

## Test Report

**Prepared for:** Integrity Communications Solutions

**Address:** 4040 E Bijou St. Ste 105,  
Colorado Springs CO, 80909

**Product:** BLDS60-A

**Test Report No:** R20241015-70-E1      **Rev:** B

**Approved by:**



Fox Lane,  
EMC Test Engineer

**DATE:** January 2, 2026

**Total Pages:** 26

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## REVISION PAGE

| Rev. No. | Date             | Description                                    |
|----------|------------------|------------------------------------------------|
| 0        | 4 September 2025 | Issued by FLane<br>Prepared by FLane           |
| A        | 10 November 2025 | Added Timing Measurement<br>Updated IC ID – FL |
| B        | 2 January 2026   | Added data from new device housing – FL        |

|                                                                                  |                |                                    |     |   |
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## 1.0 SUMMARY OF TEST RESULTS

The worst-case measurements were reported in this report. Summary of test results presented in this report correspond to the following section (Please see the checked box below for the rule part used):

The EUT has been tested according to the following specifications:

- (1) US Code of Federal Regulations, Title 47, Part 15.255
- (2) ISED RSS-210 Issue 11
- (3) ISED RSS-Gen, Issue 5

| APPLIED STANDARDS AND REGULATIONS                        |                     |          |
|----------------------------------------------------------|---------------------|----------|
| Standard Section                                         | Test Type           | Result   |
| FCC Part 15.255 (c)(2)(iii)(A)<br>RSS-210 J.3.2 (b)(iii) | EIRP                | Complies |
| FCC Part 15.255 (d)<br>RSS-210 J.4 / J.5                 | Spurious Emissions  | Complies |
| FCC Part 15.255 (f)<br>RSS-210 J.6                       | Frequency Stability | Complies |



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## 2.0 EUT DESCRIPTION

### 2.1 EQUIPMENT UNDER TEST

#### Summary and Operating Condition:

|                               |                                                                                                                                        |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| <b>EUT</b>                    | BLDS60-A                                                                                                                               |
| <b>FCC ID</b>                 | 2BBDH-BLDS60-A                                                                                                                         |
| <b>IC ID</b>                  | 33819-BLDS60A                                                                                                                          |
| <b>EUT Received</b>           | 19 February 2025                                                                                                                       |
| <b>EUT Tested</b>             | 19 February 2025 - 2 January 2026                                                                                                      |
| <b>Serial No.</b>             | 001 (Assigned by the test lab) (separated radar board)<br>002 (Assigned by the test lab) (real world housing)                          |
| <b>Operating Band</b>         | 60 – 64 GHz                                                                                                                            |
| <b>Device Type</b>            | <input checked="" type="checkbox"/> FMCW Radar                                                                                         |
| <b>Power Supply / Voltage</b> | Radar board itself operates off of 5VDC USB-C<br>Device as a whole inside real world housing is powered by Power over Ethernet (48VDC) |

NOTE: For more detailed features description, please refer to the manufacturer's specifications or user's manual.

### 2.2 DESCRIPTION OF TEST MODES

The operating range of the EUT is dependent on the device type found in section 2.1:

Device was tested in 3 modes:

Out of Phase (OOP): 2 antennas transmitting 180 degrees out of phase of each other

In Phase (IP): 2 antennas transmitting 0 degrees out of phase of each other

Single Antenna (SP): 1 antenna transmitting.

Worst case between 3 modes where, applicable, were reported.

Device was in -12dB down mode for radio testing

For Transmissions:

| Channel | Frequency |
|---------|-----------|
| Low     | 60GHz     |
| Mid     | 62 GHz    |
| High    | 63.95 GHz |

These are the only representative channels tested in the frequency range according to FCC Part 15.31 and RSS-Gen Table A1. See the operational description for a list of all channel frequencies and designations.

### 2.3 DESCRIPTION OF SUPPORT UNITS

Device was initially tested using a separated radar board, device worst case emissions and spurious emissions were repeated in real world enclosure. No changes to the radar itself were made, only the enclosure around it.

|                                                                                  |                |                                    |     |   |
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### 3.0 LABORATORY AND GENERAL TEST DESCRIPTION

#### 3.1 LABORATORY DESCRIPTION

All testing was performed at the following Facility:

The Nebraska Center for Excellence in Electronics (NCEE Labs)  
 4740 Discovery Drive  
 Lincoln, NE 68521  
 A2LA Certificate Number: 1953.01  
 FCC Accredited Test Site Designation No: US1060  
 Industry Canada Test Site Registration No: 4294A  
 NCC CAB Identification No: US0177

Environmental conditions varied slightly throughout the tests:

Relative humidity of  $35 \pm 4\%$   
 Temperature of  $22 \pm 3^\circ$  Celsius



#### 3.2 TEST PERSONNEL

| No. | PERSONNEL        | TITLE           | ROLE               |
|-----|------------------|-----------------|--------------------|
| 1   | Fox Lane         | Test Engineer   | Testing and Report |
| 2   | Ethan Schmidt    | Test Engineer   | Testing            |
| 3   | Leighton Jeppson | Test Technician | Testing            |

**Notes:**

All personnel are permanent staff members of NCEE Labs. No testing or review was sub-contracted or performed by sub-contracted personnel.

|                                                                                  |                |                                    |     |   |
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### 3.3 TEST EQUIPMENT

| DESCRIPTION AND MANUFACTURER                              | MODEL NO.                      | SERIAL NO.           | LAST CALIBRATION DATE | CALIBRATION DUE DATE |
|-----------------------------------------------------------|--------------------------------|----------------------|-----------------------|----------------------|
| Keysight MXE Signal Analyzer (44GHz)                      | N9038A                         | MY59050109           | July 14, 2025         | July 15, 2027        |
| Keysight MXE Signal Analyzer (26.5GHz)                    | N9038A                         | MY56400083           | July 15, 2025         | July 16, 2027        |
| SunAR RF Motion                                           | JB1                            | A082918-1            | July 25, 2025         | July 25, 2026        |
| SunAR RF Motion                                           | JB1                            | A082918              | July 16, 2024         | July 16, 2026        |
| ETS EMCO Red Horn Antenna                                 | 3117                           | 00274578             | February 4, 2025      | February 4, 2026     |
| EMCO Horn Antenna                                         | 3116                           | 2576                 | July 31, 2024         | July 31, 2026        |
| Agilent Preamp*                                           | 87405A                         | 3207A01475           | July 18, 2025         | July 18, 2027        |
| RF Cable (preamplifier to antenna)*                       | MFR-57500                      | 01-07-002            | July 18, 2025         | July 18, 2027        |
| ETS Red Preamplifier (Orange)*                            | 3115-PA                        | 00218576             | July 18, 2025         | July 18, 2027        |
| Keysight, External Harmonic Mixer, 75-110G                | M1971W                         | MY56390145           | April 12, 2019        | April 11, 2026       |
| Sage Standard Gain Horn Antenna, 75-110G                  | SAZ-2410-10-S1                 | 16434-01             | CNR                   | CNR                  |
| Cable to M1971W, 75-110G                                  | SLU18-SNM-01.00M               | 121108               | April 12, 2019        | April 11, 2026       |
| Cable to M1970V-002, 75-110G                              | SLU18-SNM-01.00M               | 121099               | April 13, 2019        | April 12, 2026       |
| Keysight, External Harmonic Mixer, 50-80G                 | M1970V-002                     | MY51391050           | April 13, 2019        | April 12, 2026       |
| Pasternack Standard Gain Horn Antenna, 50-80G             | PE9881-24                      | 32/2016              | CNR                   | CNR                  |
| Keysight, External Harmonic Mixer, 220-325G               | M03HLWD                        | 230320-1             | March 20, 2023        | March 19, 2026       |
| Agilent External Harmonic Mixer, 33-50G                   | 11970Q                         | 3903A03916           | CNR                   | CNR                  |
| Pasternack Standard Gain Horn Antenna, 33-50G             | SH122-23                       | SH122-23             | CNR                   | CNR                  |
| OML Diplexer                                              | DPL313B                        | 181004-2             | CNR                   | CNR                  |
| ETS – Lindgren- VSWR on 10m Chamber                       | 10m Semi-anechoic chamber-VSWR | 4740 Discovery Drive | May 15, 2024          | May 15, 2027         |
| NCEE Labs-NSA on 10m Chamber*                             | 10m Semi-anechoic chamber-NSA  | NCEE-001             | May 22, 2024          | May 22, 2026         |
| RF Cables (3m Ant. to Control room Bulkhead)              | MFR-57500                      | 1E3874               | July 18, 2025         | July 18, 2027        |
| RF Cable (antenna to 10m chamber bulkhead)*               | FSCM 64639                     | 01E3872              | July 18, 2025         | July 18, 2027        |
| RF Cable (10m chamber bulkhead to control room bulkhead)* | FSCM 64639                     | 01E3874              | July 18, 2025         | July 18, 2027        |
| RF Cable (control room bulkhead to test receiver)*        | FSCM 64639                     | 01F1206              | July 18, 2025         | July 18, 2027        |
| N connector bulkhead (10m chamber)*                       | PE9128                         | NCEEBH1              | July 18, 2025         | July 18, 2027        |
| N connector bulkhead (control room)*                      | PE9128                         | NCEEBH2              | July 18, 2025         | July 18, 2027        |
| TDK Emissions Lab Software                                | V11.25                         | 700307               | NA                    | NA                   |

\*Internal Characterization

\*\*Device was tested across multiple calibration cycles. Latest calibration cycle is reported above. All equipment was in calibration at time of testing.

#### Notes:

All equipment is owned by NCEE Labs and stored permanently at NCEE Labs facilities.



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3.4 GENERAL TEST PROCEDURE AND SETUP FOR RADIO MEASUREMNTS

Measurement type presented in this report (Please see the checked box below):

Conducted ☒

The conducted measurements were performed by connecting the output of the transmitter directly into a spectrum analyzer using an impedance matched cable and connector soldered to the EUT in place of the antenna. The information regarding resolution bandwidth, video bandwidth, span and the detector used can be found in the graphs provided in Appendix C. All the radio measurements were performed using the sections from ANSI 63.26.

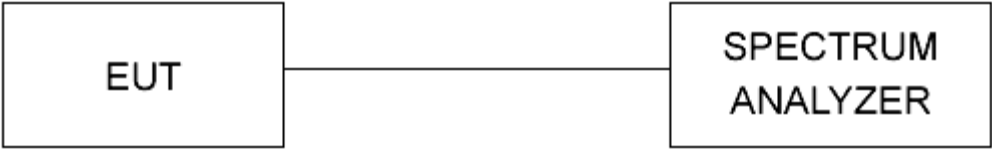


Figure 1 - Bandwidth Measurements Test Setup

# Radiated ☒

All the radiated measurements were taken at a distance of 3m from the EUT. The information regarding resolution bandwidth, video bandwidth, span and the detector used can be found in the graphs provided in Appendix C. All the radio measurements were performed using the sections from ANSI 63.26.

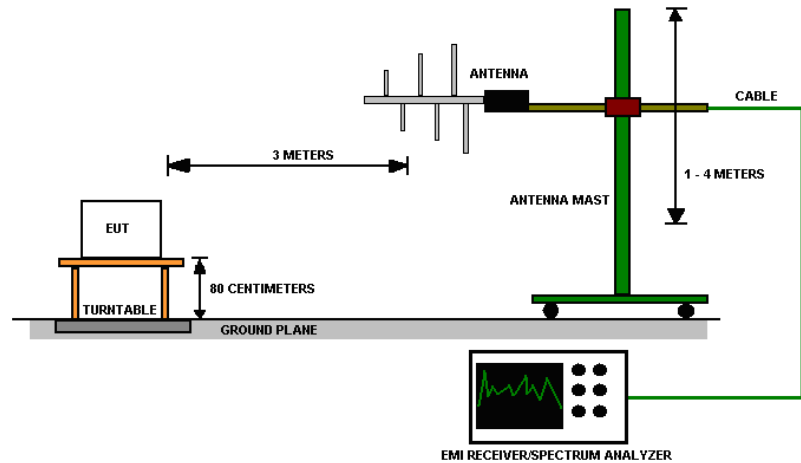


Figure 2 - Radiated Emissions Test Setup

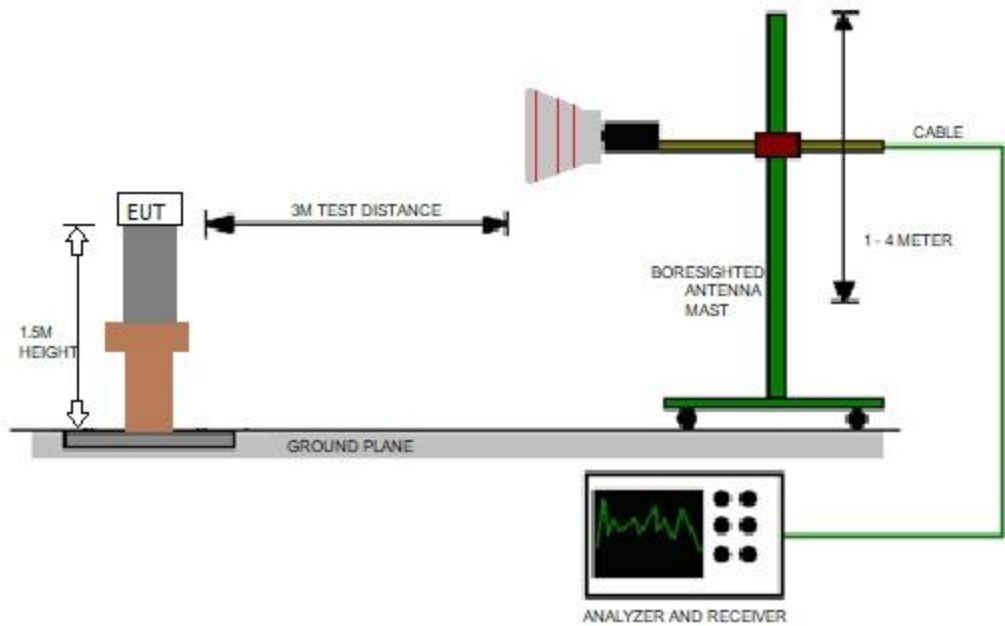


Figure 3 - Radiated Emissions Test Setup



|                |                                    |     |   |
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#### 4.0 RESULTS

| Fundamental - Peak |           |                         |                     |                   |                 |                       |                    |        |                                    |        |
|--------------------|-----------|-------------------------|---------------------|-------------------|-----------------|-----------------------|--------------------|--------|------------------------------------|--------|
| Channel            | Frequency | SA Reading (Peak) (SAR) | Antenna Factor (AF) | Mixer Factor (MF) | Cable loss (CL) | FS Level (Peak) (FSL) | Test Distance (TD) | EIRP   | EIRP Limit Part 15.255 (c)(2)(iii) | Margin |
|                    | GHz       | dBm                     | dB                  | dB                | dB              | dBm                   | m                  | dBm    | dBm                                | dB     |
| Low                | 60.000    | -37.589                 | 42.827              | 0                 | 0               | 5.238                 | 1                  | 7.468  | 14                                 | 6.532  |
| Mid                | 62.000    | -32.276                 | 43.111              | 0                 | 0               | 10.835                | 1                  | 13.065 | 14                                 | 0.935  |
| High               | 64.000    | -32.116                 | 43.387              | 0                 | 0               | 11.271                | 1                  | 13.501 | 14                                 | 0.499  |

All other spurious emissions >18GHz were found to be at least 10dB below limit and were not tabulated.



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#### 4.1 OUTPUT POWER/FIELD STRENGTH

**Test Method:**

All the radio measurements were performed using the sections from ANSI C63.26 Sec. 5.2.4.3

**Limits of field strength measurements:****For FCC 47 CFR 15.255(c)(2)(iii):**

The peak EIRP shall not exceed 14 dBm, and the sum of continuous transmitter off-times of at least two milliseconds shall equal at least 25.5 milliseconds within any contiguous interval of 33 milliseconds, except as specific in paragraph (c)(2)(iii)(B) of this section;

**RSS-210 Annex J.3.2(iii):**

the peak e.i.r.p. shall not exceed 14 dBm and the sum of continuous transmitter off-times of at least 2 ms shall equal at least 25.5 ms within any contiguous interval of 33 ms

**Test procedures:**

Details can be found in section 3.4 of this report.

**Deviations from test standard:**

No deviation.

**Test setup:**

Details can be found in section 3.4 of this report.

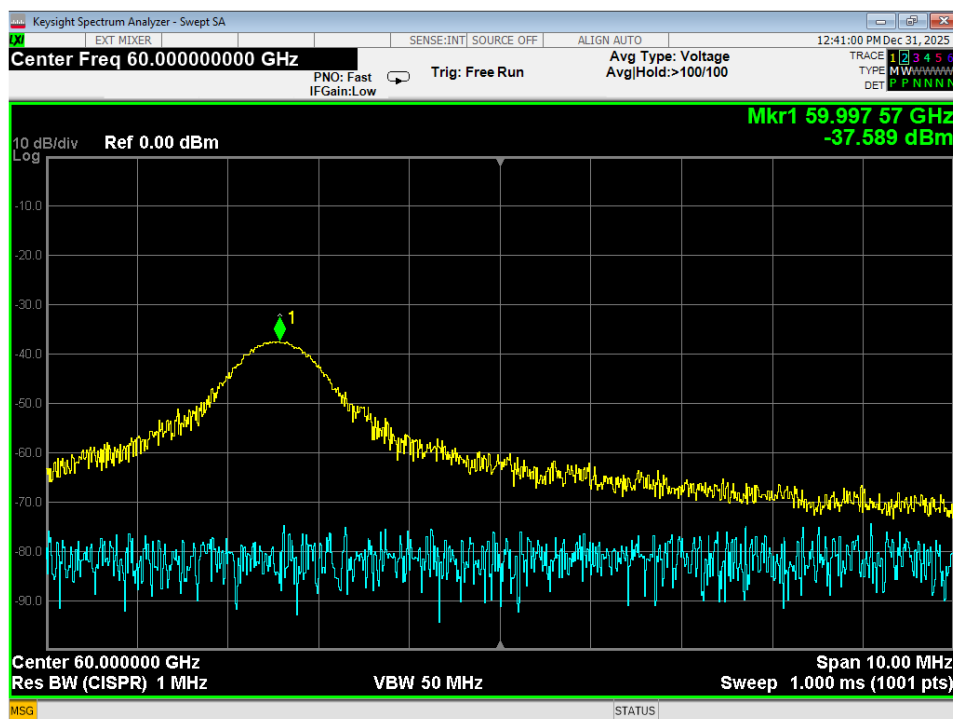
**EUT operating conditions:**

Details can be found in section 2.1 of this report.

**Test results:****Pass****Comments:**

1. All the measurements were found to be compliant.
2. Compiled values can be found in the Results section, 4.
3. Peak results compared against average limit to show compliance.

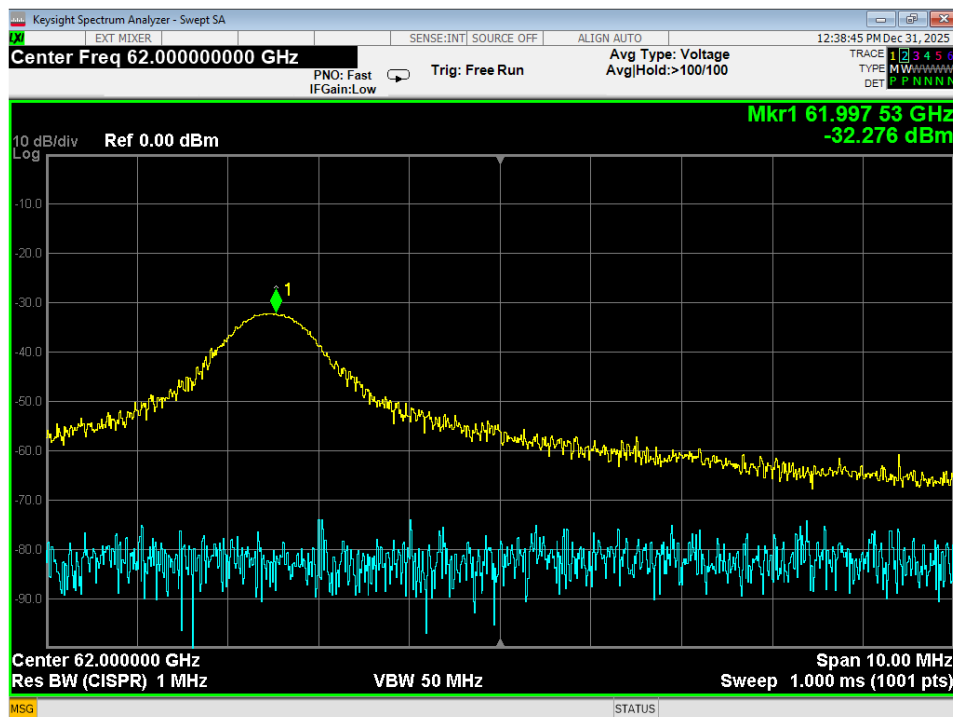
|                                                                                  |                |                                    |     |   |
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**Figure 4 - Analyzer Measurement – Fundamental, Low Channel**

Uncorrected measurement as recorded on spectrum analyzer.

See section 4.0 for tabulated data

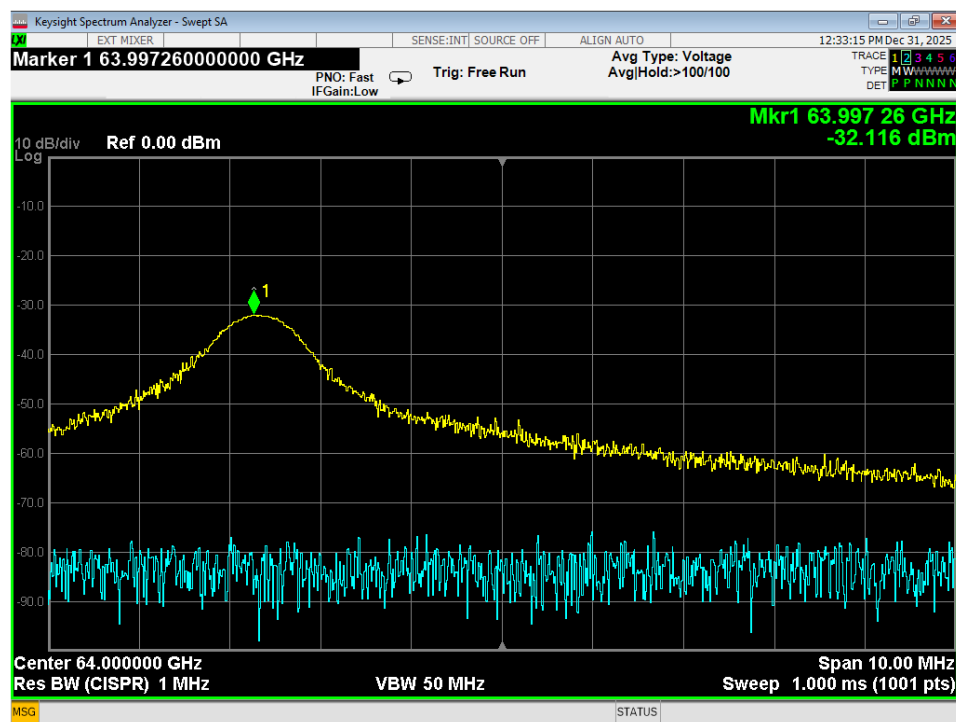


**Figure 5 - Analyzer Measurement – Fundamental, Mid Channel**

Uncorrected measurement as recorded on spectrum analyzer.

See section 4.0 for tabulated data

|                |                                    |     |   |
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**Figure 6 - Analyzer Measurement – Fundamental, High Channel**  
Uncorrected measurement as recorded on spectrum analyzer.  
See section 4.0 for tabulated data

|                                                                                  |                |                                    |     |   |
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## 4.2 BANDWIDTH

### Test Method:

All the radio measurements were performed using the sections from ANSI C63.26 Sec. 5.4

### Limits of bandwidth measurements:

#### For FCC Part 15.255 Device:

Device must remain within the allotted band.

### Test procedures:

Details can be found in section 3.4 of this report.

### Deviations from test standard:

No deviation.

### Test setup:

Test setup details can be found in section 3.4 of this report.

### EUT operating conditions:

Details can be found in section 2.1 of this report.

### Test results:

## Pass

#### Comments:

1. All the measurements were found to be compliant.
2. Device is an FMCW device however we could not put device into continuous CW operation, lowest possible BW achievable was used for testing purposes

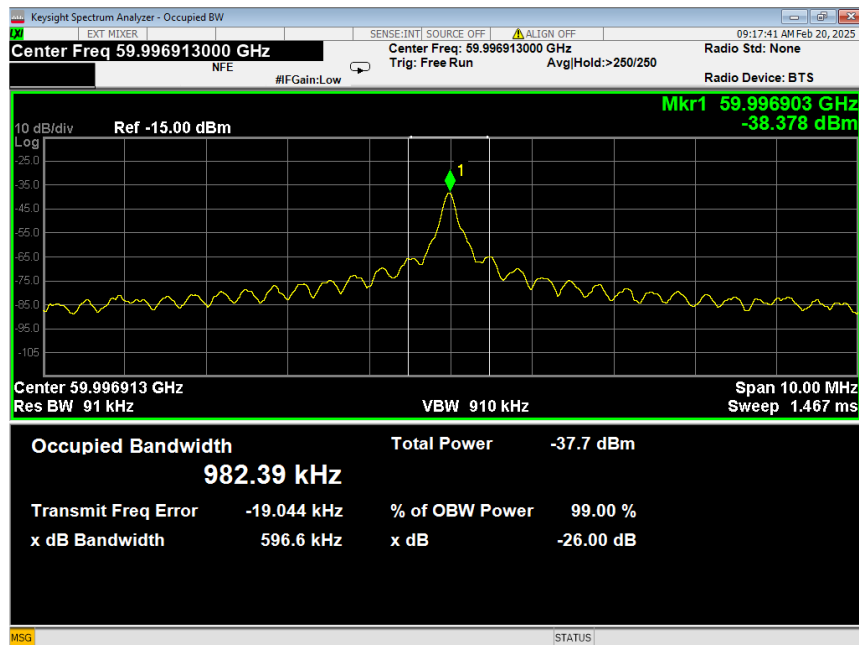


Figure 7 - Analyzer Measurement – 99% Bandwidth



|                |                                    |     |   |
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#### 4.3 RADIATED EMISSIONS

**Test Method:** ANSI C63.26 Sec. 5.5

**Limits for radiated emissions measurements:**

Radiated emissions below 40 GHz shall not exceed the general limits in §15.209.

| FREQUENCIES<br>(MHz) | FIELD<br>STRENGTH<br>( $\mu$ V/m) | MEASUREMENT<br>DISTANCE (m) |
|----------------------|-----------------------------------|-----------------------------|
| 0.009-0.490          | 2400/F(kHz)                       | 300                         |
| 0.490-1.705          | 24000/F(kHz)                      | 30                          |
| 1.705-30.0           | 30                                | 3                           |
| 30-88                | 100                               | 3                           |
| 88-216               | 150                               | 3                           |
| 216-960              | 200                               | 3                           |
| Above 960            | 500                               | 3                           |

Between 40 GHz and 200 GHz, the level of these emissions shall not exceed 90 pW/cm<sup>2</sup> at a distance of 3 meters.

The levels of the spurious emissions shall not exceed the level of the fundamental emission.

**NOTE:**

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 \* log \* Emission level ( $\mu$ V/m).
3. The EUT was tested for spurious emissions. The worst-case emissions are presented.



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**Test procedures:**

- a. The EUT was placed on the top of a rotating table above the ground plane in a 10-meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. The table was 0.8m high for measurements from 30MHz-1Ghz and 1.5m for measurements from 1GHz and higher. For measurements >18GHz EUT was placed before a high frequency horn antenna and rotated to emit worst case emissions. Distance was varied, see corresponding section for details.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna was a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are used to make the measurement.
- d. For each suspected emission, the EUT was arranged to maximize its emissions and then the antenna height was varied from 1 meter to 4 meters and the rotating table was turned from 0 degrees to 360 degrees to find the maximum emission reading.
- e. The test-receiver system was set to use a peak detector with a specified resolution bandwidth. For spectrum analyzer measurements, the composite maximum of several analyzer sweeps was used for final measurements.
- f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise, the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- g. The EUT was maximized in all 3 orthogonal positions. The results are presented for the axis that had the highest emissions.

**NOTE:**

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequencies below 1GHz.
2. The resolution bandwidth was 1 MHz for all measurements and at frequencies above 1GHz, A peak detector and average detector was used for all measurements above 1GHz. Measurements were made with an EMI Receiver.

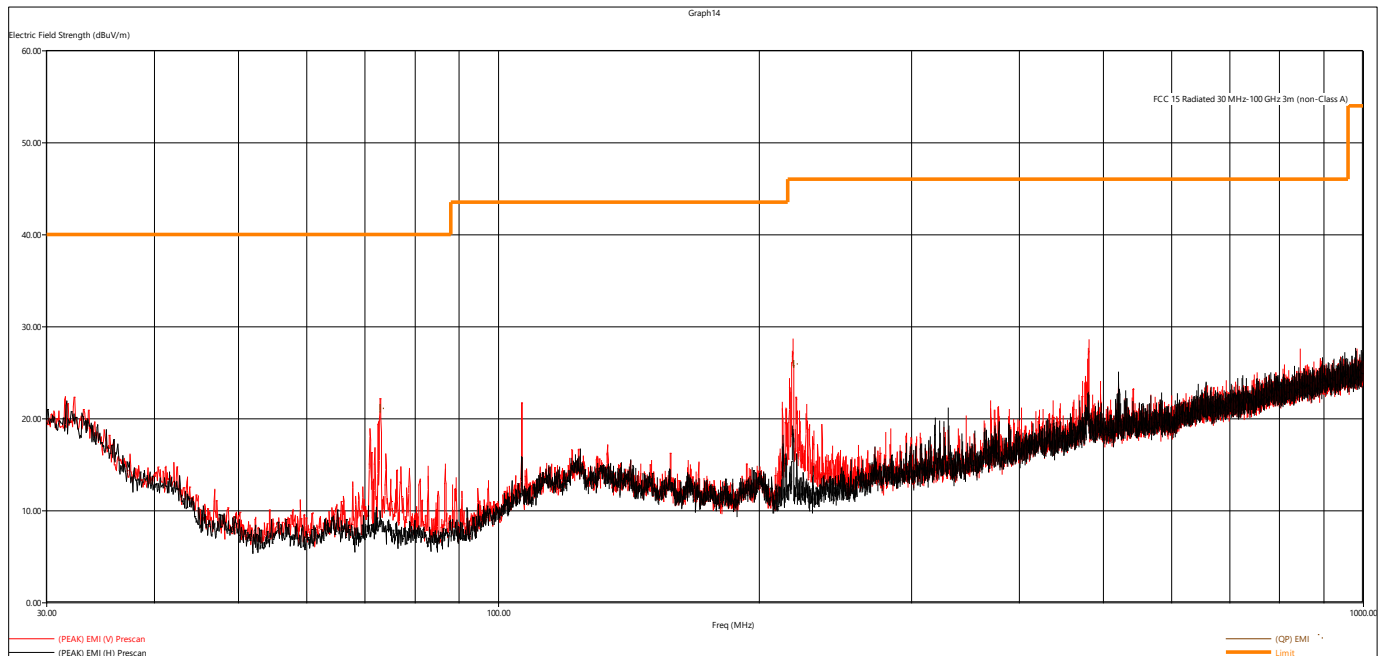
**Deviations from test standard:**

No deviation.

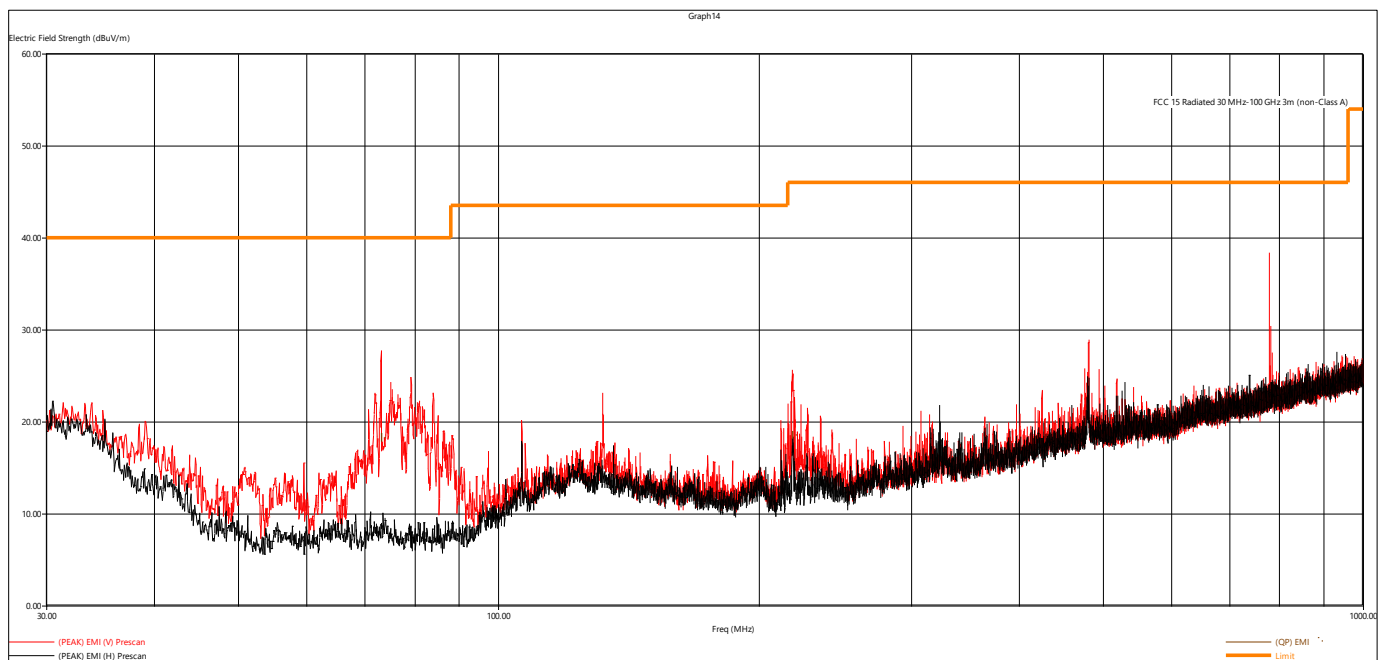
**EUT operating conditions**

Details can be found in section 2.1 of this report.

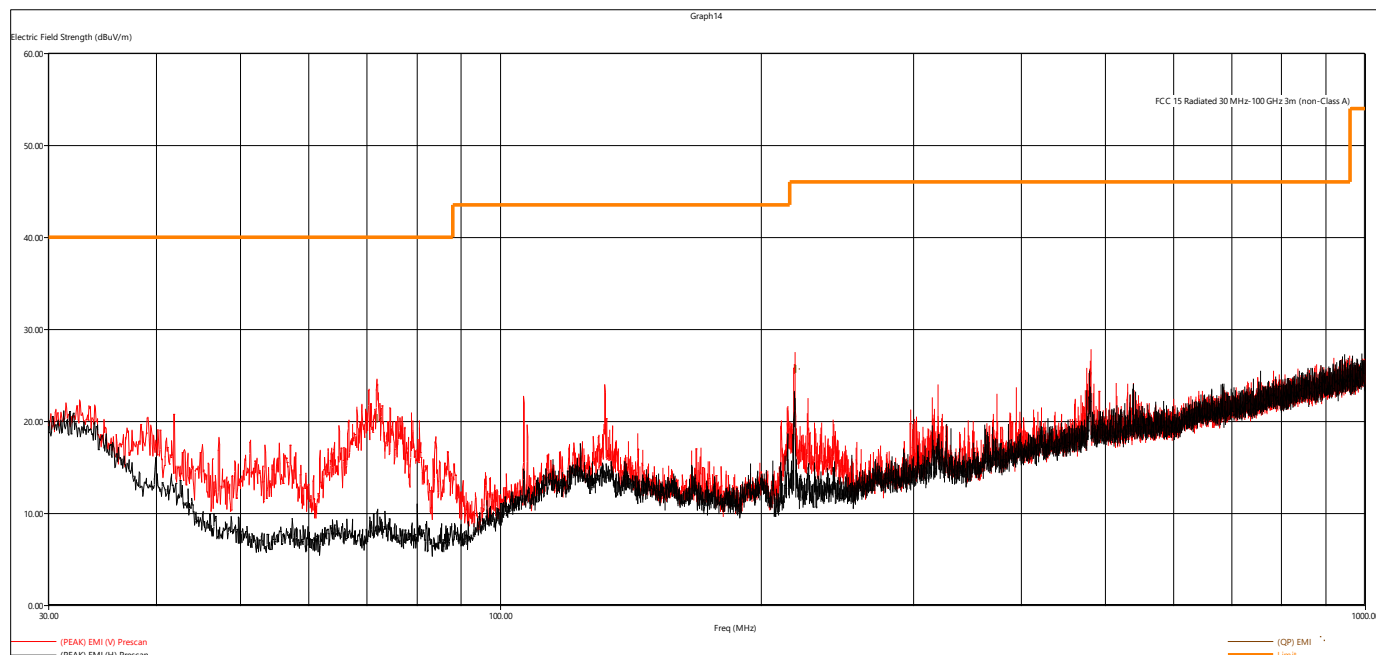
**Test results:**



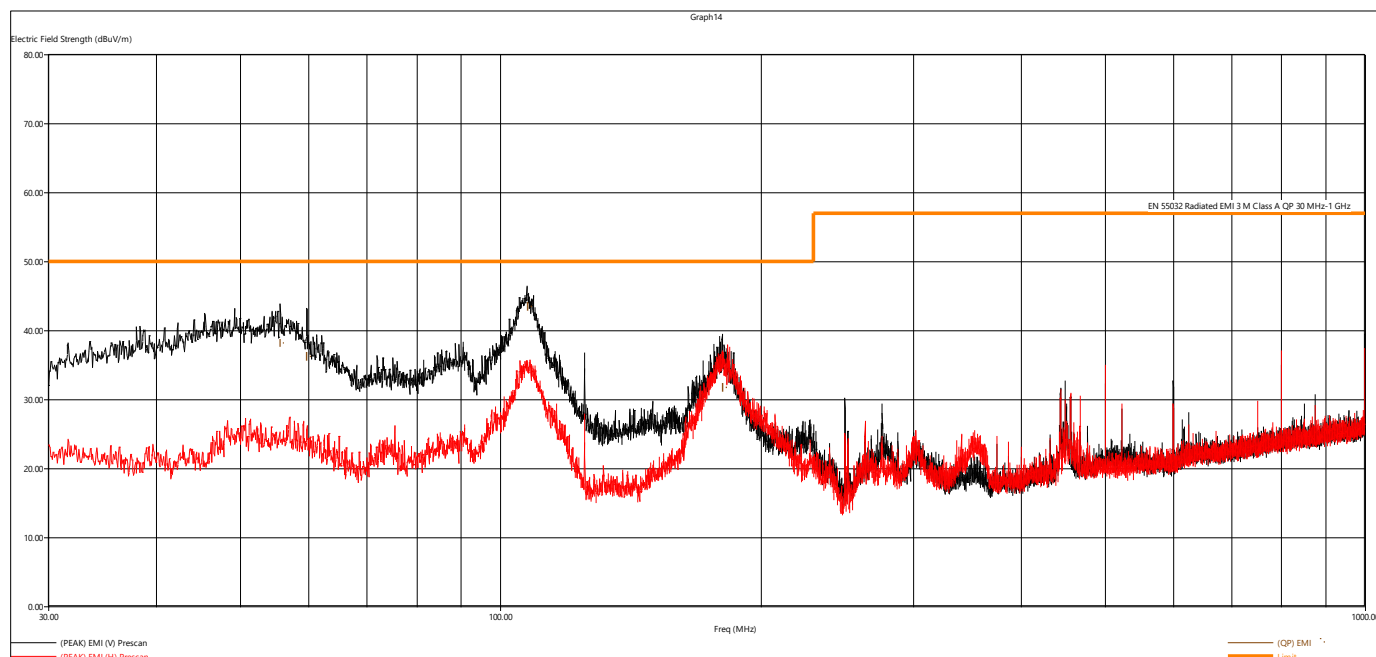
**Figure 8 - Radiated Emissions Plot, 30MHz – 1GHz, 60GHz**



**Figure 9 - Radiated Emissions Plot, 30MHz – 1GHz, 62GHz**



**Figure 10 - Radiated Emissions Plot, 30MHz – 1GHz, 64GHz**



**Figure 11 - Radiated Emissions Plot, 30MHz – 1GHz, Hopping, in real world housing, PoE**

Emissions were found to be from PoE power supply and other auxiliary equipment which would be classified under Class A limits and were not tabulated

#### REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB)
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Limit value – Emission level



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| Quasi-Peak Measurements |              |              |        |        |        |     |         |
|-------------------------|--------------|--------------|--------|--------|--------|-----|---------|
| Frequency               | Level        | Limit        | Margin | Height | Angle  | Pol | Channel |
| MHz                     | dB $\mu$ V/m | dB $\mu$ V/m | dB     | cm.    | deg.   |     |         |
| 73.020480               | 21.03        | 40.00        | 18.97  | 129.04 | 345.25 | V   | Low     |
| 218.882160              | 25.83        | 46.02        | 20.19  | 188.80 | 188.75 | V   | Low     |
| 73.005600               | 18.22        | 40.00        | 21.78  | 146.47 | 289.50 | V   | Mid     |
| 218.569200              | 18.49        | 46.02        | 27.53  | 200.92 | 217.50 | V   | Mid     |
| 71.867520               | 20.25        | 40.00        | 19.75  | 113.28 | 272.50 | V   | High    |
| 218.718720              | 25.61        | 46.02        | 20.41  | 216.20 | 192.00 | V   | High    |

Emissions >1GHz were investigated, all other emissions were found to be at least 6dB below the appropriate limits.  
Other test channels/frequencies were investigated, worst case was reported.

| Peak Measurements |              |              |        |        |        |     |         |
|-------------------|--------------|--------------|--------|--------|--------|-----|---------|
| Frequency         | Level        | Limit        | Margin | Height | Angle  | Pol | Channel |
| MHz               | dB $\mu$ V/m | dB $\mu$ V/m | dB     | cm.    | deg.   |     |         |
| 1065.094000       | 42.90        | 73.98        | 31.08  | 140.44 | 181.50 | V   | Low     |
| 11979.756000      | 47.89        | 73.98        | 26.09  | 361.46 | 221.25 | H   | Low     |
| 1066.686000       | 47.30        | 73.98        | 26.68  | 485.22 | 315.75 | V   | Mid     |
| 1065.302000       | 41.79        | 73.98        | 32.19  | 133.82 | 43.50  | V   | High    |

| Average Measurements |              |              |        |        |        |     |         |
|----------------------|--------------|--------------|--------|--------|--------|-----|---------|
| Frequency            | Level        | Limit        | Margin | Height | Angle  | Pol | Channel |
| MHz                  | dB $\mu$ V/m | dB $\mu$ V/m | dB     | cm.    | deg.   |     |         |
| 1065.094000          | 29.15        | 53.98        | 24.83  | 140.44 | 181.50 | V   | Low     |
| 11979.756000         | 34.76        | 53.98        | 19.22  | 361.46 | 221.25 | H   | Low     |
| 1066.686000          | 27.80        | 53.98        | 26.18  | 485.22 | 315.75 | V   | Mid     |
| 1065.302000          | 27.89        | 53.98        | 26.09  | 133.82 | 43.50  | V   | High    |

\*\*Emissions were investigated up to 200GHz, all other emissions found to be below labs noise floor, all emissions found to be at least 10dB below limit line



|                |                                    |     |   |
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#### 4.4 FREQUENCY ERROR

**Test Method:**

All the radio measurements were performed using the sections from ANSI C63.26 Sec. 5.6

**Limits of Frequency Error:**

**eCFR 15.255(f):**

Fundamental emissions must be contained within the frequency bands specified in this section during all conditions of operation. Equipment is presumed to operate over the temperature range -20 to +50 degrees Celsius with an input voltage variation of 85% to 115% of rated input voltage, unless justification is presented to demonstrate otherwise.

**Test procedures:**

Details can be found in section 3.4 of this report.

**Deviations from test standard:**

Temperature range tested -20C to 55C

Device is USB powered voltage intake is based on USB standard 5VDC.

Voltage variation was not investigated

**Test setup:**

Test setup details can be found in section 3.4 of this report.

**EUT operating conditions:**

Details can be found in section 2.1 of this report.

**Test results:**

**Pass**

Comments:

NA



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| Temperature Deviation |               |                       |          |            |
|-----------------------|---------------|-----------------------|----------|------------|
| Temperature (°C)      | Voltage (VDC) | Frequency Error (kHz) |          |            |
|                       |               | Ch 1                  | Ch 2     | Ch 3       |
|                       |               | 76.3 GHz              | 76.4 GHz | 76.482 GHz |
| -20°C                 | 12            | 352                   | 335      | 444        |
| 0°C                   | 12            | -850                  | -980     | -1070      |
| 20°C                  | 12            | -2050                 | -1980    | -2043      |
| 40°C                  | 12            | -3330                 | -3300    | -353       |
| 50°C                  | 12            | -3820                 | -3810    | -3920      |
| 55°C                  | 12            | -3970                 | -3960    | -4250      |



|                |                                    |     |   |
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#### 4.5 OFF-TIMES

**Test Method:**

All the radio measurements were performed using the sections from ANSI C63.26 Sec. 5.2.4.3.4

**Limits of bandwidth measurements:****For FCC Part 15.255 Device:****For RSS-210 Annex J Device:**

The peak EIRP shall not exceed 14 dBm, and the sum of continuous transmitter off-times of at least two milliseconds shall equal at least 25.5 milliseconds within any contiguous interval of 33 milliseconds, except as specific in paragraph (c)(2)(iii)(B) of this section;

**Test procedures:**

Details can be found in section 3.4 of this report.

**Deviations from test standard:**

No deviation.

**Test setup:**

Test setup details can be found in section 3.4 of this report.

**EUT operating conditions:**

Details can be found in section 2.1 of this report.

**Test results:****Pass****Comments:**

1. All the measurements were found to be compliant.

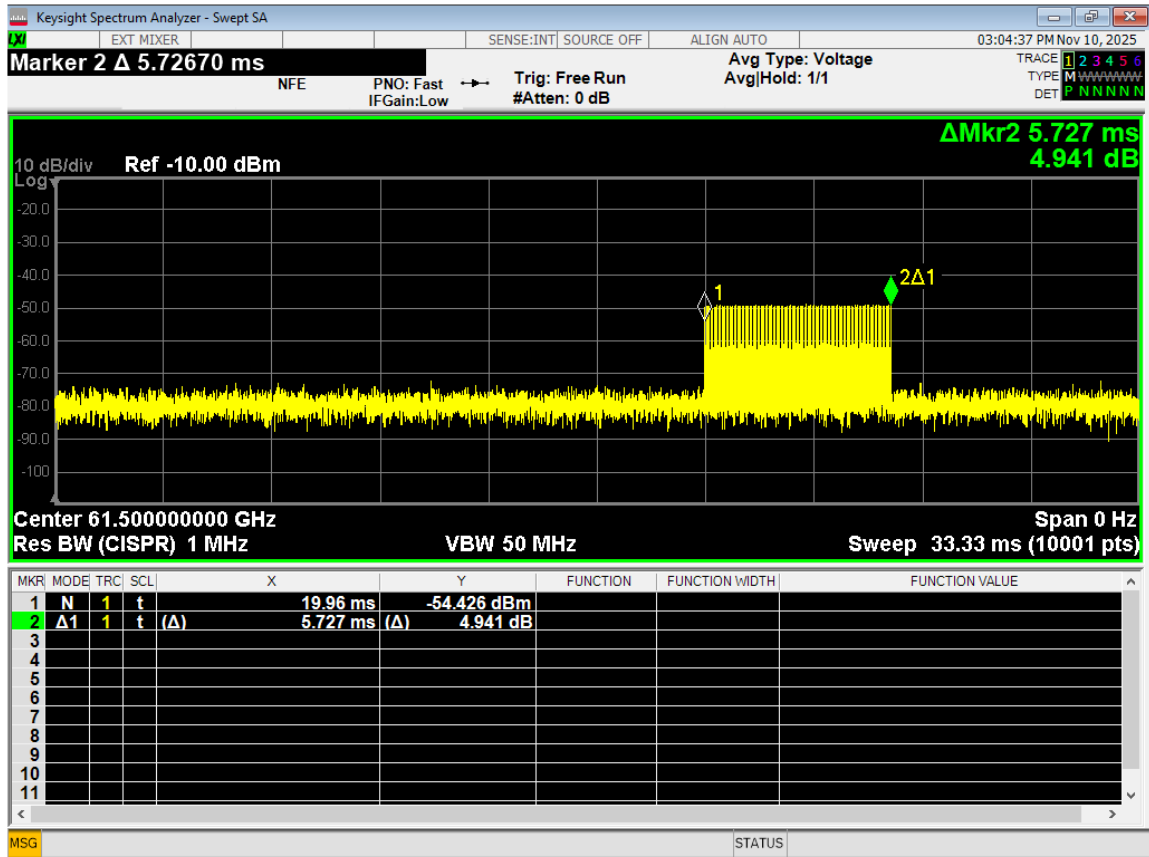


Figure 12 - Analyzer Measurement – OFF-Time Timing Measurement

Total sweep time – ON time = OFF time  
 33ms – 5.727ms = **27.273ms**

|                                                                                  |                |                                    |     |   |
|----------------------------------------------------------------------------------|----------------|------------------------------------|-----|---|
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## APPENDIX A: SAMPLE CALCULATION

### Field Strength Calculation

The field strength is calculated by adding the Antenna Factor, Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF - (-CF + AG) + AV$$

where FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Attenuation Factor

AG = Amplifier Gain

AV = Averaging Factor (if applicable)

Assume a receiver reading of 55 dB $\mu$ V is obtained. The Antenna Factor of 12 and a Cable Factor of 1.1 is added. The Amplifier Gain of 20 dB is subtracted, giving a field strength of 48.1 dB $\mu$ V/m.

$$FS = 55 + 12 - (-1.1 + 20) + 0 = 48.1 \text{ dB}\mu\text{V/m}$$

The 48.1 dB $\mu$ V/m value can be mathematically converted to its corresponding level in  $\mu$ V/m.

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm} [(48.1 \text{ dB}\mu\text{V/m})/20] = 254.1 \mu\text{V/m}$$

AV is calculated by taking the  $20 \cdot \log(T_{\text{on}}/100)$  where  $T_{\text{on}}$  is the maximum transmission time in any 100ms window.

### EIRP Calculations

In cases where direct antenna port measurement is not possible or would be inaccurate, output power is measured in EIRP. The maximum field strength is measured at a specified distance and the EIRP is calculated using the following equation;

$$EIRP (\text{Watts}) = [\text{Field Strength (V/m)} \times \text{antenna distance (m)}]^2 / 30$$

$$\text{Power (watts)} = 10^{[\text{Power (dBm)}]/10} / 1000$$

$$\text{Voltage (dB}\mu\text{V)} = \text{Power (dBm)} + 107 \text{ (for } 50\Omega \text{ measurement systems)}$$

$$\text{Field Strength (V/m)} = 10^{[\text{Field Strength (dB}\mu\text{V/m)} / 20] / 10^6}$$

$$\text{Gain} = 1 \text{ (numeric gain for isotropic radiator)}$$

Conversion from 3m field strength to EIRP (d=3):

$$EIRP = [FS(\text{V/m}) \times d^2]/30 = FS [0.3] \text{ for } d = 3$$

$$EIRP (\text{dBm}) = FS(\text{dB}\mu\text{V/m}) - 10(\log 10^9) + 10\log[0.3] = FS(\text{dB}\mu\text{V/m}) - 95.23$$

$10\log(10^9)$  is the conversion from micro to milli.



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APPENDIX B – MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been for tests performed in this test report:

| Test                   | Frequency Range | Uncertainty Value (dB) |
|------------------------|-----------------|------------------------|
| Radiated Emissions, 3m | 30MHz - 1GHz    | ±4.31                  |
| Radiated Emissions, 3m | 1GHz - 18GHz    | ±5.08                  |
| Emissions, conducted   | 30MHz – 18GHz   | ±3.03                  |

Expanded uncertainty values are calculated to a confidence level of 95%.



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