | 6/8/2022 |
| 00806 | MINI-CIRCUITS, 3061 | HF CABLE, SMA | 6/17/2022 |
| 00977 | JUNKOSHA, USA MX-322 | 6M COAX. CABLE, SMA/N | 1/3/2023 |

| Test Name: **Fundamental Transmitter Power** | | Test Date: **4/27/2022 – 4/29/2022** | |
|---|---|---|---|
| **Asset #** | **Manufacturer/Model** | **Description** | **Cal. Due** |
| 00461 | TEKTRONIX | DIGITAL STORAGE OSCILLOSCOPE | 6/19/2022 |
| 00967 | MILLIMETER WAVE, 950V/385 | BROADBAND RF DETECTOR | 9/23/2024 |
| 00834 | ULTIFLEX, UFA360 | HF COAXIAL CABLE | 12/21/2022 |
| 30692 | ANRITSU, MG3696A | 65 GHZ SIGNAL GENERATOR | 11/11/2022 |
| 00929 | MILLITECH SGH12 | 60-90 GHZ HORN | CNR |

| Test Name: **Spurious Emissions Above 40GHz** | | Test Date: | **5/2/2022** |
|---|---|---|---|
| **Asset #** | **Manufacturer/Model** | **Description** | **Cal. Due** |
| 00528 | AGILENT, E4446A | SPECTRUM ANALYZER | 3/25/2023 |
| 00928 | VIRGINIA DIODES, WR12 | SAX, DOWNCONVERTER | 7/28/2023 |
| 00929 | MILLITECH SGH12 | 60-90 GHZ HORN | CNR |
| 00294 | OML, INC DPLXX | IF/LO DIPLEXER, 12DB | CNR |
| 00083 | AGILENT, 11970U | HF MIXER, HARMONIC | CNR |
| 00054 | AGILENT, 11970V | HF MIXER, HARMONIC | CNR |

| Test Name: **Frequency Stability** | | Test Date: | **5/4/2022** |
|---|---|---|---|
| **Asset #** | **Manufacturer/Model** | **Description** | **Cal. Due** |
| 00776 | TENNY | TJR-A-WS4, CHAMBER | 06//26/2022 |
| 00948 | AGILENT, 8564EC | SPECTRUM ANALYZER | 12/17/2022 |
| 00800 | FLUKE, 87V | DIGITAL MULTIMETER | 02/16/2023 |
| 00093 | KIKISUI | PROGRAMABLE AC POWER | CNR |