

## FCC/ISED TEST REPORT

**Prepared for:** Aerostar International

**Address:** 205 E 6th Street.  
Sioux Falls, SD 57104, USA

**Product:** HiPointer 100

**Test Report No:** R20210412-23-E1C

**Approved By:**   
Nic Johnson,  
Technical Manager

**DATE:** November 3, 2023

**Total Pages:** 37

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|                                                                                  |                |                        |     |   |
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## REVISION PAGE

| Rev. No. | Date            | Description                                                       |
|----------|-----------------|-------------------------------------------------------------------|
| 0        | 24 January 2023 | Issued by NJohnson<br>Reviewed by FLane<br>Prepared by KVepuri    |
| A        | 15 March 2023   | Removed references to Part 90                                     |
| B        | 31 August 2023  | Added Frequency ppm error to table - FL                           |
| C        | 10 October 2023 | Added calculation for Freq Stability – FL<br>Approved by NJohnson |

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

The worst-case measurements were reported in this report. The EUT has been tested according to the following specifications:

| <b>FCC Part 80 requirements</b><br><b>Test Method:</b> IEEE ANSI C63.26-2015, TIA-603-D |                   | Result |
|-----------------------------------------------------------------------------------------|-------------------|--------|
| Test                                                                                    | FCC Rule Part     |        |
| RF Output Power                                                                         | Part 80.215(a)(3) | Pass   |
| Modulation characteristics                                                              | Part 80.213 (g)   | Pass   |
| Occupied bandwidth                                                                      | Part 80.205(a)    | Pass   |
| Spurious emissions at antenna terminals                                                 | Part 80.211(f)    | Pass   |
| Field strength of spurious emission                                                     | Part 80.211(f)    | Pass   |
| Frequency Stability                                                                     | Part 80.209(b)    | Pass   |
| Tested in temperature chamber set to high and low of mfg specs                          |                   |        |

See Section 4 for details on the test methods used for each test.

|                                                                                  |                |                        |     |   |
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## 2.0 EUT DESCRIPTION

### 2.1 EQUIPMENT UNDER TEST

|                       |                                           |
|-----------------------|-------------------------------------------|
| <b>Model</b>          | HiPointer 100                             |
| <b>EUT Received</b>   | 25 July 2022                              |
| <b>EUT Tested</b>     | 25 July 2022- 4 November 2022             |
| <b>Serial No.</b>     | NCEETEST1 (Assigned by the test lab)      |
| <b>Operating Band</b> | 9410 MHz – 9463 MHz                       |
| <b>Device Type</b>    | Licensed Radio                            |
| <b>Power Supply</b>   | 24VDC battery (2 X 12 V Marine batteries) |

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

### 2.2 DESCRIPTION OF TEST MODES

The EUT operates on, and was tested at the frequencies below:

| Mode | CHANNEL<br>FREQUENCY<br>(MHz) |
|------|-------------------------------|
| A    | 9410.000000                   |
| B    | 9413.000000                   |
| C    | 9460.000000                   |
| D    | 9463.000000                   |

See the operational description for a list of all channel frequency and designations.

This EUT was set to transmit in a worst-case scenario. The manufacturer modified the unit to transmit continuously on four different modes.

### 2.3 DESCRIPTION OF SUPPORT UNITS

NA

|                                                                                  |                |                        |     |   |
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### 3.0 LABORATORY 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-1  
 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

All testing was performed by Karthik Vepuri and Fox Lane of NCEE Labs. The results were reviewed by Karthik Vepuri and Nic Johnson.

|                                                                                  |                |                        |     |   |
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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 19, 2022         | July 19, 2024        |
| Keysight MXE Signal Analyzer (26.5GHz)***                 | N9038A        | MY56400083 | July 19, 2022         | July 19, 2024        |
| Keysight EXA Signal Analyzer**                            | N9010A        | MY56070862 | July 20, 2021         | July 20, 2023        |
| SunAR RF Motion                                           | JB1           | A091418-1  | July 26, 2022         | July 26, 2023        |
| EMCO Horn Antenna**                                       | 3115          | 6416       | July 28, 2021         | July 28, 2023        |
| Rohde & Schwarz Preamplifier*                             | TS-PR18       | 3545700803 | March 21, 2022        | March 21, 2024       |
| 8447F POT H64 Preamplifier                                | 8447F POT H64 | 3113AD4667 | March 21, 2022        | March 21, 2024       |
| TDK Emissions Lab Software                                | V11.25        | 700307     | NA                    | NA                   |
| RF Cable (preamplifier to antenna)*                       | MFR-57500     | 01-07-002  | March 21, 2022        | March 21, 2024       |
| RF Cable (antenna to 10m chamber bulkhead)*               | FSCM 64639    | 01E3872    | September 24, 2021    | September 24, 2023   |
| RF Cable (10m chamber bulkhead to control room bulkhead)* | FSCM 64639    | 01E3864    | September 24, 2021    | September 24, 2023   |
| RF Cable (control room bulkhead to test receiver)*        | FSCM 64639    | 01F1206    | September 24, 2021    | September 24, 2023   |
| N connector bulkhead (10m chamber)*                       | PE9128        | NCEEBH1    | September 24, 2021    | September 24, 2023   |
| N connector bulkhead (control room)*                      | PE9128        | NCEEBH2    | September 24, 2021    | September 24, 2023   |

\*Internal Characterization

| Serial No. | Manufacturer    | Model          | Description           | Last Cal.   | Calibration due |
|------------|-----------------|----------------|-----------------------|-------------|-----------------|
| 2576       | ETS             | 3116           | Horn Antenna          | 9 Mar 2020  | 9 Mar 2023**    |
| MY51391050 | Keysight        | M1970V-002     | Mixer, 50 – 80 GHz    | 13 Apr 2019 | 13 Apr 2023*    |
| 700307     | V11.25          | 700307         | TDK Emissions Lab S/W | NA          | NA              |
| 32/2016    | Pasternack      | PE9881-24      | WR-15 Horn Antenna    | CNR***      | CNR***          |
| 16434-01   | Sage Millimeter | SAZ-2410-10-S1 | WR-10 Horn Antenna    | CNR***      | CNR***          |
| 3903A03916 | Agilent         | 11970Q         | Mixer, 33 – 50 GHz    | CNR****     | CNR****         |
| Ncee1      | Pasternack      | SH122-23       | WR-22 Horn Antenna    | CNR***      | CNR***          |
| 181004-2   | OML             | DPL313B        | Diplexer              | CNR****     | CNR****         |

All mixers and pre-amplifiers were calibrated with associated cables.

\*4 Year Cal \*\* 3 Year Cal \*\*\*\*Calibration Not Required, internal verification \*\*\*Calibration not required, standard gain horn antenna.

|                                                                                  |                |                        |     |   |
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## 4.0 DETAILED RESULTS

### 4.1 UNWANTED EMISSIONS & FIELD STRENGTH OF EMISSIONS

**Test Method:** ANSI C63.26:2015:  
Section 5.5, "Radiated Emissions Testing"

**Limits for field strength of emissions measurements:**  
**47 CFR 80.211(f):**

The mean power when using emissions other than those in paragraphs (a), (b), (c) and (d) of this section:

- (1) On any frequency removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: At least 25 dB;
- (2) On any frequency removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: At least 35 dB; and
- (3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 plus  $10\log_{10}$  (mean power in watts) dB.

**Test procedures:**

The EUT was connected directly to a spectrum analyzer using attenuators to protect the test equipment. Analyzer measurement settings can be found in the plots below along with the corresponding power levels.

All Radiated Emissions were performed at 3m test distance.

**Deviations from test standard:**

No deviation.

|                                                                                  |                |                        |     |   |
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## Test setup:

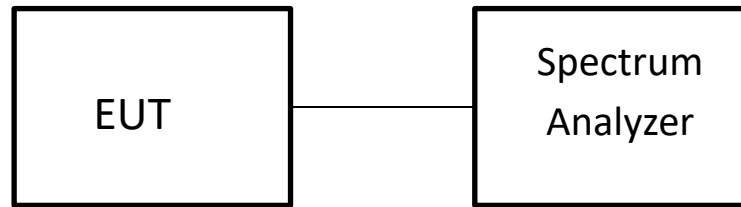


Figure 1 - Conducted Spurious Test Setup

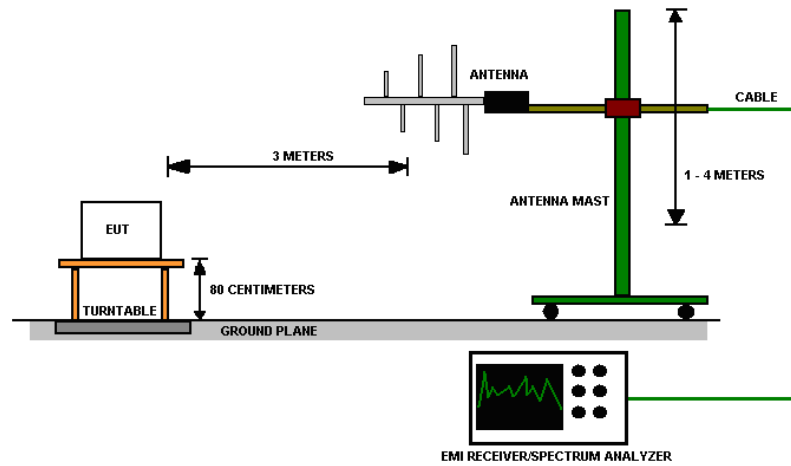


Figure 2 - Radiated Emissions Test Setup

**EUT operating conditions**  
See Section 2.1 & 2.2

|                                                                                  |                |                        |     |   |
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### Test results:

Only worst-case measurements were reported. The EUT was evaluated by following the recommendation in C63.26 Section 5.1.1 (a) (1).

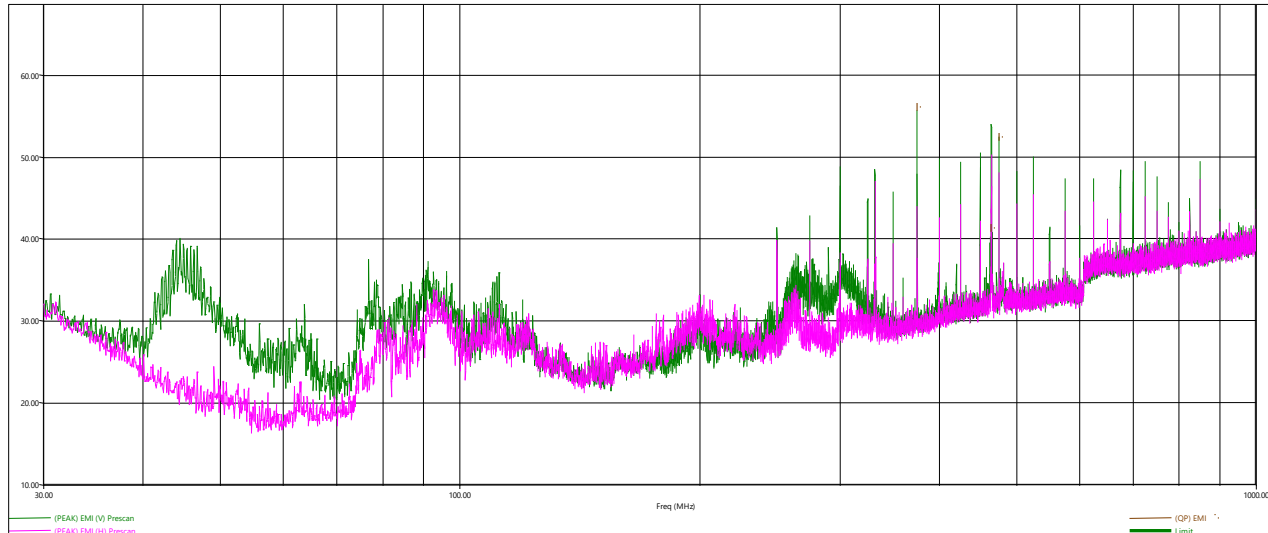


Figure 3 - Conducted Unwanted Emissions Plot, 30 MHz -1 GHz

\*Limit is 82.23dBuV/m – all the radiated measurements were found to be at least 6dB below the limit-Pass.

### Limit Calculation:

$43 + 10\log(100) = 63$ ;  $50\text{dBm} - 63 = -13\text{ dBm}$ ;  $3\text{m limit in dBuV/m} = 95.23 - 13\text{ dBm} = 82.23\text{ dBuV/m}$

|                                                                                  |                |                        |     |   |
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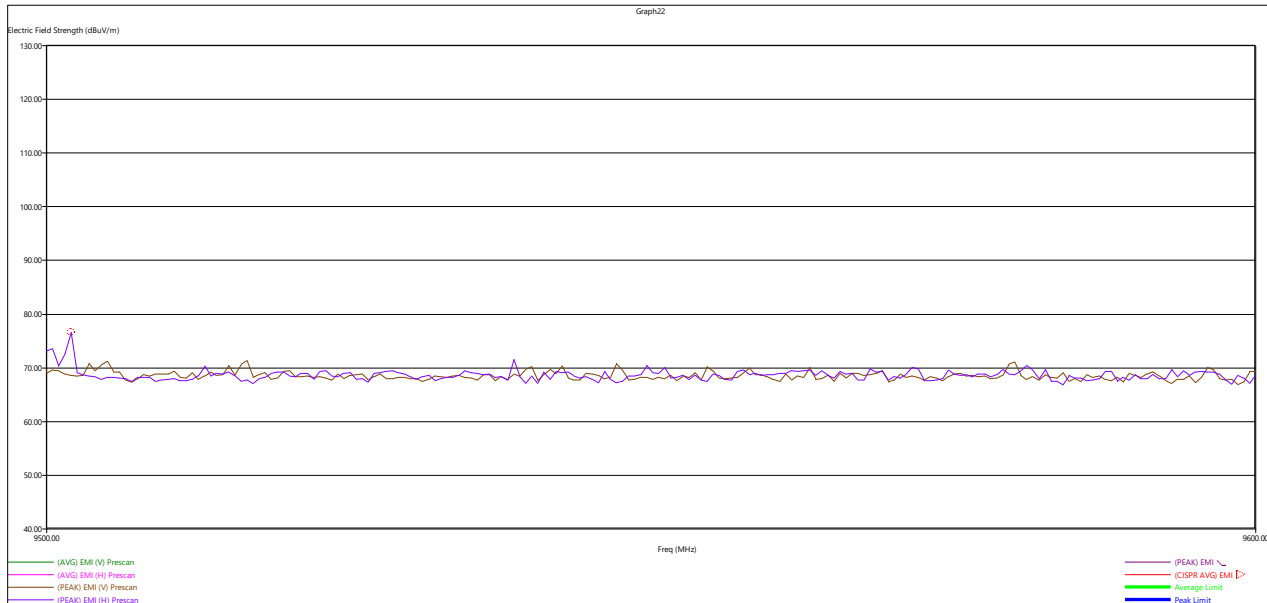


Figure 4 – Lower Band Edge, Mode C, 9200MHz – 9300MHz

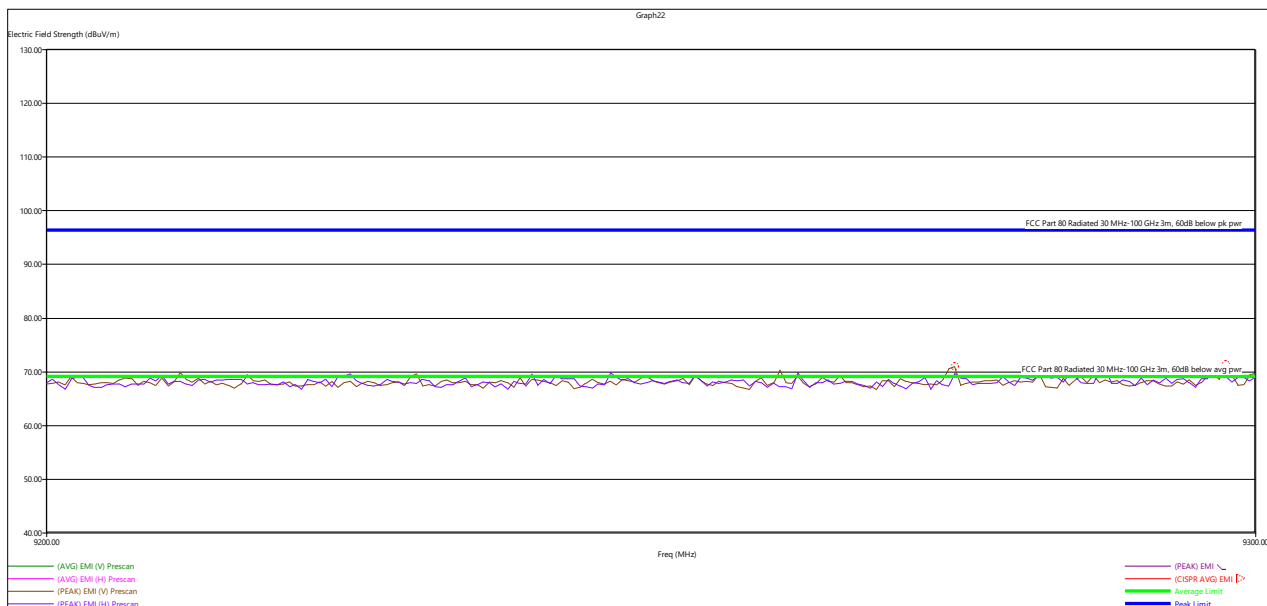


Figure 5 – Higher Band Edge, Mode C, 9500MHz – 9600MHz

|                                                                                  |                |                        |     |   |
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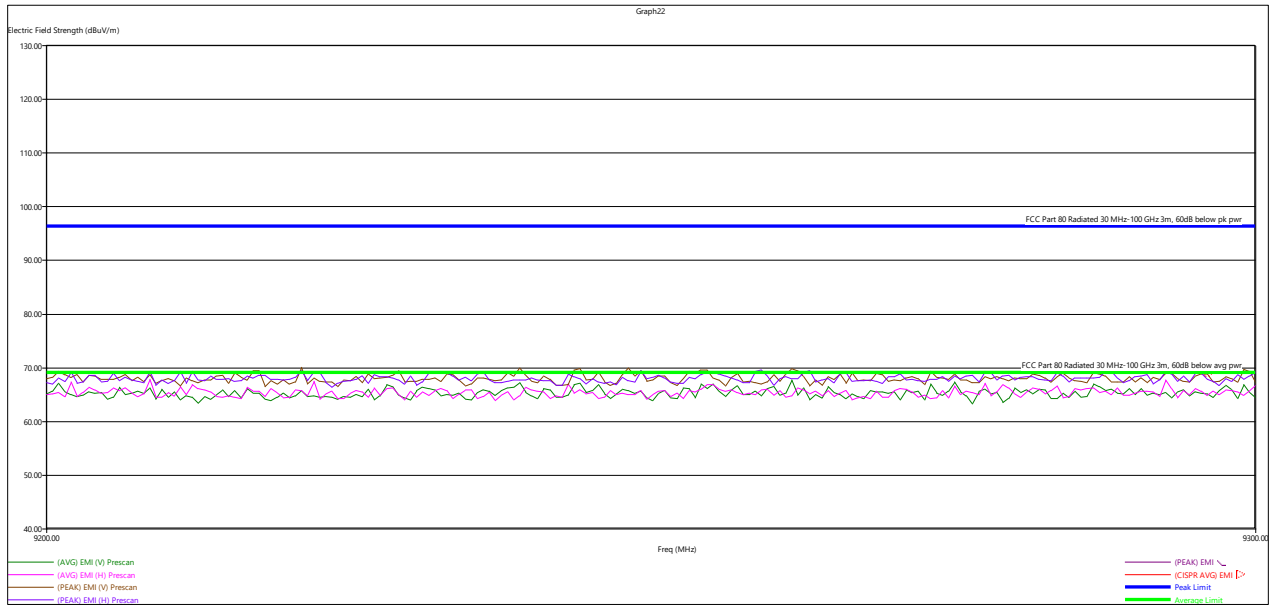


Figure 6 – Lower Band Edge, Mode A, 9200MHz – 9300MHz

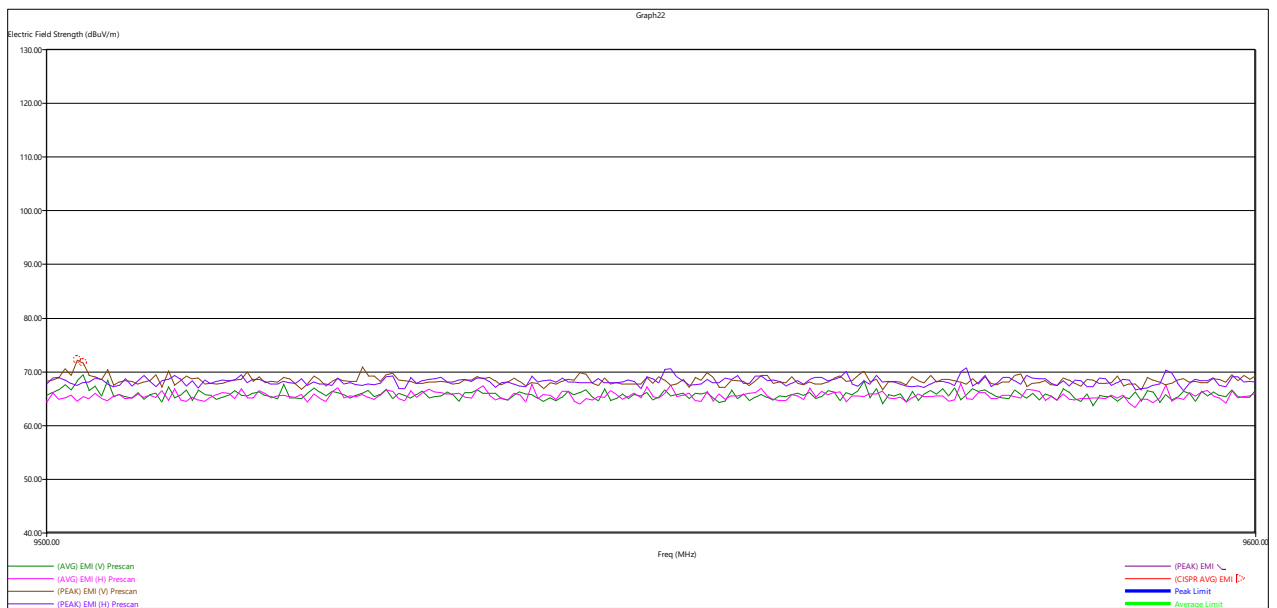


Figure 7 – Lower Band Edge, Mode A, 9500MHz – 9600MHz

|                                                                                  |                |                        |     |   |
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| Lower Band edge, Peak |      |        |        |        |                |               |               |
|-----------------------|------|--------|--------|--------|----------------|---------------|---------------|
| Band                  | Mode | Freq   | Peak H | Peak V | Limit(dBuV/m)* | Peak H Margin | Peak V Margin |
| Lower                 | C    | 9275   | 69.65  | 70.93  | 96.36          | 26.71         | 25.43         |
| Lower                 | C    | 9297.5 | 69.08  | 71.35  | 96.36          | 27.28         | 25.01         |
| Lower                 | A    | 9292.5 | 69.51  | 68.94  | 96.36          | 26.85         | 27.42         |
| Lower                 | A    | 9296   | 67.84  | 68.9   | 96.36          | 28.52         | 27.46         |

\*Limit calculated from 2.1053

| Higher Band edge, Peak |      |        |        |        |                |               |               |
|------------------------|------|--------|--------|--------|----------------|---------------|---------------|
| Band                   | Mode | Freq   | Peak H | Peak V | Limit(dBuV/m)* | Peak H Margin | Peak V Margin |
| Higher                 | C    | 9502   | 76.65  | 68.58  | 96.36          | 19.71         | 27.78         |
| Higher                 | A    | 9502.5 | 67.44  | 72.23  | 96.36          | 28.92         | 24.13         |
| Higher                 | A    | 9503   | 68.03  | 71.7   | 96.36          | 28.33         | 24.66         |

\*Limit calculated from 2.1053

| Lower Band edge, Average |      |         |        |        |       |         |         |                 |               |               |
|--------------------------|------|---------|--------|--------|-------|---------|---------|-----------------|---------------|---------------|
| Band                     | Mode | Freq    | Peak H | Peak V | DCCF  | Avg (H) | Avg (V) | Limit (dBuV/m)* | Peak H Margin | Peak V Margin |
| Lower                    | C    | 9275.00 | 69.65  | 70.93  | 27.96 | 41.69   | 42.97   | 69.08           | 27.39         | 26.11         |
| Lower                    | C    | 9297.50 | 69.08  | 71.35  | 27.96 | 41.12   | 43.39   | 69.08           | 27.96         | 25.69         |
| Lower                    | A    | 9292.50 | 69.51  | 68.94  | 27.96 | 41.55   | 40.98   | 69.08           | 27.53         | 28.10         |
| Lower                    | A    | 9296.00 | 67.84  | 68.90  | 27.96 | 39.88   | 40.94   | 69.08           | 29.20         | 28.14         |

\*Limit calculated from 2.1053

| Lower Band edge, Average |      |         |        |        |       |         |         |                 |               |               |
|--------------------------|------|---------|--------|--------|-------|---------|---------|-----------------|---------------|---------------|
| Band                     | Mode | Freq    | Peak H | Peak V | DCCF  | Avg (H) | Avg (V) | Limit (dBuV/m)* | Peak H Margin | Peak V Margin |
| Higher                   | C    | 9502.00 | 76.65  | 68.58  | 27.96 | 48.69   | 40.62   | 69.08           | 20.39         | 28.46         |
| Higher                   | A    | 9502.50 | 67.44  | 72.23  | 27.96 | 39.48   | 44.27   | 69.08           | 29.60         | 24.81         |
| Higher                   | A    | 9503.00 | 68.03  | 71.70  | 27.96 | 40.07   | 43.74   | 69.08           | 29.01         | 25.34         |
| Higher                   | C    | 9502.00 | 76.65  | 68.58  | 27.96 | 48.69   | 40.62   | 69.08           | 20.39         | 28.46         |

\*Limit calculated from 2.1053

|                                                                                  |                |                        |     |   |
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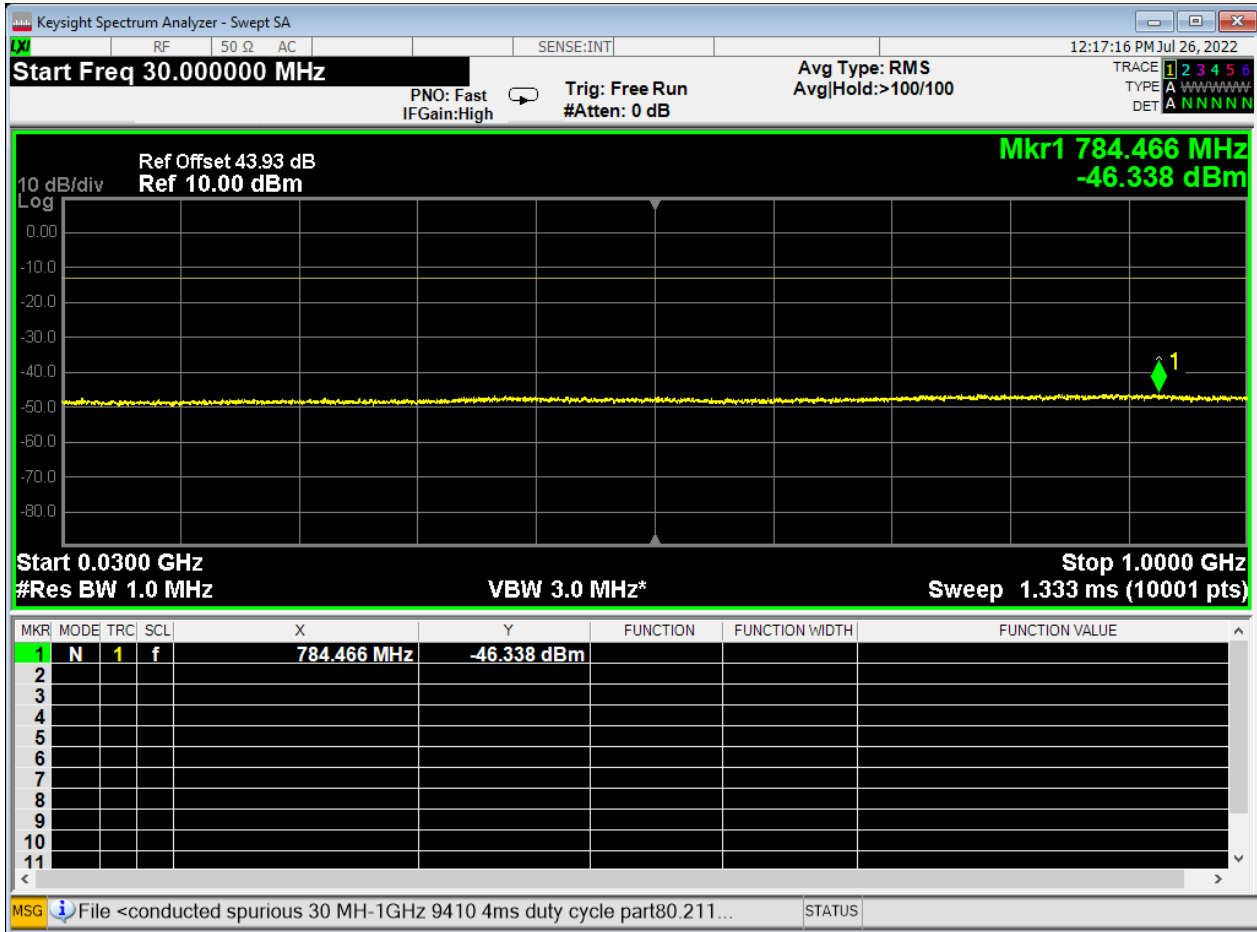


Figure 8 - Conducted Unwanted Emissions Plot, 30 MHz-1 GHz

\*Limit is -13dBm – Pass

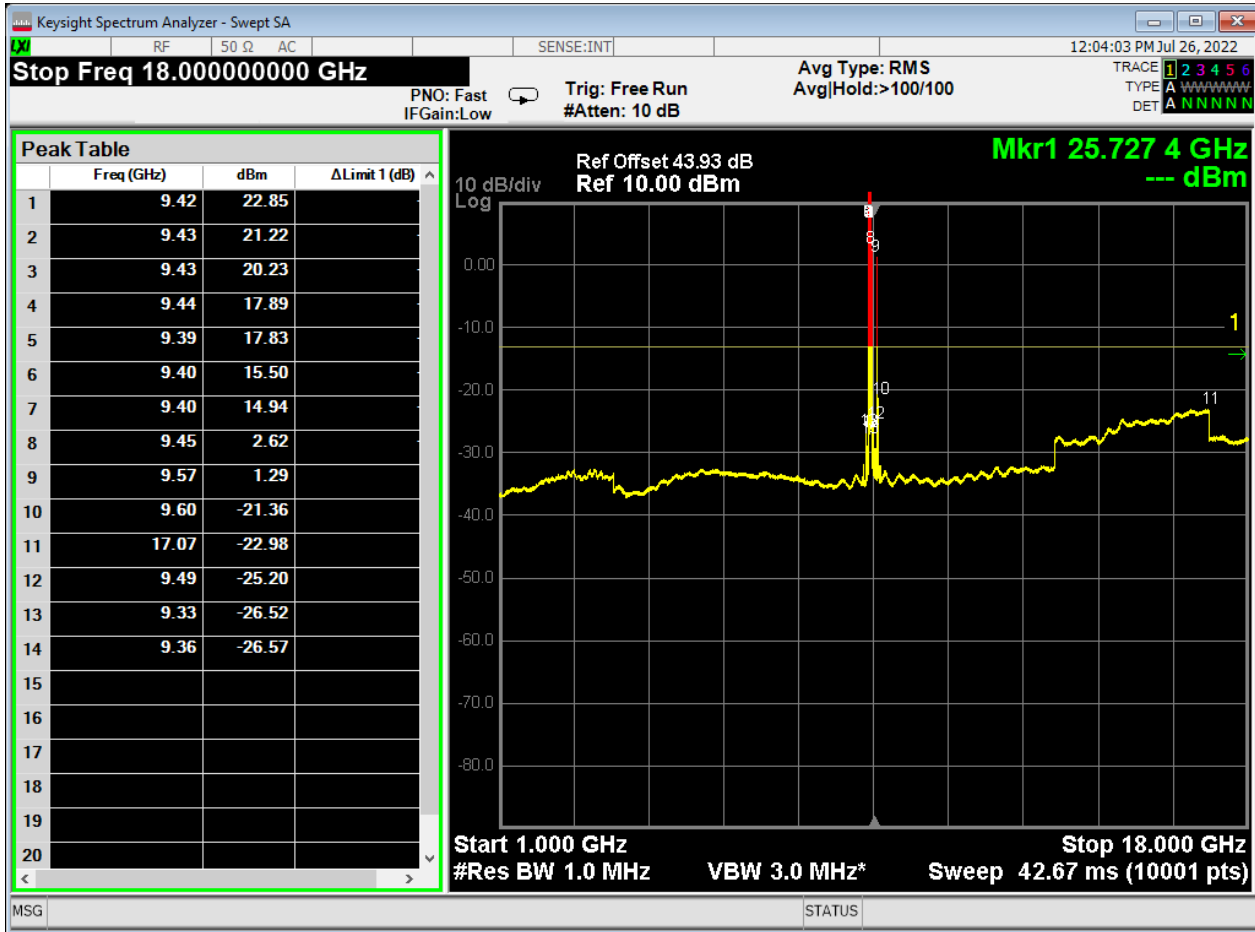


Figure 9 - Conducted Unwanted Emissions Plot, 1 GHz-18 GHz

\*Limit is -13dBm – Pass

Marker 1 is on the fundamental frequency and thus can be disregarded. Also, the green line is for reference only not a limit.

|                                                                                  |                |                        |     |   |
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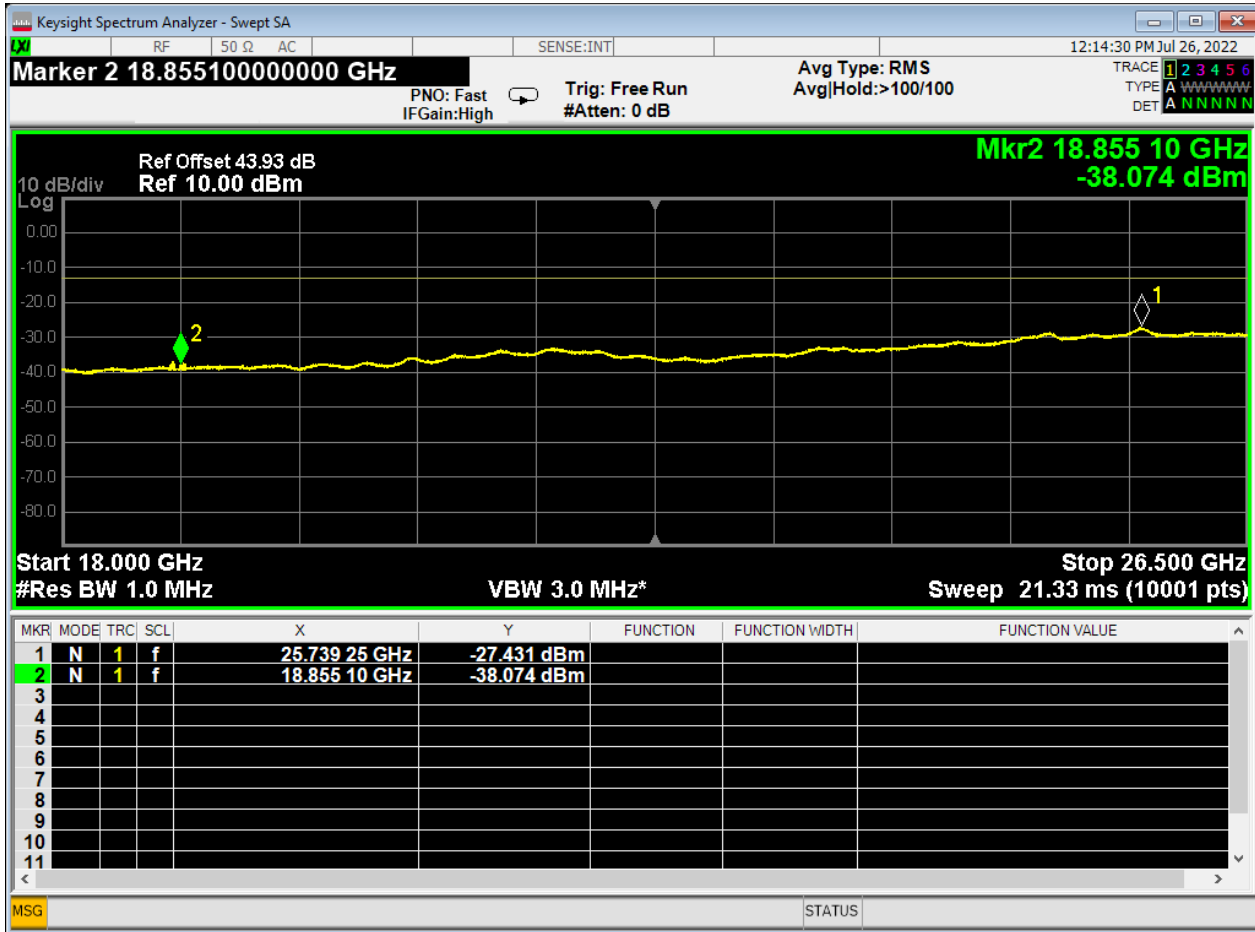


Figure 10 - Conducted Unwanted Emissions Plot, 18 GHz-26 GHz

\*Limit is -13dB – Pass

All other measurements including above 26 GHz were found to be at least 6 dB below the limits.

|                                                                                  |                |                        |     |   |
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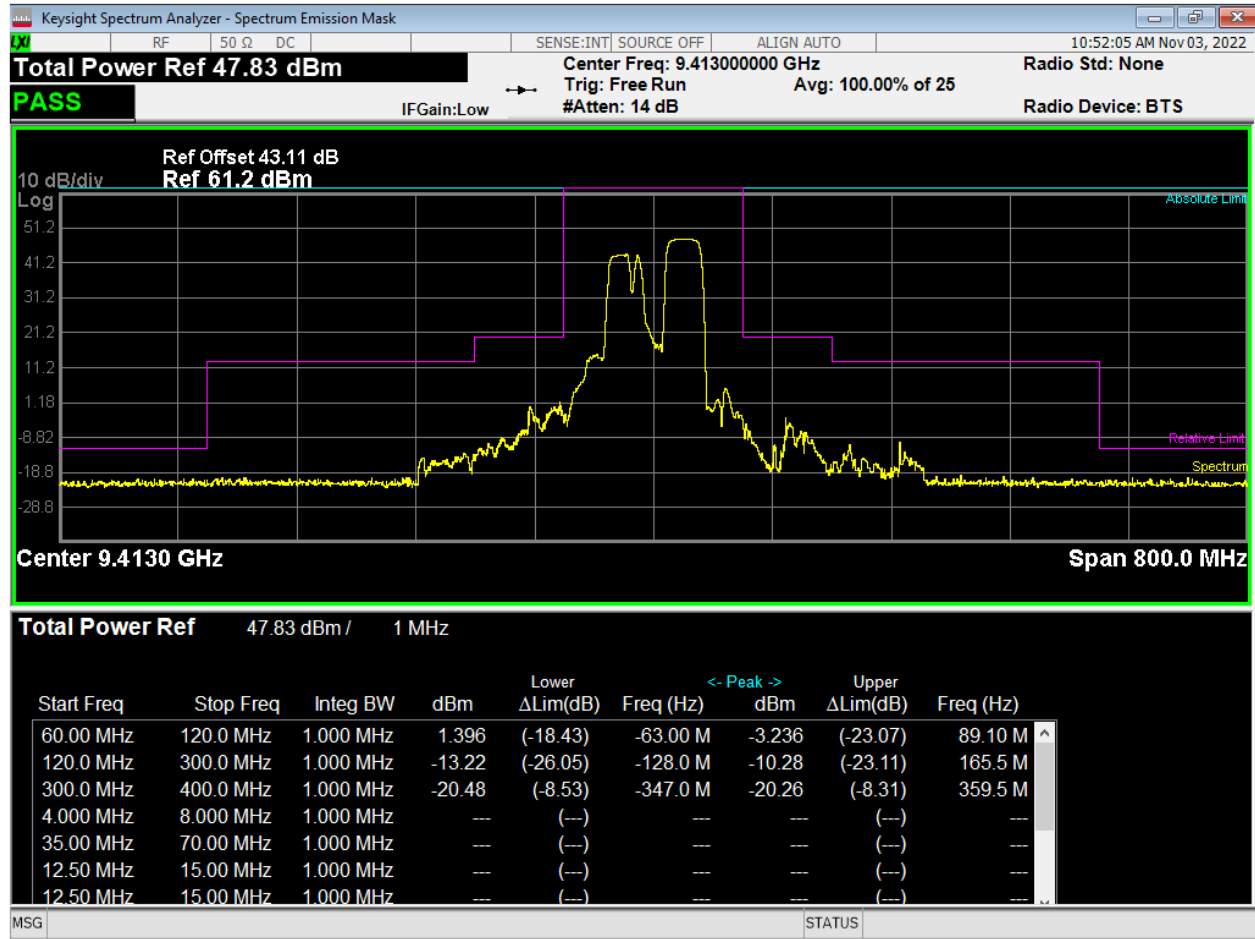


Figure 11 – Emissions Mask, Mode A, 120 MHz Authorized BW

|                                                                                  |                |                        |     |   |
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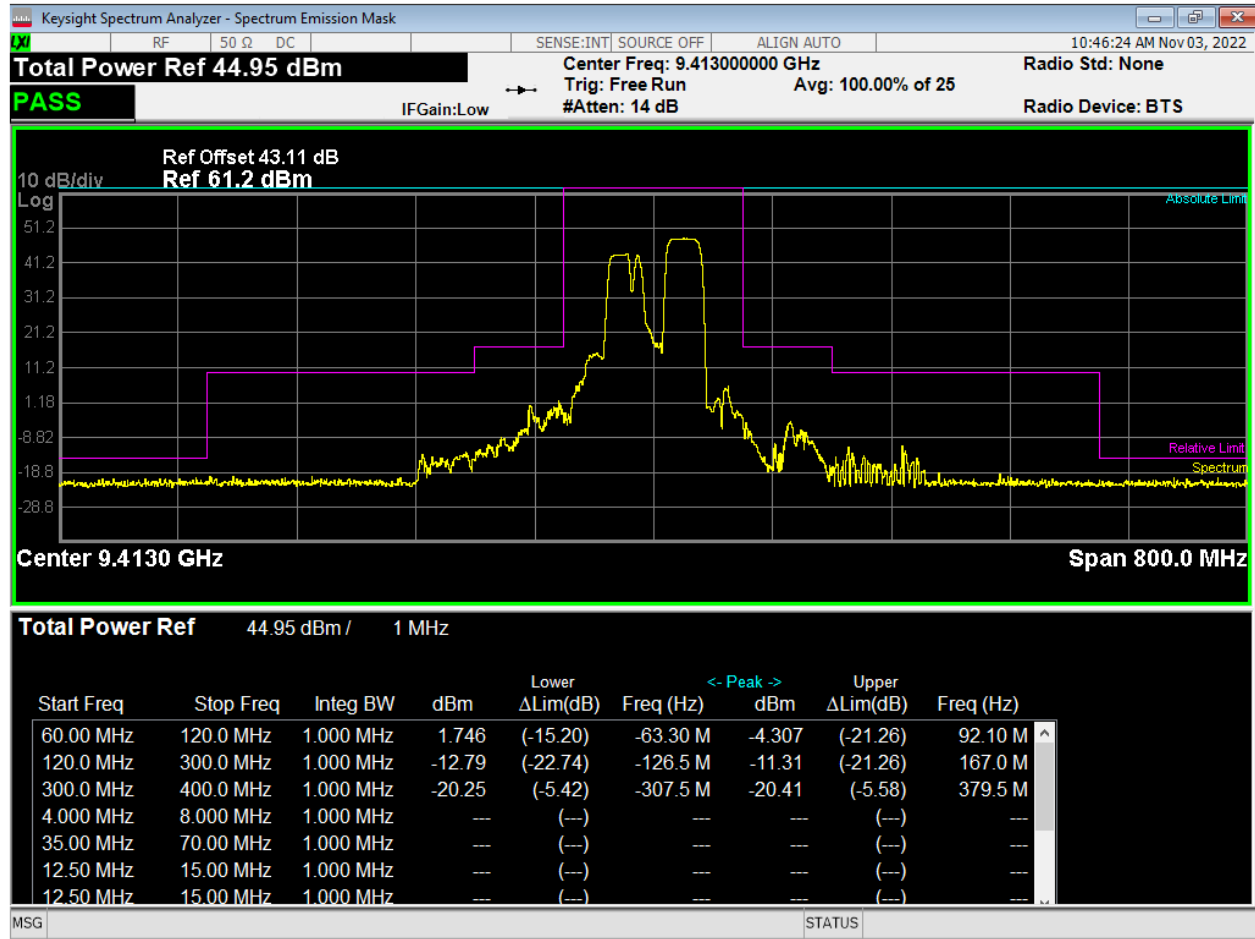


Figure 12 – Emissions Mask, Mode B, 120 MHz Authorized BW

|                                                                                  |                |                        |     |   |
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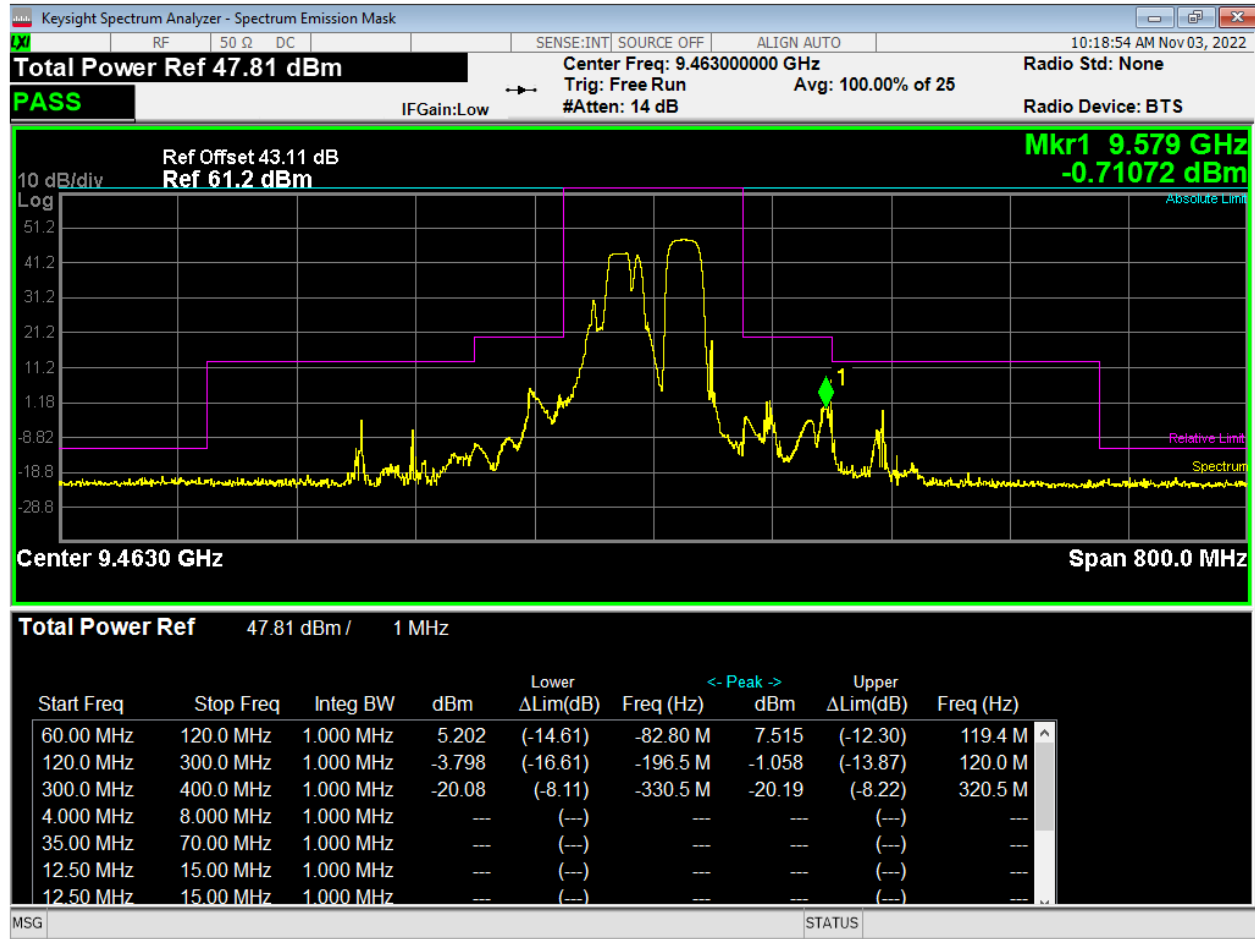


Figure 13 – Emissions Mask, Mode C, 120 MHz Authorized BW

|                                                                                  |                |                        |     |   |
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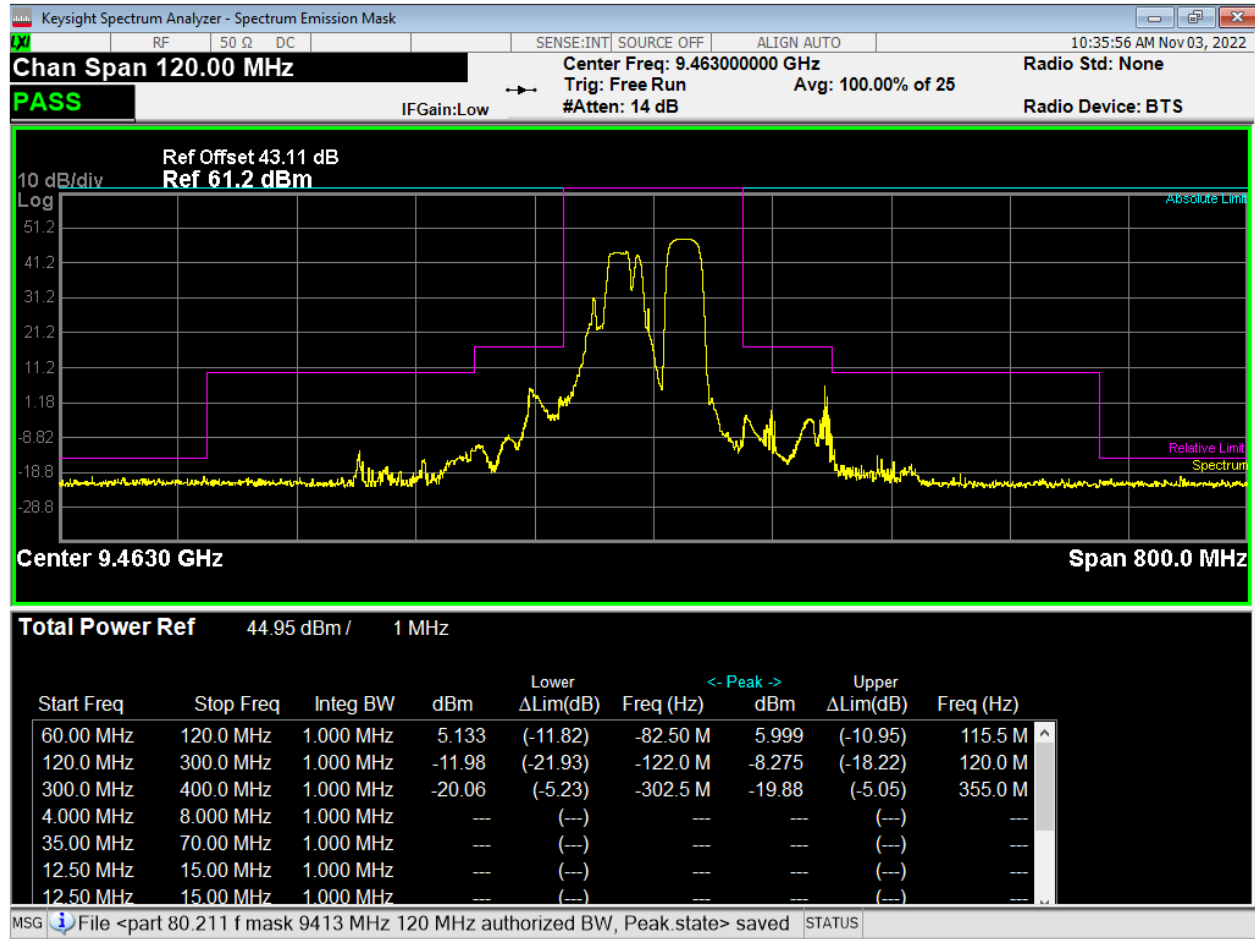


Figure 14 – Emissions Mask, Mode D, 120 MHz Authorized BW

|                                                                                  |                |                        |     |   |
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## 4.2 OUTPUT POWER

**Test Method:** ANSI C63.26:  
Section(s) 5.2.4.4.2

### Limits of power measurements:

Transmitter power shown on the radio station authorization is the maximum power the licensee is authorized to use. Power is expressed in the following terms: For PON and F3N emission: Mean power

### Test procedures:

All the measurements were done with RBW greater than OBW of the signal.

### Deviations from test standard:

No deviation.

### Test setup:

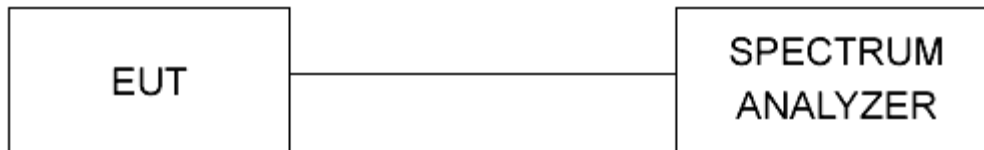


Figure 15 – Output Power Measurements Test Setup

### EUT operating conditions:

See Section 2.1 & 2.2

### Test results:

#### Output Power

| Mode                                                                                                                | CHANNEL FREQUENCY (MHz) | Duty Cycle Correction Factor (DCCF) | Raw uncorrected level (dBm) | Corrected Output Power (dBm) | Corrected Output Power (mW) | Method    | RESULT |
|---------------------------------------------------------------------------------------------------------------------|-------------------------|-------------------------------------|-----------------------------|------------------------------|-----------------------------|-----------|--------|
| A-4% Duty Cycle                                                                                                     | 9410.000000             | 13.9794                             | 33.55                       | 47.53                        | 56616.11                    | Conducted | PASS   |
| B-2% Duty Cycle                                                                                                     | 9413.000000             | 16.9897                             | 30.52                       | 47.51                        | 56359.87                    | Conducted | PASS   |
| C-4% Duty Cycle                                                                                                     | 9460.000000             | 13.9794                             | 33.41                       | 47.39                        | 54820.12                    | Conducted | PASS   |
| D-2% Duty Cycle                                                                                                     | 9463.000000             | 16.9897                             | 30.59                       | 47.58                        | 57275.65                    | Conducted | PASS   |
| Duty cycle is declared by the manufacturer. Corrected Output Power=DCCF + Raw uncorrected level. Limit-50 dBm/100 W |                         |                                     |                             |                              |                             |           |        |

|                                                                                  |                |                        |     |   |
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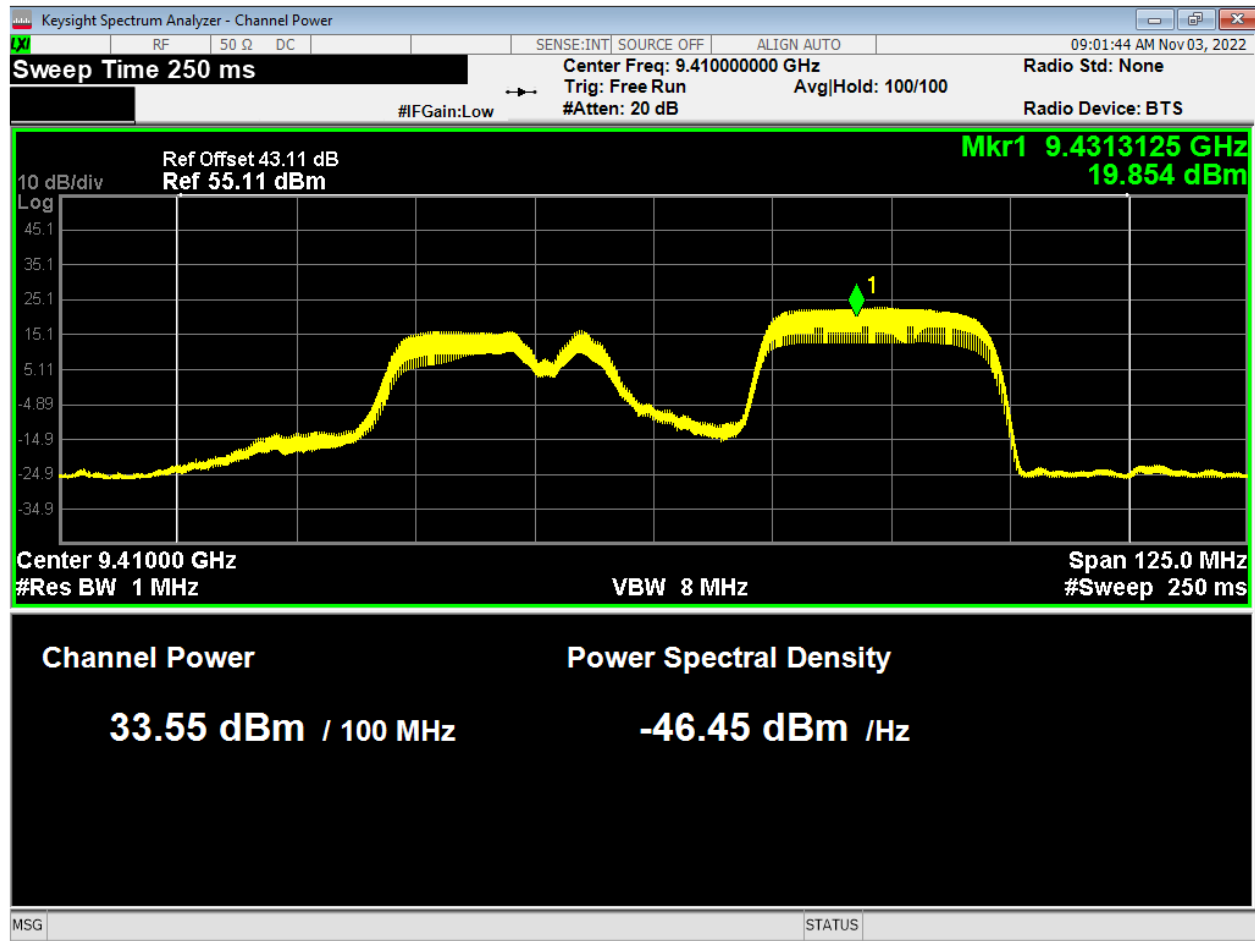


Figure 16 – Average Power, Mode A

|                                                                                  |                |                        |     |   |
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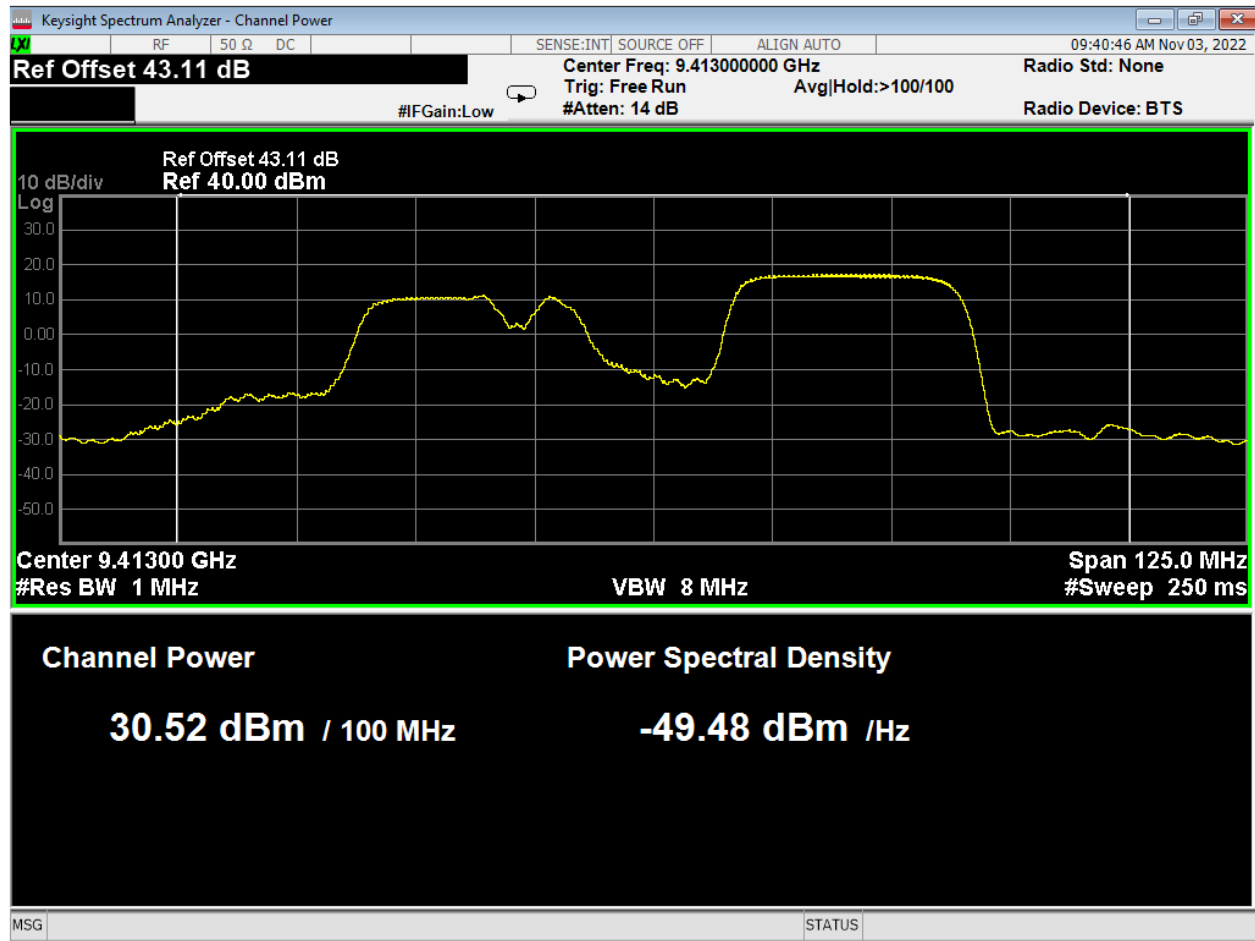


Figure 17 – Average Power, Mode B

|                                                                                  |                |                        |     |   |
|----------------------------------------------------------------------------------|----------------|------------------------|-----|---|
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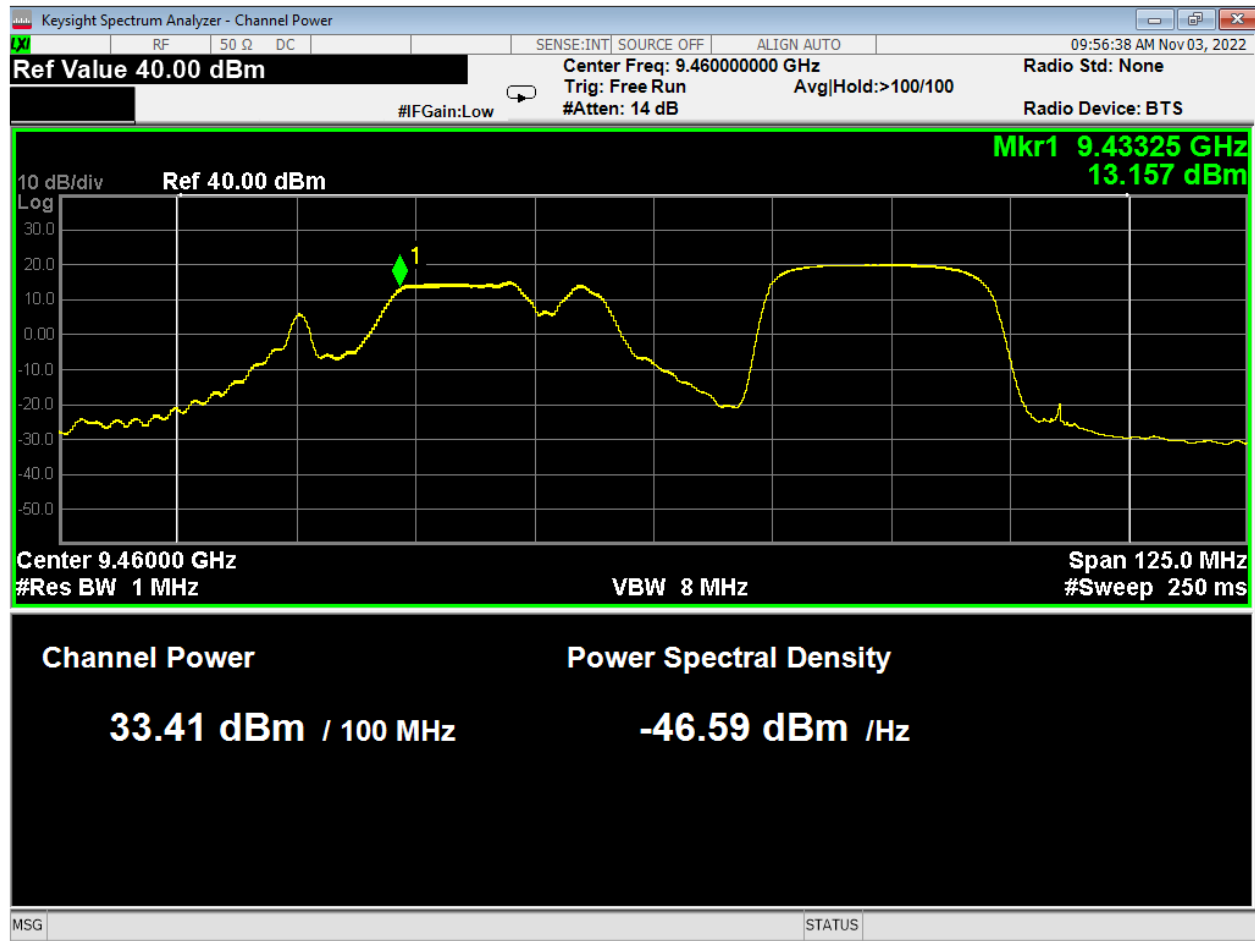


Figure 18 – Average Power, Mode C

|                                                                                  |                |                        |     |   |
|----------------------------------------------------------------------------------|----------------|------------------------|-----|---|
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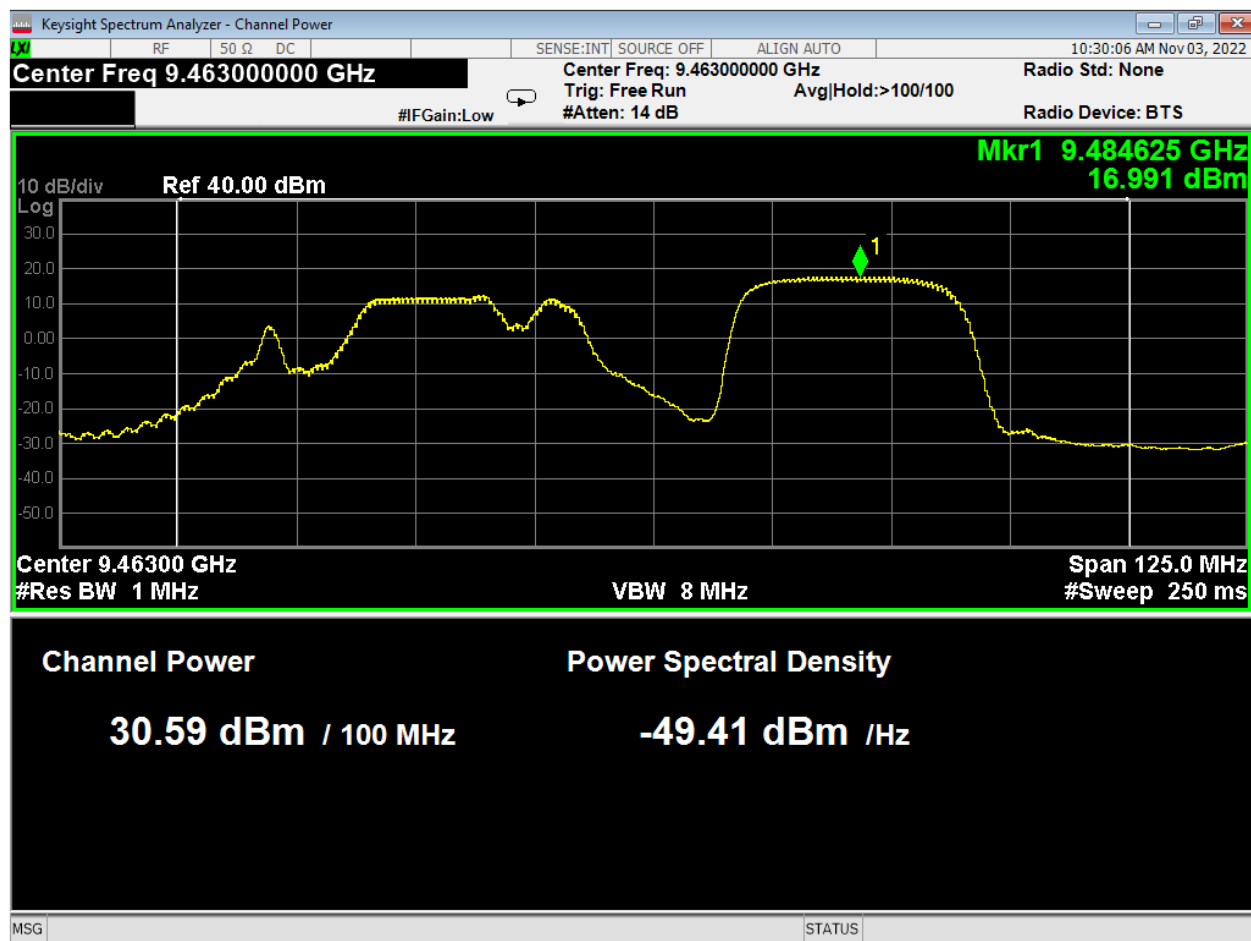


Figure 19 – Average Power, Mode D

|                                                                                  |                |                        |     |   |
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### 4.3 BANDWIDTH AND MODULATION CHARACTERISTICS

**Test Method:** ANSI C63.26,  
1. Section(s) 5.4.3, 5.4.4

**Limits of bandwidth measurements:**  
Authorized Bandwidth is 120 MHz. Operating Range is 9410 MHz – 9463 MHz.

**Limits for Modulation Characteristics:**  
Radar stations operating in the bands above 2.4 GHz may use any type of modulation consistent with the bandwidth requirements in § 80.209(b).

**Test procedures:**  
The EUT was connected to the spectrum analyzer directly with a low-loss shielded coaxial cable and an attenuator to protect measurement equipment. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 1 MHz RBW and 8 MHz VBW. The bandwidth measurements were done using the automatic bandwidth measurement.

**Deviations from test standard:**  
No deviation

**Test setup:**

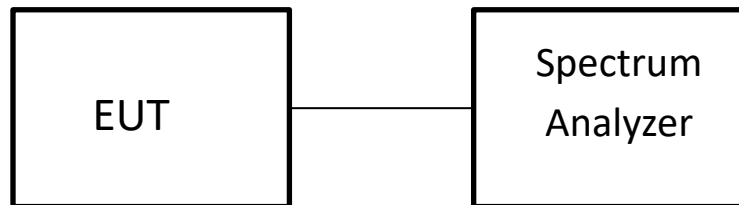


Figure 20 –Measurements Test Setup

**EUT operating conditions:**  
See Section 2.1 & 2.2

**Test results:**

|                                                                                  |                |                        |     |   |
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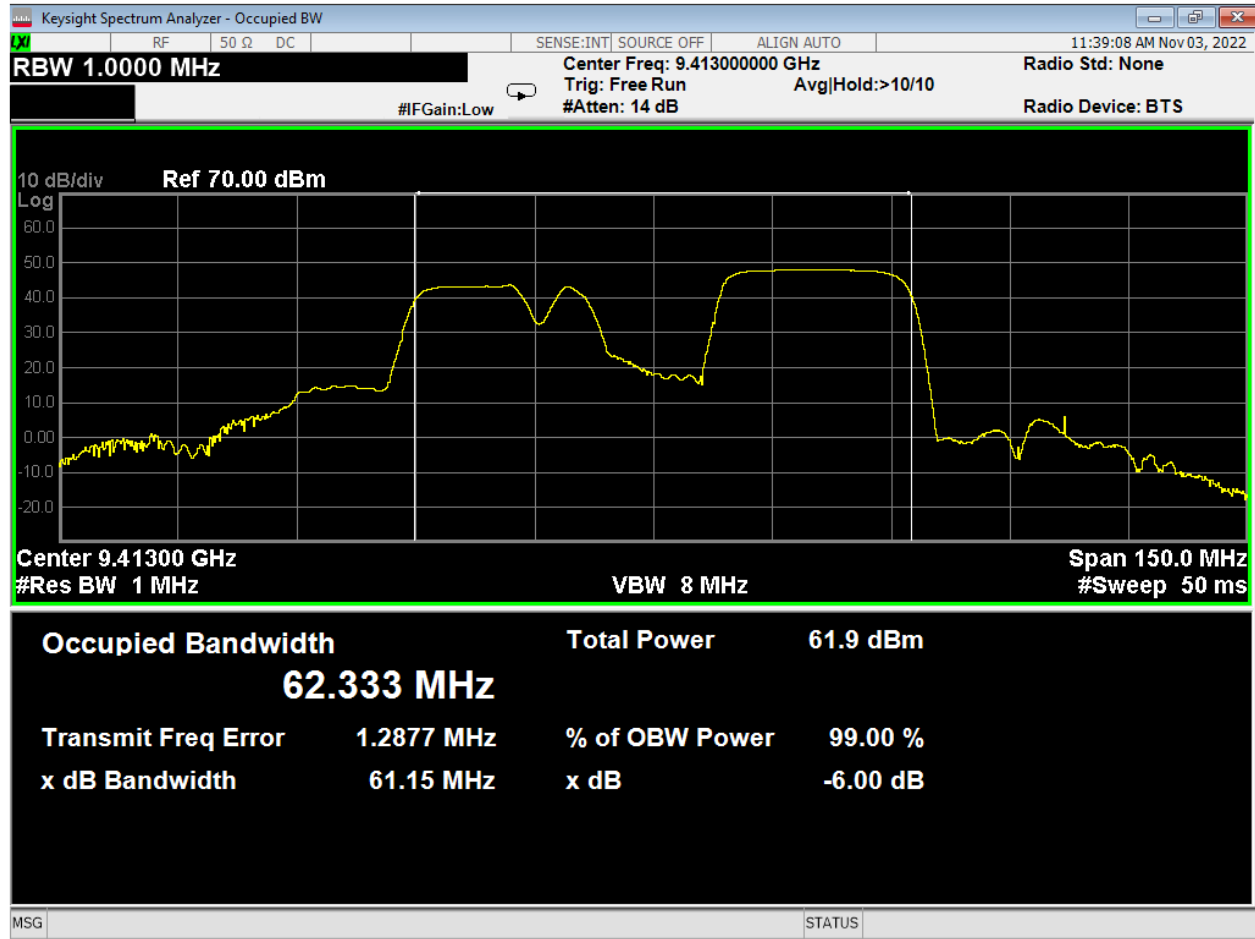


Figure 21 - 99% Occupied Bandwidth, Mode A

|                                                                                  |                |                        |     |   |
|----------------------------------------------------------------------------------|----------------|------------------------|-----|---|
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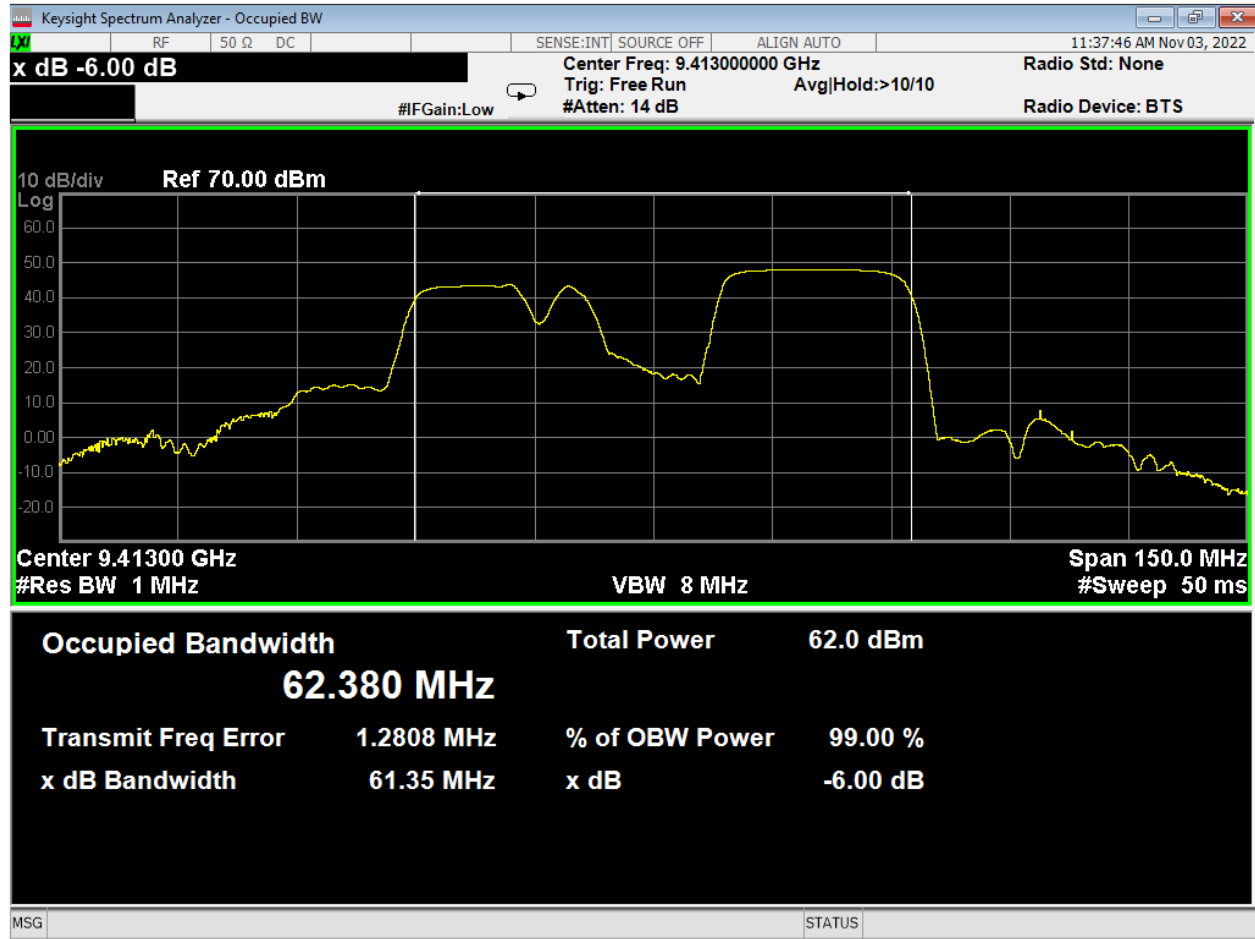


Figure 22 - 99% Occupied Bandwidth, Mode B

|                                                                                  |                |                        |     |   |
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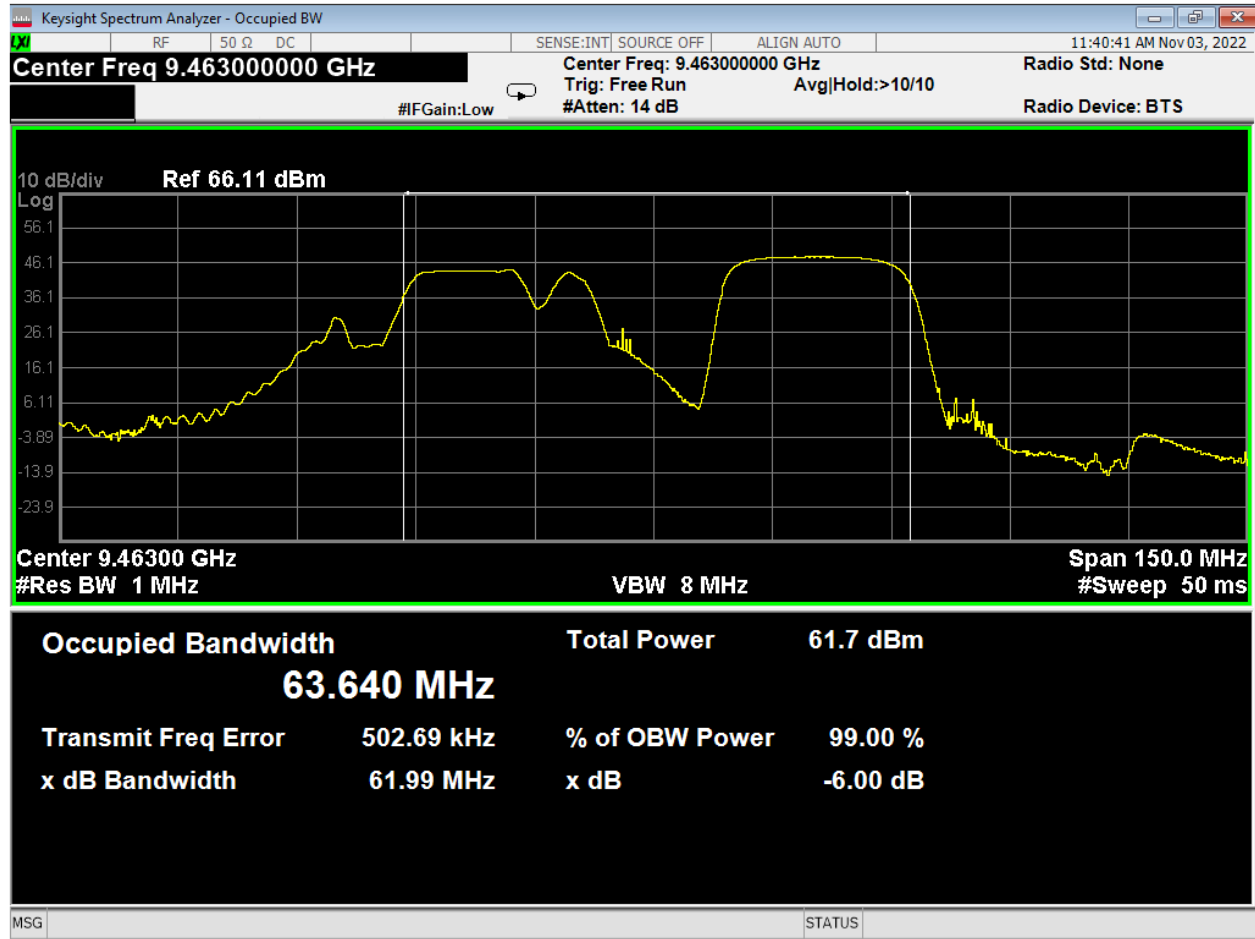


Figure 23 - 99% Occupied Bandwidth, Mode C

|                                                                                  |                |                        |     |   |
|----------------------------------------------------------------------------------|----------------|------------------------|-----|---|
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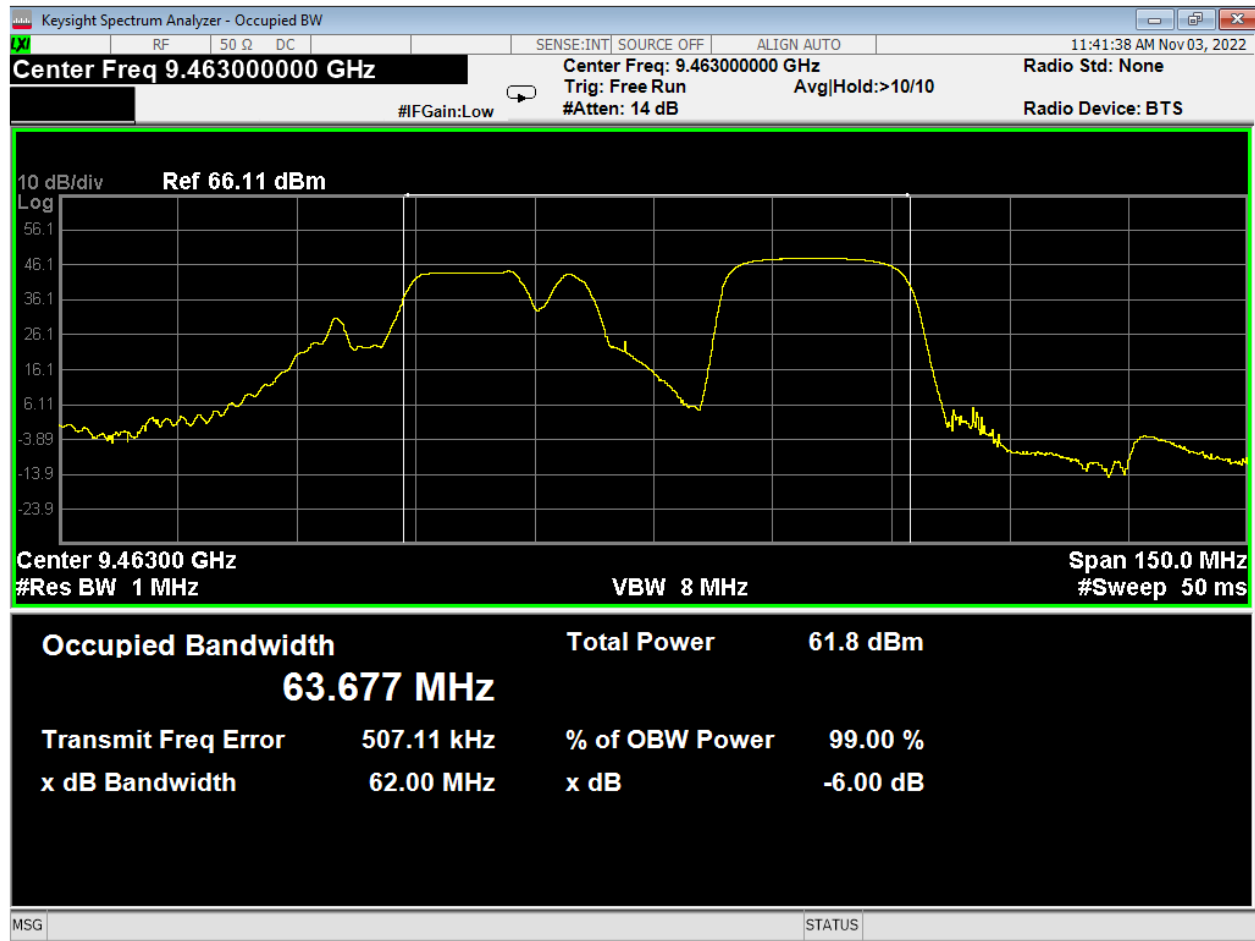


Figure 24 - 99% Occupied Bandwidth, Mode D

|                                                                                  |                |                        |     |   |
|----------------------------------------------------------------------------------|----------------|------------------------|-----|---|
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#### 4.4 FREQUENCY STABILITY MEASUREMENTS

**Test Method:** ANSI C63.26,

1. Section(s) 5.6.3 "Procedures for frequency stability testing"

**Limits:**

**47 CFR 80.209(b)**

When pulse modulation is used in land and ship radar stations operating in the bands above 2.4 GHz the frequency at which maximum emission occurs must be within the authorized bandwidth and must not be closer than  $1.5/T$  MHz to the upper and lower limits of the authorized bandwidth where "T" is the pulse duration in microseconds. In the band 14.00-14.05 GHz the center frequency must not vary more than 10 MHz from 14.025 GHz.

**Test procedures:**

Radiated power was measured on a spectrum analyzer with resolution bandwidth and video bandwidth set to 1 MHz and 8 MHz respectively. The frequency error functionality on the receiver was used. The temperature was varied from -30°C to +50°C.

**Deviations from test standard:**

No deviation

**Test setup:**

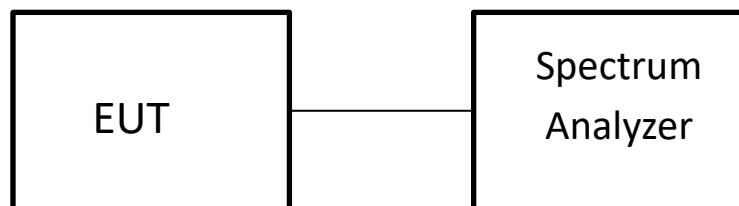


Figure 25 –Measurements Test Setup

**EUT operating conditions:**

See Section 2.1 & 2.2

|                                                                                  |                |                        |     |   |
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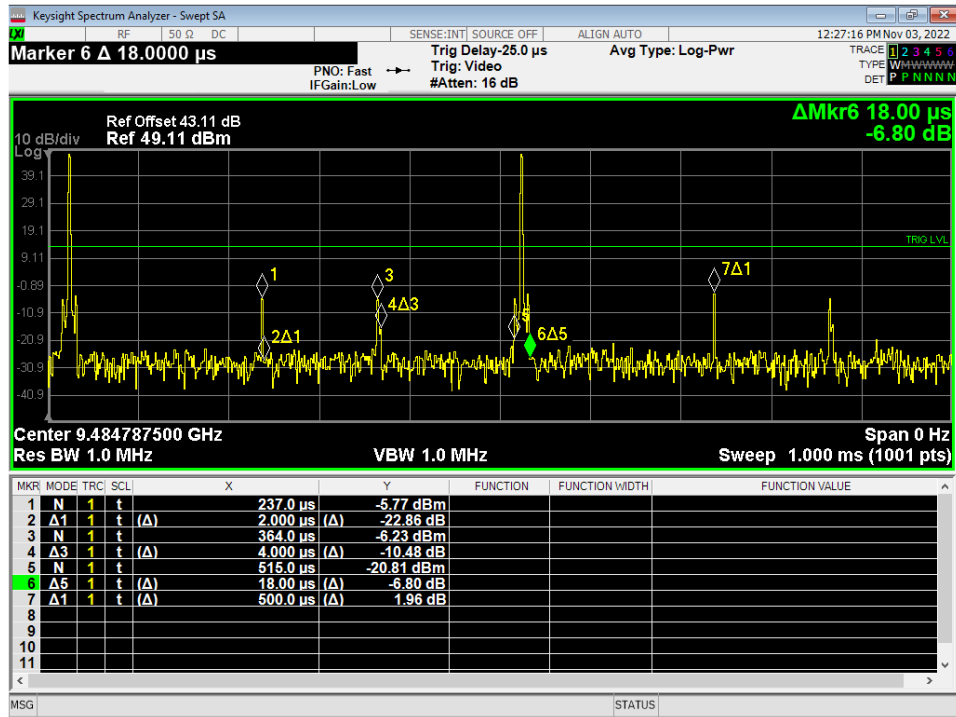


Figure 26 – Pulse length plot, shows shortest pulse length observed

$T = \text{pulse length } (\mu\text{s})$   
 $1.5/T = 1.5/2 = \mathbf{0.75\text{MHz}}$   
 from the edge of the authorized band

Authorized bandwidth (AB) = 120MHz  
 Worst case deviation (WCD) = 0.69619MHz.  
 Largest OBW = 63.677MHz  
 Lowest Channel = 9410MHz  
 Highest Channel = 9463MHz

Device's worst-case deviation:

$9463\text{MHz} + \frac{1}{2} \cdot \text{OBW} + (\text{WCD}) = 9495.53469\text{MHz}$

$9410\text{MHz} - \frac{1}{2} \cdot \text{OBW} + (\text{WCD}) = 9378.85769\text{MHz}$

+Authorized edge = 9523MHz

-Authorized edge = 9350MHz

**Margin to +Authorized edge =  $9523 - 9495.43469 = 27.46531\text{MHz}$**

**Complies**

**Margin to -Authorized edge =  $9377.46531\text{MHz} - 9350 = 28.85769\text{MHz}$**

**Complies**

See bandwidth for plots. The device complies with frequency deviation limits.

|                                                                                  |                |                        |     |   |
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**Test results:** Worst case is reported. Complies

|                                                       |                       |              |           |
|-------------------------------------------------------|-----------------------|--------------|-----------|
| Reference Freq (MHz)                                  |                       |              | 9463      |
| Frequency error versus temperature and supply voltage |                       |              |           |
| Temperature (°C)                                      | Frequency Error (MHz) | Error in ppm | limit ppm |
| 50                                                    | 0.64871               | 68.55        | 100       |
| 40                                                    | 0.59426               | 62.80        | 100       |
| 30                                                    | 0.56803               | 60.03        | 100       |
| 20                                                    | 0.5407                | 57.14        | 100       |
| 10                                                    | 0.51142               | 54.04        | 100       |
| 0                                                     | 0.31888               | 33.70        | 100       |
| -10                                                   | 0.1388                | 14.67        | 100       |
| -20                                                   | 0.055903              | 5.91         | 100       |
| -30                                                   | 0.18238               | 19.27        | 100       |
| 85% of nominal voltage                                | 0.53957               | 57.02        | 100       |
| 115% of nominal voltage                               | 0.5379                | 56.84        | 100       |
| Nominal voltage (28VDC)                               | 0.5407                | 57.14        | 100       |

#### Frequency Stability, Temp/Voltage Variation

|                                                               |                       |              |           |
|---------------------------------------------------------------|-----------------------|--------------|-----------|
| Reference Freq (MHz)                                          |                       |              | 9463      |
| Cold Start from first ability to activate transmission (-30C) |                       |              |           |
| power on to ability to transmit due to software               |                       |              | 3:23      |
| Minutes after ability to Transmit                             | Frequency Error (kHz) | Error in ppm | limit ppm |
| 0 Min(s)                                                      | 0.69619               | 73.57        | 100       |
| 1 Min(s)                                                      | 0.6936                | 73.30        | 100       |
| 2 Min(s)                                                      | 0.652                 | 68.90        | 100       |
| 3 Min(s)                                                      | 0.6252                | 66.07        | 100       |
| 4 Min(s)                                                      | 0.6004                | 63.45        | 100       |
| 5 Min(s)                                                      | 0.5752                | 60.78        | 100       |

#### Frequency Stability, Start-Up Variation

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

### Field Strength Calculation

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

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

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

|                                                                                  |                |                        |     |   |
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## 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;

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

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

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

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

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

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

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

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

$10\log(10^9)$  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                  |

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

|                                                                                  |                |                        |     |   |
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REPORT END