UNIFIED COMPLIANCE LABORATORY

**427 West 12800 South**
**Draper, UT 84020**

# Test Report

## Certification

| | |
|---|---|
| **FCC ID** | SWX-U7PROP |
| **Canada ID** | 6545A-U7PROP |
| **Equipment Under Test** | U7 Pro |
| **Test Report Serial Number** | TR9343_05 |
| **Date of Test(s)** | 19, 23, 29 and 30 August 2024 |
| **Report Issue Date** | 3 September 2024 |

| Test Specification | Applicant |
|---|---|
| 47 CFR FCC Part 15, Subpart E<br>RSS-GEN | Ubiquiti Inc.<br>685 Third Avenue<br>New York, NY 10019<br>U.S.A. |

NVLAP TESTING ilac-MRA

**NVLAP LAB CODE 600241-0**

# Certification of Engineering Report

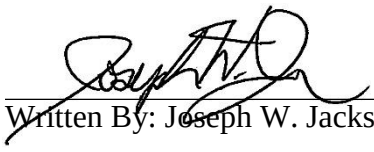
This report has been prepared by Unified Compliance Laboratory (UCL) to document compliance of the device described below with the requirement of Federal Communication Commissions (FCC) Part 15, Subpart E. This report may be reproduced in full. Partial reproduction of this report may only be made with the written consent of the laboratory. The results in this report apply only to the sample tested.

| | |
|---|---|
| **Applicant** | Ubiquiti Inc. |
| **Manufacturer** | Ubiquiti Inc. |
| **Brand Name** | UBIQUITI |
| **Model Number** | U7 Pro |
| **FCC ID** | SWX-U7PROP |
| **Canada ID** | 6545A-U7PROP |

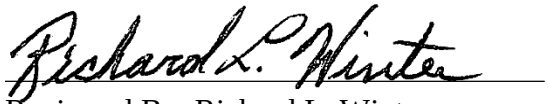
On this 3rd day of September 2024, I individually and for Unified Compliance Laboratory certify that the statements made in this engineering report are true, complete, and correct to the best of my knowledge and are made in good faith.

Although NVLAP has accredited the Unified Compliance Laboratory testing facilities, this report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the U.S. federal government.

Unified Compliance Laboratory



Written By: Joseph W. Jackson



Reviewed By: Richard L. Winter

| Revision History | | |
|---|---|---|
| **Revision** | **Description** | **Date** |
| 01 | Original Report Release | 3 September 2024 |
| 02 | Added DFS Spot Check Data In Section 2 | 12 September 2024 |
| 03 | Revised Sections 2.2 and 2.3. Added Sections 2.4 and 2.5 | 16 September 2024 |
| 04 | Removed Section 2.5 | 16 September 2024 |
| 05 | Revised Section 2.4 and add Section 2.5 | 25 September 2024 |

# Table of Contents

# 1 Client Information

## 1.1 Applicant

| | |
|---|---|
| **Company** | Ubiquiti Inc.<br>685 Third Avenue<br>New York, NY 10017<br>U.S.A. |
| **Contact Name** | Alex Macon |
| **Title** | Compliance Manager |

## 1.2 Manufacturer

| | |
|---|---|
| **Company** | Ubiquiti Inc.<br>685 Third Avenue<br>New York, NY 10017<br>U.S.A. |
| **Contact Name** | Alex Macon |
| **Title** | Compliance Manager |

# 2 Summary

## 2.1 Identification of EUT

| | |
|---|---|
| **Brand Name** | UBIQUITI |
| **Model Number** | U7 Pro |
| **Serial Number** | 05B1B5 |
| **Dimensions (cm)** | 20.6 x 20.6 x 4.6 |

## 2.2 Introduction

The purpose of this document is to provide definition of the differences between models and evidence of their similarities. It will also identify the test data that is to be used between the models and identifies the data that will be new to the U7 Pro. This document is based on guidance provided in KDB 484596 DO1 Referencing Test Data. The applicant takes full responsibility for the fact that the test date referenced in this test report represents valid data for demonstrating compliance for the variants listed in this application. The following tables outline the identifying devices.

### 2.2.1 U7-Pro – (Original Equipment) Certification

| | Equipment Class | Rule Part | Frequency Bands |
|---|---|---|---|
| U7-Pro | DTS | Part 15 C | 2412 – 2462 MHz |
| | NII | Part 15 E | 5180 – 5240 MHz |
| | NII | Part 15 E | 5260 – 5320 MHz |
| | NII | Part 15 E | 5500 – 5720 MHz |
| | NII | Part 15 E | 5745 – 5825 MHz |
| | NII (6ID) | Part 15 E | 5955 – 7115 MHz |
| | NII (6PP) | Part 15 E | 5955 – 7115 MHz |

### 2.2.2 U7 Pro – (New Original Equipment) Certification

| | Equipment Class | Rule Part | Frequency Bands |
|---|---|---|---|
| U7 Pro | DTS | Part 15 C | 2412 – 2462 MHz |
| | NII | Part 15 E | 5180 – 5240 MHz |
| | NII | Part 15 E | 5260 – 5320 MHz |
| | NII | Part 15 E | 5500 – 5720 MHz |
| | NII | Part 15 E | 5745 – 5825 MHz |
| | NII (6ID) | Part 15 E | 5955 – 7115 MHz |
| | NII (6PP) | Part 15 E | 5955 – 7115 MHz |

## 2.3 Description of EUT Differences and Justification

U7-Pro (FCC ID: SWX-U7PRO / IC ID: 6545A-U7PRO) is identical to the U7 Pro (FCC ID: SWX-U7PROP / 6545A-U7PROP) in hardware and software other than the RF circuity for the 2412 – 2462 MHz WiFi Band. In the 2412 – 2462 MHz WiFi Band the RF circuitry was changed from a one System on Chip (SOC) to a two chip set.

This change only affects the FCC Part 15 C of the FCC rules in the Equipment Class DTS. This band of the U7 Pro was completely retested and the testing results are found in test report "U7_Pro_FCC_15.247_WiFi_01"

No changes have been made in the hardware or software for the UNII-1 Band (5180–5240 MHz), UNII-2a Band (5260–5320 MHz), UNII-2c Band (5500–5720 MHz), (UNII-3 Band (5745–5825 MHz), UNII-5 Band (5955–6415 MHz), UNII-6 Band (6435–6515 MHz), UNII-7 Band (6535–6875 MHz) and UNII-8 Band (6895–7115 MHz). Since no changes have been made in these bands the applicant declares that the test date referenced in this test report represents valid data for demonstrating compliance for the variants listed in this application.

This spot check test report along with the original test report for the NII bands listed above are provided to show that since no changes have been made to the equipment subject to FCC Part 15 E of the FCC rules, the U7 Pro continues to comply with the FCC Rules and Regulations.

### 2.3.1 U7-Pro (Original Equipment) Certification

The U7-Pro was originally granted on 12/08/2023 for the frequency bands of 2412–2462 MHz, per CFR Part 15C, 15.247; 5180–5240 MHz, 5260–5320 MHz, 5500–5720 MHz, 5745–5825 MHz, per CFR Part 47 Part 15E, 15.407 and originally granted on 01/04/2024 for the frequency bands of 5955–7115 MHz, per CFR Part 47 Part 15E.

### 2.3.2 U7 Pro (New Equipment Certification) Proposal

The U7 Pro is requesting a grant for the frequency bands of 2412–2462 MHz, per CFR Part 15C, 15.247; 5180–5240 MHz; 5260–5320 MHz; 5500–5720 MHz; 5745–5825 MHz; and 5955–7115 MHz, per CFR Part 47 Part 15E.

The frequency bands of 5180–5240 MHz; 5260–5320 MHz; 5500–5720 MHz; 5745–5825 MHz; and 5955 – 7115 MHz have no hardware or software changes from the original certification of the U7-Pro (SWX-U7PRO / 6545A-U7PRO).

The frequency band of 2412–2462 MHz will be covered by a new separate test report due to the changes in this frequency band as described in Section 2.3 above and is the reason for this application.

## 2.4 U7 Pro Spot Check Test Plan

The spot-check plan listed in this section was formulated using good engineering judgement based on the knowledge of the device design by the Ubiquiti Inc. engineering team. The grantee of this device takes full responsible for the continued compliance to the FCC Rules. With this good engineering judgement, the confidence is high that the variant device will continue to be compliance with all the relevant FCC Rule parts.

### 2.4.1 Cross Reference Table

| **Reference Device** | **Variant Device** | **Key Differences** |
|---|---|---|
| Model U7-Pro<br>FCC ID: SWX-U7PRO | Model U7 Pro<br>FCC ID: SWX-U7PROP | 2412 – 2462 MHz WiFi Band the RF circuitry was changed from a one System on Chip (SOC) to a two chip set<br>See Section 2.3 above |

| Rule Part | Test Item | Data Referencing | Comments |
|---|---|---|---|
| 15.247 | All testing | No | The 15.247 testing was completely retested. See test report U7_Pro_FCC_15.247_WiFi_01 |
| U-NII Bands | | | |
| 15.407 | AC Mains Conducted | No | Note 1<br>Note 2 |
| 15.407 | Bandwidth Requirement | No | Note 1<br>Note 2 |
| 15.407 | Output Power | Yes | See Section 3.1 |
| 15.407 | Spurious Emissions | Yes | See Section 3.3 |
| 15.407 | Power Spectral Density | Yes | See Section 3.1 |
| 15.407 (U-NII-2) | DFS Requirement | Yes | See Section 3.2 |

Note 1: The following are the original test report references for UNII-1, UNII-2, UNII-3 and UNII-5 respectfully

- TR8594_U7-Pro_FCC_15.407_UNII-1_02
- TR8570_U7-Pro_15.407_UNII-2_02
- TR8575_U7-Pro_15.407_UNII-3_01
- TR8585_U7-Pro_FCC_15.407_UNII-5_04

Note 2: Combined Spot Check report combined with original report are:

- TR9367_U7_Pro_FCC_15.407_UNII-1_04
- TR9368_U7_Pro_FCC_15.407_UNII-2_04

- TR9369_U7_Pro_FCC_15.407_UNII-3_04
- TR9370_U7_Pro_FCC_15.407_UNII-5_04

### 2.4.2 Acceptance Criteria

The accepted criteria is listed under sections 2.4.3, 2.4.4 and 2.4.5.

### 2.4.3 U7 Pro Spot Check – Power / PSD

Per KDB 484596 DO1 a spot check was conducted for the bands that have no changes applied, 5180–5240 MHz; 5260–5320 MHz; 5500–5720 MHz; 5745–5825 MHz; and 5955–7115 MHz, to ensure the levels are still less than the original power reported during the certification process. Below is the spot check comparison with test report references. The test reports noted below will also be submitted to the TCB for reference.
The accepted criteria for the outcome of the spot check is continued compliance to the FCC Rules and reasonable close results to the original test data.

### 2.4.4 U7 Pro Spot Check – DFS

Per KDB 484596 D01 a spot check was conducted for the bands that have no changes applied, 5500-5720 MHz to ensure the level are still less than the original reported DFS during the original certification process. Below is the spot check comparison for the DFS portion.
The accepted criteria for the outcome of the spot check is continued compliance to the FCC Rules and reasonable close results to the original test data.

### 2.4.5 U7 Pro Spot Check – Radiated Emissions

Per KDB 484596 D01 a spot check was conducted for radiated emissions in the UNII-1, UNII-2 and UNII-5 bands that have no changes applied. Below is the spot check comparison for the Radiated Emissions portion.
The accepted criteria for the outcome of the spot check is continued compliance to the FCC Rules and reasonable close results to the original test data.

## 2.5 Illustrations

The illustration exhibit is being submitted separately due to the size restrictions. The exhibit is titled, “U7_Pro_Internal_Illustrations_Comparison.”

# 3 Spot Check Test Data

## 3.1 Power and PSD

**5180–5240 MHz Band UNII-1 Spot Check**

| Mode | Frequency | UCL Results (10/3/2023) | | UCL Results (8/29/2024) | | Delta | |
|---|---|---|---|---|---|---|---|
| | | RF Pwer | PSD | RF Pwer | PSD | RF Pwer | PSD |
| | | W | dbm | W | dBm | W | dBm |
| HE20 | 5180 | 0.177 | 9.25 | 0.137 | 8.57 | - 0.04 | - 0.68 |
| HE20 | 5210 | 0.415 | 12.86 | 0.334 | 12.44 | - 0.08 | - 0.42 |
| HE20 | 5240 | 0.540 | 13.97 | 0.388 | 13.20 | - 0.15 | - 0.77 |
| HE40 | 5190 | 0.113 | 4.37 | 0.088 | 4.05 | - 0.03 | - 0.32 |
| HE40 | 5230 | 0.234 | 7.20 | 0.173 | 6.88 | - 0.06 | - 0.32 |
| HE80 | 5210 | 0.134 | 1.75 | 0.099 | 1.39 | - 0.04 | - 0.36 |

**5260–5320 MHz Band**

**UNII-2A Spot Check**

| Mode | Frequency | UCL Results (9/8/2023) | | UCL Results (8/29/2024) | | Delta | |
|---|---|---|---|---|---|---|---|
| | | RF Pwer | PSD | RF Pwer | PSD | RF Pwer | PSD |
| | | W | dbm | W | dBm | W | dBm |
| HE20 | 5260 | 0.230 | 10.11 | 0.185 | 9.66 | - 0.05 | - 0.45 |
| HE20 | 5280 | 0.211 | 9.90 | 0.183 | 9.64 | - 0.03 | - 0.26 |
| HE20 | 5320 | 0.208 | 9.72 | 0.195 | 9.85 | - 0.01 | 0.13 |
| HE40 | 5270 | 0.226 | 7.03 | 0.184 | 6.80 | - 0.04 | - 0.23 |
| HE40 | 5310 | 0.220 | 6.82 | 0.199 | 6.98 | - 0.02 | 0.16 |
| HE80 | 5290 | 0.202 | 3.58 | 0.180 | 3.67 | - 0.02 | 0.09 |
| HE160 | 5250 | 0.225 | 1.18 | 0.180 | 0.64 | - 0.05 | - 0.54 |

**5500–5720 MHz Band**

**UNII-2C Spot Check**

| Mode | Frequency | UCL Results (9/8/2023) | | UCL Results (8/30/2024) | | Delta | |
|---|---|---|---|---|---|---|---|
| | | RF Pwer | PSD | RF Pwer | PSD | RF Pwer | PSD |
| | | W | dbm | W | dBm | W | dBm |
| HE20 | 5500 | 0.242 | 10.55 | 0.217 | 10.70 | - 0.02 | 0.15 |
| HE20 | 5600 | 0.201 | 9.96 | 0.163 | 9.68 | - 0.04 | - 0.28 |
| HE20 | 5720 | 0.250 | 10.75 | 0.173 | 10.15 | - 0.08 | - 0.60 |
| HE40 | 5510 | 0.242 | 7.53 | 0.215 | 7.67 | - 0.03 | 0.14 |
| HE40 | 5590 | 0.207 | 6.90 | 0.164 | 6.60 | - 0.04 | - 0.30 |
| HE40 | 5710 | 0.203 | 6.81 | 0.137 | 5.99 | - 0.07 | - 0.82 |
| HE80 | 5530 | 0.237 | 4.41 | 0.205 | 6.08 | - 0.03 | 1.67 |
| HE80 | 5610 | 0.248 | 4.72 | 0.188 | 4.41 | - 0.06 | - 0.31 |
| HE80 | 5690 | 0.240 | 4.74 | 0.155 | 3.62 | - 0.09 | - 1.12 |
| HE160 | 5570 | 0.229 | 1.46 | 0.204 | 1.79 | - 0.03 | 0.33 |

## 3.2 DFS

**DFS Spot Check – 10 Trials at 80 MHz – All wave Forms**

**Original Summary Table from 10/18/2023**

| Summary | | | |
|---|---|---|---|
| **Type** | **Detections** | **Trials** | **Detection Probability** |
| Type 1 | 29 | 30 | 97% |
| Type 2 | 28 | 30 | 93% |
| Type 3 | 25 | 30 | 83% |
| Type 4 | 28 | 30 | 93% |
| Type 5 | 30 | 30 | 100% |
| Type 6 | 30 | 30 | 100% |
| Aggregate 1-4 | 110 | 120 | 92% |

**New Summary Table and Data from 9/11/2024**

| Summary | | | |
|---|---|---|---|
| **Type** | **Detections** | **Trials** | **Detection Probability** |
| Type 1 | 9 | 10 | 90% |
| Type 2 | 9 | 10 | 90% |
| Type 3 | 9 | 10 | 90% |
| Type 4 | 8 | 10 | 80% |
| Type 5 | 10 | 10 | 100% |
| Type 6 | 10 | 10 | 100% |
| Aggregate 1-4 | 35 | 40 | 88% |

**Trials**

| RADAR TYPE 1 | | | | Rohde & Schwarz K350 Pulse Sequencer DFS |
|---|---|---|---|---|
| **Trial #** | **Number of Pulses per Burst** | **Pulse Width (µsec)** | **PRI (µs)** | **Detection (yes/no)** |
| 1 | 46 | 1 | 1152 | y |
| 2 | 58 | 1 | 918 | y |
| 3 | 19 | 1 | 2877 | n |

| | | | | |
|---|---|---|---|---|
| 4 | 31 | 1 | 1726 | y |
| 5 | 18 | 1 | 2948 | y |
| 6 | 53 | 1 | 996 | y |
| 7 | 19 | 1 | 2829 | y |
| 8 | 87 | 1 | 611 | y |
| 9 | 31 | 1 | 1733 | y |
| 10 | 25 | 1 | 2148 | y |
| | | | | |
| | | | | |

9/10=90%

## RADAR TYPE 2

Rohde & Schwarz
K350 Pulse Sequencer DFS

| Trial # | Number of Pulses per Burst | Pulse Width (µsec) | PRI (µs) | Detection (yes/no) |
|---|---|---|---|---|
| 1 | 28 | 3.9 | 169 | y |
| 2 | 29 | 2.2 | 182 | y |
| 3 | 28 | 1.4 | 222 | n |
| 4 | 29 | 2 | 166 | y |
| 5 | 28 | 2.7 | 203 | y |
| 6 | 25 | 4 | 196 | y |
| 7 | 26 | 1.5 | 152 | y |
| 8 | 27 | 2.4 | 225 | y |
| 9 | 28 | 4.5 | 169 | y |
| 10 | 24 | 3.2 | 170 | y |
| | | | | |
| | | | | |

9/10=90%

## RADAR TYPE 3

Rohde & Schwarz
K350 Pulse Sequencer DFS

| Trial # | Number of Pulses per Burst | Pulse Width (µsec) | PRI (µs) | Detection (yes/no) |
|---|---|---|---|---|
| 1 | 18 | 9 | 387 | y |
| 2 | 17 | 9 | 433 | y |
| 3 | 18 | 6.1 | 453 | y |
| 4 | 17 | 6.7 | 368 | n |
| 5 | 17 | 9.5 | 241 | y |
| 6 | 16 | 6.5 | 337 | y |
| 7 | 17 | 9.2 | 288 | y |
| 8 | 18 | 8.1 | 474 | y |
| 9 | 16 | 6.2 | 284 | y |
| 10 | 18 | 9.6 | 476 | y |

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

9/10=90%

| RADAR TYPE 4 | | | Rohde & Schwarz K350 Pulse Sequencer DFS | |
|---|---|---|---|---|
| **Trial #** | **Number of Pulses per Burst** | **Pulse Width (µsec)** | **PRI (µs)** | **Detection (yes/no)** |
| 1 | 12 | 14.8 | 237 | y |
| 2 | 15 | 17 | 437 | n |
| 3 | 13 | 19.9 | 352 | y |
| 4 | 15 | 14 | 389 | y |
| 5 | 12 | 16 | 304 | y |
| 6 | 15 | 12.7 | 350 | y |
| 7 | 12 | 12.2 | 204 | y |
| 8 | 16 | 12.9 | 367 | y |
| 9 | 12 | 18.6 | 422 | n |
| 10 | 13 | 18 | 484 | y |
| | | | | |
| | | | | |

8/10=80%

| TYPE 5 | Rohde & Schwarz K350 Pulse Sequencer DFS | | | |
|---|---|---|---|---|
| **Trial #** | **Detection (yes/no)** | **Chirp Width (MHz)** | **Subset** | **Fc** |
| 1 | y | 11 | 1 | 5570 |
| 2 | y | 19 | 1 | 5570 |
| 3 | y | 17 | 1 | 5570 |
| 4 | y | 13 | 1 | 5570 |
| 5 | y | 12 | 1 | 5570 |
| 6 | y | 17 | 1 | 5570 |
| 7 | y | 18 | 1 | 5570 |
| 8 | y | 9 | 1 | 5570 |
| 9 | y | 6 | 1 | 5570 |
| 10 | y | 13 | 1 | 5570 |

10/10=100%

| TYPE 6 S | Rohde & Schwarz K350 Pulse Sequencer DFS |
|---|---|
| **Trial #** | **Detection (yes/no)** |
| 1 | y |
| 2 | y |
| 3 | y |
| 4 | y |
| 5 | y |
| 6 | y |
| 7 | y |
| 8 | y |
| 9 | y |
| 10 | y |

10/10=100%

**5745–5825 MHz Band**

**UNII-3 Spot Check**

| Mode | Frequency | UCL Results (10/4/2023) | | UCL Results (8/30/2024) | | Delta | |
|---|---|---|---|---|---|---|---|
| | | RF Pwer | PSD | RF Pwer | PSD | RF Pwer | PSD |
| | | W | dbm | W | dBm | W | dBm |
| HE20 | 5745 | 0.697 | 12.12 | 0.465 | 11.29 | - 0.23 | - 0.83 |
| HE20 | 5775 | 0.840 | 13.03 | 0.594 | 11.50 | - 0.25 | - 1.53 |
| HE20 | 5825 | 0.621 | 11.33 | 0.490 | 10.71 | - 0.13 | - 0.62 |
| HE40 | 5755 | 0.540 | 7.90 | 0.364 | 7.50 | - 0.18 | - 0.40 |
| HE40 | 5775 | 0.628 | 8.70 | 0.401 | 7.19 | - 0.23 | - 1.51 |
| HE40 | 5795 | 0.587 | 8.27 | 0.378 | 7.75 | - 0.21 | - 0.52 |
| HE80 | 5775 | 0.244 | 1.81 | 0.163 | 1.36 | - 0.08 | - 0.45 |

**5955–7115 MHz Band**

**UNII-5 Spot Check**

| Mode | Frequency | UCL Results (11/16/2023) | | UCL Results (8/30/2024) | | Delta | |
|---|---|---|---|---|---|---|---|
| | | RF Pwer | PSD | RF Pwer | PSD | RF Pwer | PSD |
| | | W (eirp) | dbm | W (eirp) | dBm | W (eirp) | dBm |
| EHT20 | 5955 | 0.062 | -1.27 | 0.038 | -1.82 | - 0.02 | - 0.55 |
| EHT20 | 6195 | 0.071 | -0.87 | 0.056 | -1.22 | - 0.01 | - 0.35 |
| EHT20 | 6415 | 0.074 | -1.33 | 0.043 | -2.81 | - 0.03 | - 1.48 |
| EHT40 | 5965 | 0.139 | -1.72 | 0.084 | -1.72 | - 0.06 | 0.00 |
| EHT40 | 6205 | 0.143 | -1.11 | 0.113 | -1.33 | - 0.03 | - 0.22 |
| EHT40 | 6405 | 0.153 | -1.27 | 0.094 | -2.22 | - 0.06 | - 0.95 |
| EHT80 | 5985 | 0.262 | -0.99 | 0.187 | -1.39 | - 0.08 | - 0.40 |
| EHT80 | 6225 | 0.277 | -1.16 | 0.223 | -1.19 | - 0.05 | - 0.03 |
| EHT80 | 6385 | 0.282 | -1.49 | 0.187 | -2.31 | - 0.09 | - 0.82 |
| EHT160 | 6025 | 0.467 | -1.24 | 0.300 | -1.59 | - 0.17 | - 0.35 |
| EHT160 | 6185 | 0.492 | -1.02 | 0.445 | -0.95 | - 0.05 | 0.07 |
| EHT160 | 6325 | 0.578 | -1.37 | 0.438 | -1.37 | - 0.14 | 0.00 |
| EHT320 | 6265 | 0.869 | -1.56 | 0.676 | -2.13 | - 0.19 | - 0.57 |

## 3.3 U7 Pro Spot Check – Radiated TX Spurious Emissions

Per KDB 484596 DO1 a spot was conducted for the bands that have no changes applied (5180–5240 MHz; 5260–5320 MHz; 5500–5720 MHz; 5745–5825 MHz; and 5955–7115 MHz) to ensure the levels of spurious / harmonic emissions comply with CFR 47 Part 15.209 and 15.255 respectively as reported during the certification process. Below is the spot check comparison with test report references. The test report noted below will also be submitted to the TCB for reference.

**UNII-1 Spurious Low Channel 1 – 17 GHz**
**Previous Data as recorded in Report #: U7-Pro_FCC_15.407_UNII-1_02**

Peak

| Frequency | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Azimuth (°) | Height (m) | Pol. | Correction (dB) |
|---|---|---|---|---|---|---|---|
| 10.37 GHz | 55.017 | 74 | -18.98 | 136 | 1.643 | Vertical | 8.55 |
| 11.91 GHz | 58.708 | 74 | -15.29 | 87 | 1.638 | Vertical | 10.05 |
| 15.54 GHz | 66.609 | 74 | -7.39 | 124 | 2.645 | Vertical | 10.59 |
| 10.35 GHz | 55.596 | 74 | -18.40 | 162 | 2.645 | Horizontal | 8.39 |
| 15.53 GHz | 59.965 | 74 | -14.04 | 148 | 3.154 | Horizontal | 10.60 |

Avg

| Frequency | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Azimuth (°) | Height (m) | Pol. | Correction (dB) |
|---|---|---|---|---|---|---|---|
| 10.37 GHz | 41.564 | 54 | -12.44 | 136 | 1.643 | Vertical | 8.55 |
| 11.91 GHz | 52.136 | 54 | -1.86 | 87 | 1.638 | Vertical | 10.05 |
| 15.54 GHz | 52.195 | 54 | -1.81 | 124 | 2.645 | Vertical | 10.59 |
| 10.35 GHz | 42.29 | 54 | -11.71 | 162 | 2.645 | Horizontal | 8.39 |
| 15.53 GHz | 45.337 | 54 | -8.63 | 148 | 3.154 | Horizontal | 10.60 |

**UNII-1 Spurious Low Channel**
**Data taken 8/19/2024**

Peak

| Frequency | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Azimuth (°) | Height (m) | Pol. | Correction (dB) |
|---|---|---|---|---|---|---|---|
| 12.40 GHz | 54.732 | 74 | -19.27 | 89 | 2.329 | Vertical | 13.99 |
| 14.82 GHz | 56.135 | 74 | -17.87 | 13 | 4 | Vertical | 14.43 |
| 16.17 GHz | 56.786 | 74 | -17.21 | 70 | 1.834 | Vertical | 16.14 |
| 12.30 GHz | 54.805 | 74 | -19.20 | 23 | 1.834 | Horizontal | 14.42 |

| Frequency | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Azimuth (°) | Height (m) | Pol. | Correction (dB) |
|---|---|---|---|---|---|---|---|
| 16.20 GHz | 57.609 | 74 | -16.39 | 318 | 1.643 | Horizontal | 16.74 |

Avg

| Frequency | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Azimuth (°) | Height (m) | Pol. | Correction (dB) |
|---|---|---|---|---|---|---|---|
| 12.40 GHz | 41.342 | 54 | -12.66 | 89 | 2.329 | Vertical | 13.99 |
| 14.82 GHz | 42.375 | 54 | -11.63 | 13 | 4 | Vertical | 14.43 |
| 16.17 GHz | 43.689 | 54 | -10.31 | 70 | 1.834 | Vertical | 16.14 |
| 12.30 GHz | 41.656 | 54 | -12.34 | 23 | 1.834 | Horizontal | 14.42 |
| 16.20 GHz | 44.344 | 54 | -9.66 | 318 | 1.643 | Horizontal | 16.74 |

**UNII-1 Spurious High Channel 1 – 17 GHz**
**Previous Data as recorded in Report #: U7-Pro_FCC_15.407_UNII-1_02**

Peak

| Frequency | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Azimuth (°) | Height (m) | Pol. | Correction (dB) |
|---|---|---|---|---|---|---|---|
| 10.47 GHz | 52.904 | 74 | -21.10 | 5 | 4 | Vertical | 8.01 |
| 11.91 GHz | 58.719 | 74 | -15.28 | 88 | 1.643 | Vertical | 10.05 |
| 15.74 GHz | 64.193 | 74 | -9.81 | 147 | 1.638 | Vertical | 11.14 |
| 10.47 GHz | 52.743 | 74 | -21.26 | 147 | 1.834 | Horizontal | 7.97 |
| 15.72 GHz | 62.14 | 74 | -11.86 | 129 | 1.833 | Horizontal | 11.19 |

Avg

| Frequency | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Azimuth (°) | Height (m) | Pol. | Correction (dB) |
|---|---|---|---|---|---|---|---|
| 10.47 GHz | 39.40 | 54 | -14.60 | 5 | 4 | Vertical | 8.01 |
| 11.91 GHz | 51.94 | 54 | -2.06 | 88 | 1.643 | Vertical | 10.05 |
| 15.74 GHz | 51.12 | 54 | -2.88 | 147 | 1.638 | Vertical | 11.14 |
| 10.47 GHz | 40.02 | 54 | -13.98 | 147 | 1.834 | Horizontal | 7.97 |
| 15.72 GHz | 48.94 | 54 | -5.06 | 129 | 1.833 | Horizontal | 11.19 |

**UNII-1 Spurious High Channel**
**Data taken 8/19/2024**

Peak

| Frequency | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Azimuth (°) | Height (m) | Pol. | Correction (dB) |
|---|---|---|---|---|---|---|---|
| 12.95 GHz | 54.344 | 74 | -19.66 | 11 | 2.325 | Vertical | 14.65 |
| 14.70 GHz | 56.687 | 74 | -17.31 | 143 | 2.142 | Vertical | 15.65 |
| 16.21 GHz | 57.226 | 74 | -16.77 | 1 | 3.153 | Vertical | 16.70 |
| 13.01 GHz | 55.226 | 74 | -18.77 | 27 | 3.802 | Horizontal | 15.171 |
| 16.10 GHz | 55.962 | 74 | -18.04 | 210 | 3.802 | Horizontal | 14.875 |

Avg

| Frequency | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Azimuth (°) | Height (m) | Pol. | Correction (dB) |
|---|---|---|---|---|---|---|---|
| 12.95 GHz | 41.121 | 54 | -12.88 | 11 | 2.325 | Vertical | 14.65 |
| 14.70 GHz | 43.596 | 54 | 10.40 | 143 | 2.142 | Vertical | 15.65 |
| 16.21 GHz | 44.143 | 54 | -9.86 | 1 | 3.153 | Vertical | 16.70 |

| Frequency | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Azimuth (°) | Height (m) | Pol. | Correction (dB) |
|---|---|---|---|---|---|---|---|
| 13.01 GHz | 41.503 | 54 | -12.50 | 27 | 3.802 | Horizontal | 15.171 |
| 16.10 GHz | 42.627 | 54 | -11.37 | 210 | 3.802 | Horizontal | 14.875 |

**UNII-5 Spurious Mid Channel 17 – 40 GHz**
**Previous Data as recorded in Report #: U7-Pro_FCC_15.407_UNII-5_01**

Peak

| Frequency | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Azimuth (°) | Pol. | Correction (dB) |
|---|---|---|---|---|---|---|
| 17.01 GHz | 50.362 | 74 | -23.64 | 259 | Horizontal | -0.01 |

Avg

| Frequency | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Azimuth (°) | Pol. | Correction (dB) |
|---|---|---|---|---|---|---|
| 17.01 | 37.261 | 54 | -16.74 | 259 | Horizontal | -0.01 |

**UNII-5 Spurious Mid Channel**
**Data Taken 8/23/2024**

Peak

| Frequency | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Azimuth (°) | Pol. | Correction (dB) |
|---|---|---|---|---|---|---|
| 33.46 GHz | 55.159 | 74 | -18.84 | 255 | Vertical | 4.54 |
| 34.91 GHz | 57.259 | 74 | -16.74 | 243 | Vertical | 6.22 |
| 33.80 GHz | 55.817 | 74 | -18.18 | 39 | Horizontal | 5.27 |
| 34.95 GHz | 57.085 | 74 | -16.92 | 156 | Horizontal | 6.33 |

Avg

| Frequency | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Azimuth (°) | Pol. | Correction (dB) |
|---|---|---|---|---|---|---|
| 33.46 GHz | 42.024 | 54 | -11.98 | 255 | Vertical | 4.54 |
| 34.91 GHz | 43.668 | 54 | -10.33 | 243 | Vertical | 6.22 |
| 33.80 GHz | 42.543 | 54 | -11.46 | 39 | Horizontal | 5.27 |
| 34.95 GHz | 43.939 | 54 | -10.06 | 156 | Horizontal | 6.33 |

-- End of Test Report --

UNIFIED COMPLIANCE LABORATORY

**427 West 12800 South**
**Draper, UT 84020**

# Test Report

## Certification

| | |
|---|---|
| **FCC ID** | SWX-U7PRO |
| **ISED ID** | 6545A-U7PRO |
| **Equipment Under Test** | U7-Pro |
| **Test Report Serial Number** | TR8585_04 |
| **Date of Tests** | 29 August; 1, 12, 14 October 2023 |
| **Report Issue Date** | 12 December 2023 |

| Test Specification | Applicant |
|---|---|
| 47 CFR FCC Part 15, Subpart E | Ubiquiti Inc.<br>685 Third Avenue<br>New York, NY 10017<br>U.S.A. |

NVLAP TESTING ilac-MRA

**NVLAP LAB CODE 600241-0**

# Certification of Engineering Report

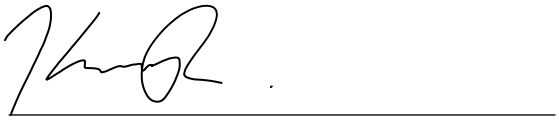
This report has been prepared by Unified Compliance Laboratory (UCL) to document compliance of the device described below with the requirement of Federal Communication Commissions (FCC) Part 15, Subpart E. This report may be reproduced in full. Partial reproduction of this report may only be made with the written consent of the laboratory. The results in this report apply only to the sample tested.

| | |
|---|---|
| **Applicant** | Ubiquiti Inc. |
| **Manufacturer** | Ubiquiti Inc. |
| **Brand Name** | UBIQUITI |
| **Model Number** | U7-Pro |
| **FCC ID** | SWX-U7PRO |
| **ISED ID** | 6545A-U7PRO |

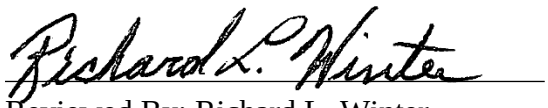
On this 12th day of December 2023, I individually and for Unified Compliance Laboratory certify that the statements made in this engineering report are true, complete, and correct to the best of my knowledge and are made in good faith.

Although NVLAP has accredited the Unified Compliance Laboratory testing facilities, this report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the U.S. federal government.

Unified Compliance Laboratory



Written By: Kimberly Rodriguez



Reviewed By: Richard L. Winter

| Revision History | | |
|---|---|---|
| **Revision** | **Description** | **Date** |
| 01 | Original Report Release | 24 October 2023 |
| 02 | Updated Section 5.1 for beamforming gain and Section 2.10 for channel puncturing and RU considerations. | 7 December 2023 |
| 03 | Added information on partial RU considerations into section 2.6 | 11 December 2023 |
| 04 | Added CBP Test Equipment to Section 4, RE diagrams to Section 4.3, RU test Data to section 5.6, updated CBP test procedure to include 0dBi antenna gain in section 5.7 | 12 December 2023 |

# Table of Contents

# 1 Client Information

## 1.1 Applicant

| | |
|---|---|
| **Company** | Ubiquiti Inc.<br>685 Third Avenue<br>New York, NY 10017<br>U.S.A. |
| **Contact Name** | Alex Macon |
| **Title** | Compliance |

## 1.2 Manufacturer

| | |
|---|---|
| **Company** | Ubiquiti Inc.<br>685 Third Avenue<br>New York, NY 10017<br>U.S.A. |
| **Contact Name** | Alex Macon |
| **Title** | Compliance |

# 2 Equipment Under Test (EUT)

## 2.1 Identification of EUT

| | |
|---|---|
| **Brand Name** | UBIQUITI |
| **Model Number** | U7-Pro |
| **Serial Number** | 9AZ 003 |
| **Dimensions (cm)** | 20.6 x 20.6 x 4.6 |

## 2.2 Description of EUT

The U7-Pro is WiFi 7 access point that represents the next generation of competitively priced, prosumer wireless technology for home and enterprise users. The U7-Pro provides high aggregate throughput speeds. The U7-Pro transmit in the 2.4 GHz, 5 GHz and 6 GHz frequency bands and uses integrated antennas. The U7-Pro is powered from an 802.3at power adapter.

This report covers the circuitry of the device subject to FCC Part 15, Subpart E. The circuitry of the device subject to FCC Part 15 Subpart B was found to be compliant and is covered under a separate Unified Compliance Laboratory test report.

The table below show the channels used within the different modulation bandwidths.

| Band | Modulation Bandwidth | Frequency (MHz) | Maximum Power Setting |
|---|---|---|---|
| UNII-5 | be (EHT20) | 5995 | TP10 |
| | | 6195 | TP10 |
| | | 6415 | TP10 |
| | be (EHT40) | 5965 | TP12 |
| | | 6205 | TP13 |
| | | 6405 | TP13 |
| | be (EHT80) | 5985 | TP16 |
| | | 6225 | TP16 |
| | | 6385 | TP16 |
| | be (EHT160) | 6205 | TP19 |
| | | 6185 | TP19 |
| | | 6325 | TP19 |
| | be (EHT320) | 6265 | TP21 |
| | ax (HE20) | 6115 | TP10 |
| | | 6195 | TP10 |
| | | 6415 | TP10 |

| | | | |
|---|---|---|---|
| | ax (HE40) | 6125 | TP13 |
| | | 6205 | TP13 |
| | | 6405 | TP13 |
| | ax (HE80) | 6145 | TP16 |
| | | 6225 | TP16 |
| | | 6385 | TP16 |
| | ax (HE160) | 6185 | TP19 |
| | | 6325 | TP19 |

## 2.3 EUT and Support Equipment

The EUT and support equipment used during the test are listed below.

| Brand Name<br>Model Number<br>Serial Number | Description | Name of Interface Ports / Interface Cables |
|---|---|---|
| BN: UBIQUITI<br>MN: U7-Pro<br>SN: 9AZ 003 | WiFi Access Point | See Section 2.4 |
| BN: UBIQUITI<br>MN: U-POE-at<br>SN: N/A | PoE Power Adapter | Unshielded Cat 5e cable/1 meters |
| BN: Dell<br>MN: XPS 13<br>SN: N/A | Laptop Personal Computer | Unshielded Cat 5e cable/1 meters |

Notes: (1) EUT
(2) Interface port connected to EUT (See Section 2.4)

The support equipment listed above was not modified in order to achieve compliance with this standard.

## 2.4 Interface Ports on EUT

| Name of Ports | No. of Ports Fitted to EUT | Cable Description/Length |
|---|---|---|
| AC Mains | 1 | 3 conductor power cord/80 cm |
| POE (POE Injector) | 1 | Unshielded Cat 5e cable/8 meters |
| LAN (POE Injector) | 1 | Unshielded Cat 5e cable/1 meters |

## 2.5 Operating Environment

| | |
|---|---|
| **Power Supply** | 120 Volts AC Mains to 48 Volts PoE |
| **AC Mains Frequency** | 60 Hz |

| | |
|---|---|
| **Temperature** | 24.7 – 26.4 °C |
| **Humidity** | 30.4 – 35.9 % |
| **Barometric Pressure** | 1017 mBar |

## 2.6 Operating Modes

The U7-Pro was tested using test software in order to enable to constant transmission. The measurements within this report are corrected to reference a 100% duty cycle. All emission modes of 802.11ax were investigated. Partial Resource Units were investigated and found to comply to all requirements. center and edge allocations were measured and are included in the Annex for review. Per the manufacturer the U7-Pro does not support channel puncturing and considerations noted in KDB 987594 D02 per we not applicable.

## 2.7 EUT Exercise Software

EUT firmware version 1.0 was used to operate the transmitter using a constant transmit mode.

## 2.8 Block Diagram of Test Configuration

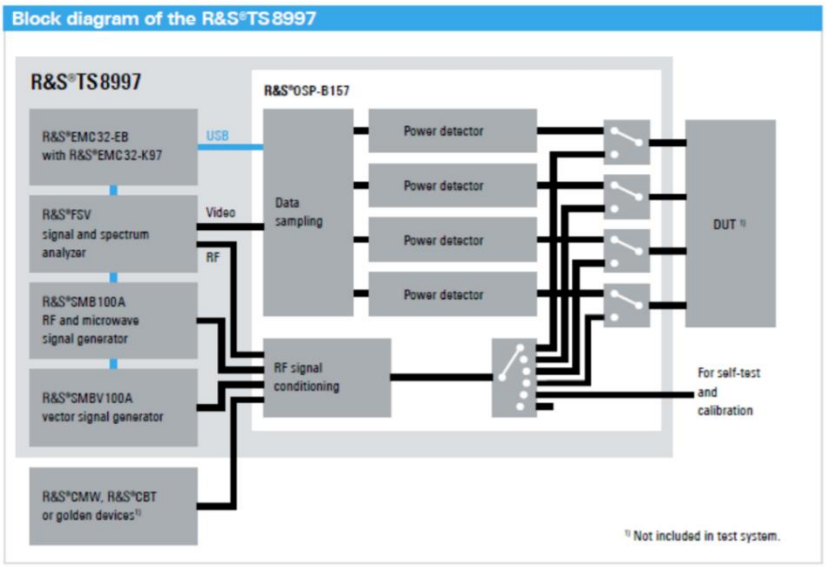



**Diagram 1: Test Configuration Block Diagram**

## 2.9 Modification Incorporated/Special Accessories on EUT

There were no modifications made to the EUT during testing to comply with the specification.

## 2.10 Deviation, Opinions Additional Information or Interpretations from Test Standard

None

# 3 Test Specification, Method and Procedures

## 3.1 Test Specification

| | |
|---|---|
| **Title** | 47 CFR FCC Part 15, Subpart E, Section 15.407<br>Limits and methods of measurement of radio interference characteristics of Unlicensed National Information Infrastructure Devices |
| **Purpose of Test** | The tests were performed to demonstrate initial compliance |

## 3.2 Methods & Procedures

### 3.2.1 47 CFR FCC Part 15 Section 15.407

See test standard for details.

## 3.3 FCC Part 15, Subpart E

### 3.3.1 Summary of Tests

| FCC Section | ISED Section | Environmental Phenomena | Frequency Range (MHZ) | Result |
|---|---|---|---|---|
| 15.203 | N/A | Antenna requirements | Structural Requirement | Compliant |
| 15.207 | RSS-Gen | Conducted Disturbance at Mains Port | 0.15 to 30 | Compliant |
| 15.407(a) | RSS-247 §6.2.2, §6.2.3 | Bandwidth Requirement | 5955 to 6415 | Compliant |
| 15.407(a) | RSS-247 §6.2.2, §6.2.3 | Peak Output Power[1] | 5955 to 6415 | Compliant |
| 15.407(f) | RSS-247 §6.2.2, §6.2.3 | Antenna Conducted Spurious Emissions[1] | 0.009 to 40000 | N/A |
| 15.407(a) | RSS-247 §6.2.2, §6.2.3 | Radiated Spurious Emissions | 0.009 to 40000 | Compliant |
| 15.407(a) | RSS-247 §6.2.2, §6.2.3 | Peak Power Spectral Density[1] | 5955 to 6415 | Compliant |
| 15.407(d) | RSS-247 §6.2.2, §6.2.3 | Contention Based Protocol | 5955 to 6415 | Compliant |

The testing was performed according to the procedures in ANSI C63.10-2013, KDB 789033, KDB 987594 and 47 CFR Part 15. Where applicable, KDB 662911 was followed to sum required measurements.

Note [1]: Various RU modes were considered for RF Power, PSD, and Spurious Emissions, and the "single client" RU mode is the worst case - the results herein are "single client" RU mode.

## 3.4 Results

In the configuration tested, the EUT complied with the requirements of the specification.

## 3.5 Test Location

Testing was performed at the Unified Compliance Laboratory 3-meter and 10-meter chamber located at 427 West 12800 South, Draper, UT 84020. Unified Compliance Laboratory is accredited by National Voluntary Laboratory Accreditation Program (NVLAP); NVLAP Code 600241-0 which is effective until 30 June 2024. This site has also been registered with Innovations, Science and Economic Development (ISED) department as was accepted under Appendix B, Phase 1 procedures of the APEC Tel MRA for Canadian recognition. ISED No.: 25346, effective until 30 June 2024.

Unified Compliance Laboratory has been assigned Designation Number US5037 by the FCC and Conformity Assessment Number US0223 by ISED.

# 4 Test Equipment

## 4.1 Conducted Emissions at Mains Ports

| Type of Equipment | Manufacturer | Model Number | Asset Number | Date of Last Calibration | Due Date of Calibration |
|---|---|---|---|---|---|
| EMI Receiver | AFJ | FFT3010 | UCL-6754 | 2/22/2023 | 2/22/2024 |
| LISN | AFJ | LS16C/10 | UCL-6749 | 12/6/2021 | 12/6/2023 |
| ISN | Teseq | ISN T800 | UCL-2974 | 6/27/2022 | 6/27/2024 |
| LISN | Com-Power | LIN-120C | UCL-2612 | 1/24/2023 | 1/24/2024 |
| AC Power Source | Laplace Instruments | AC1000A | UCL-2857 | N/A | N/A |
| Test Software | UCL | Revision 1 | UCL-3107 | N/A | N/A |

**Table 1: List of equipment used for Conducted Emissions Testing at Mains Port**

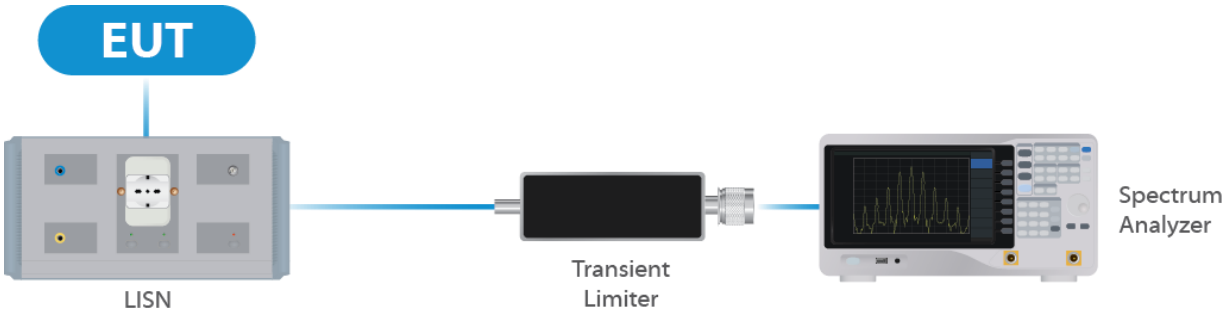



**Figure 1: Conducted Emissions Test**

## 4.2 Direct Connect at the Antenna Port Tests

| Type of Equipment | Manufacturer | Model Number | Asset Number | Date of Last Calibration | Due Date of Calibration |
|---|---|---|---|---|---|
| Spectrum Analyzer | R&S | FSV40 | UCL-2861 | 11/7/2022 | 11/7/2023 |
| Signal Generator | R&S | SMB100A | UCL-2864 | N/A | N/A |
| Vector Signal Generator | R&S | SMBV100A | UCL-2873 | N/A | N/A |
| Switch Extension | R&S | OSP-B157WX | UCL-2867 | 2/22/2023 | 2/22/2024 |
| Switch Extension | R&S | OSP-150W | UCL-2870 | 2/22/2023 | 2/22/2024 |

**Table 2: List of equipment used for Direct Connect at the Antenna Port**

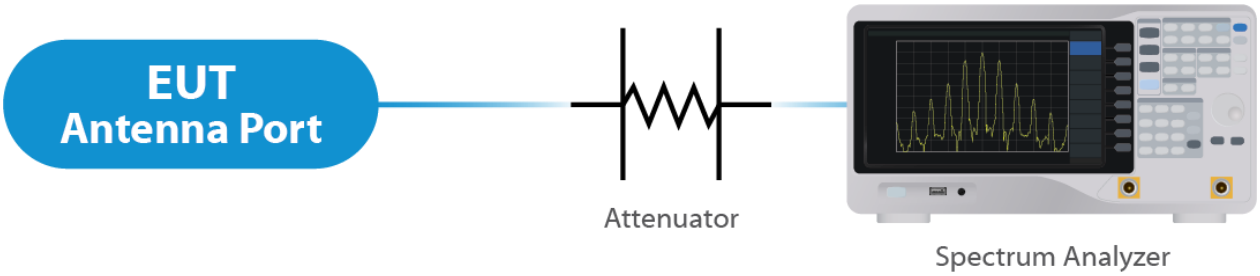



**Figure 2: Direct Connect at the Antenna Port Test**

## 4.3 Radiated Emissions

| Type of Equipment | Manufacturer | Model Number | Asset Number | Date of Last Calibration | Due Date of Calibration |
|---|---|---|---|---|---|
| EMI Receiver | Keysight | N9038A | UCL-2778 | 1/27/2023 | 1/27/2024 |
| Pre-Amplifier 9 kHz – 1 GHz | Sonoma Instruments | 310N | UCL-2889 | 10/7/2021 | 10/7/2023 |
| Broadband Antenna | Scwarzbeck | VULB 9163 | UCL-3062 | 9/13/2022 | 9/13/2024 |
| Broadband Antenna | Scwarzbeck | VULB 9163 | UCL-3071 | 6/08/2022 | 6/22/2024 |
| Double Ridge Horn Antenna | Scwarzbeck | BBHA 9120D | UCL-3065 | 9/22/2022 | 9/22/2024 |
| Log Periodic | Scwarzbeck | STLP 9129 | UCL-3068 | 1/27/2023 | 1/27/2025 |
| 15 - 40 GHz Horn Antenna | Scwarzbeck | BBHA 9170 | UCL-2487 | 6/09/2022 | 6/09/2024 |
| 1 – 18 GHz Amplifier | Com-Power | PAM 118A | UCL-3833 | 12/9/2022 | 12/9/2023 |
| Test Software | UCL | Revision 1 | UCL-3108 | N/A | N/A |

**Table 3: List of equipment used for Radiated Emissions**

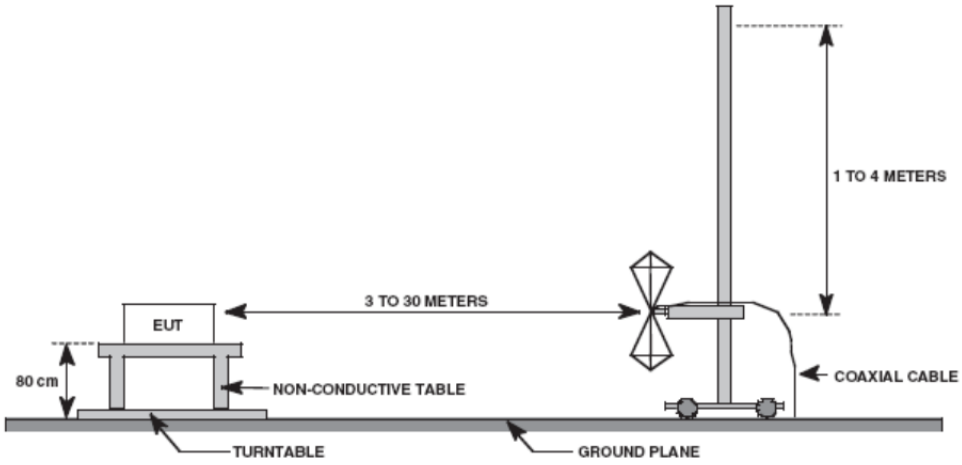



**Figure 3a: Radiated Emissions Test 30-1000MHz**

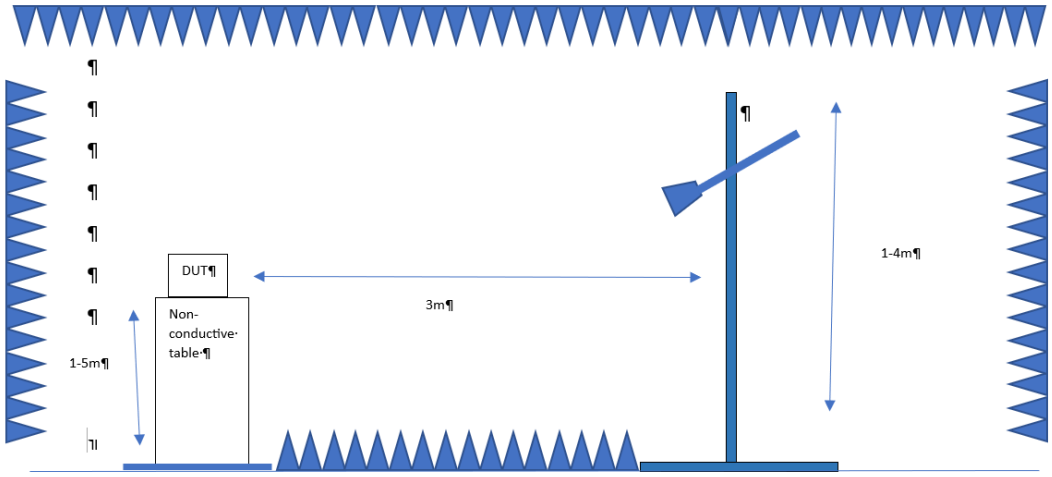



**Figure 3b: Radiated Emissions Test Above 1GHz**

## 4.4 Contention Base Protocol Tests

| Type of Equipment | Manufacturer | Model Number | Asset Number | Date of Last Calibration | Due Date of Calibration |
|---|---|---|---|---|---|
| Spectrum Analyzer | Keysight | N9010B EXA | UCL-7069 | 4/25/2023 | 4/25/2024 |
| Signal Generator | Keysight | MXG-B | UCL-6291 | 6/29/2023 | 6/29/2024 |
| MIMO Test Set | Keysight | X8750A | UCL-7373 | 9/19/2023 | 9/19/2024 |

Table 4: List of equipment used for Direct Connect at the Antenna Port

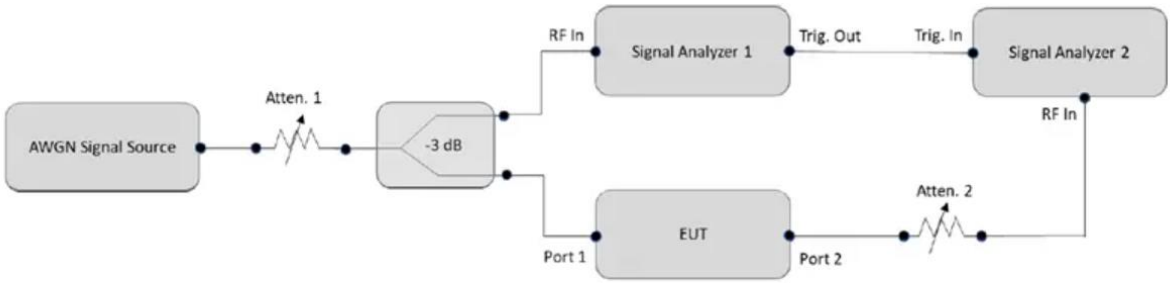



*Figure 1. CBP conducted test setup diagram. Source: KDB 987594 D02 V01r01*

Figure 4: Contention Base Protocol Test

## 4.5 Equipment Calibration

All applicable equipment is calibrated using either an independent calibration laboratory or Unified Compliance Laboratory personnel at intervals defined in ANSI C63.4:2014 following outlined calibration procedures. All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Supporting documentation relative to traceability is on file and is available for examination upon request.

## 4.6 Measurement Uncertainty

| Test | Uncertainty (± dB) | Confidence (%) |
|---|---|---|
| Conducted Emissions | 1.44 | 95 |
| Radiated Emissions (9 kHz to 30 MHz) | 2.50 | 95 |
| Radiated Emissions (30 MHz to 1 GHz) | 4.38 | 95 |
| Radiated Emissions (1 GHz to 18 GHz) | 4.37 | 95 |
| Radiated Emissions (18 GHz to 40 GHz) | 3.93 | 95 |
| **Direct Connect Tests** | **K Factor** | **Value** |
| Emissions Bandwidth | 2 | 2.0% |
| Output Power | 2 | 1.0 dB |
| Peak Power Spectral Density | 2 | 1.3 dB |
| Band Edge | 2 | 0.8 dB |
| Transmitter Spurious Emissions | 2 | 1.8 dB |

# 5 Test Results

## 5.1 §15.203 Antenna Requirements

The EUT uses an integral antenna. Per the manufacturer, the Maximum gain of the antenna per chain is 5.8 dBi. This is an 802.11 device and utilizes CDD as described in KDB 662911 D01. The antenna is not user replaceable. For CDD transmissions, directional gain is calculated as follows.

Array Gain = 10 log(NANT/NSS) dB

NANT = number of transmit antennas and
NSS = number of spatial streams. NSS = 1 considered worst case.

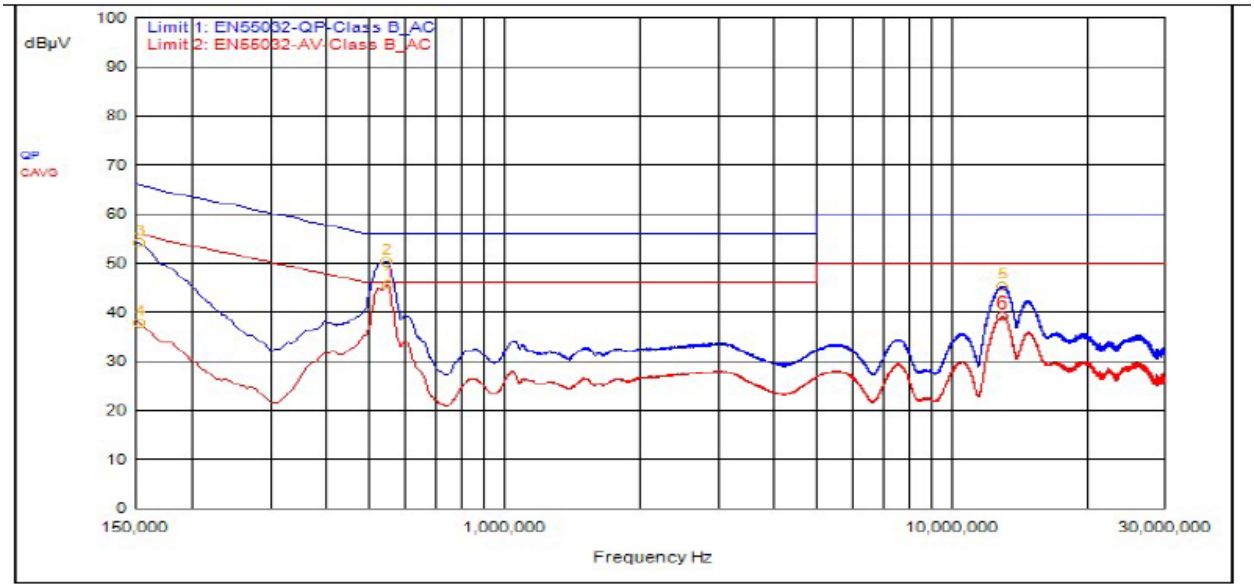
For power measurements on IEEE 802.11 devices, Array Gain = 0 dB for NANT ≤ 4;
For PSD measurements when Nss=1: Array Gain = 10 log(NANT/NSS) (dB) + Antenna Gain (dBi). Or 3.01 dB + 5.8 dBi = 8.81 dBi

### Results

The EUT complied with the specification

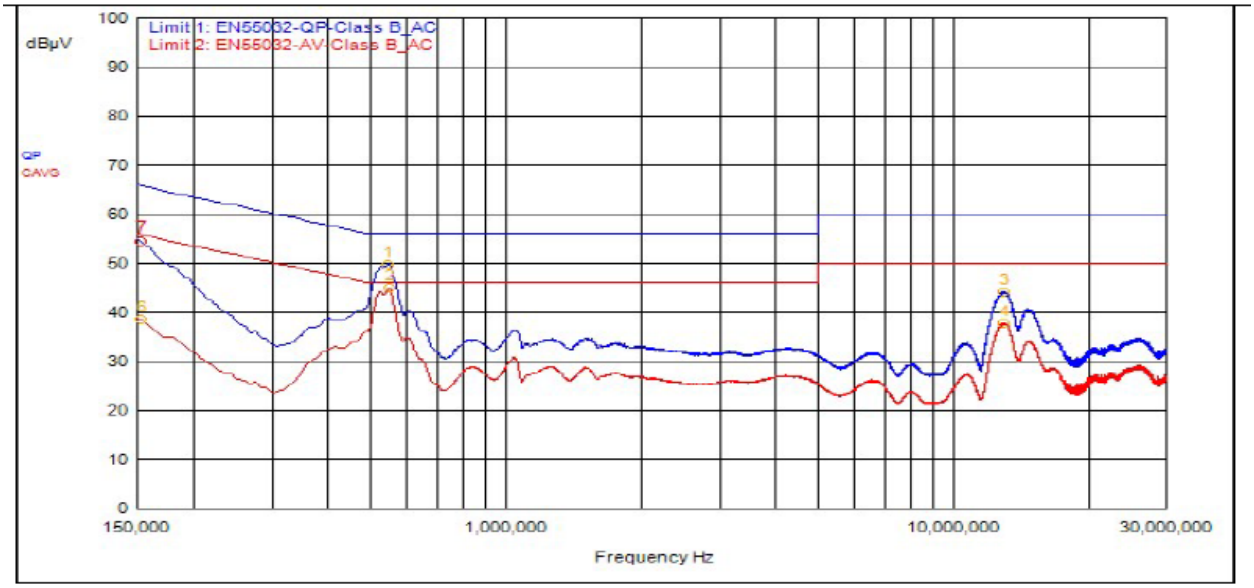
## 5.2 Conducted Emissions at Mains Ports Data

### 5.2.1 Line




| ID | Frequency | Probe | Cable | Atten. | Detector | Meter Read | Meas Level | Limit 1 | Limit 1 Dist. | Limit 2 | Limit 2 Dist. | P/F |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MU | MHz | dB | dB | dB | Type | dBµV | dBµV | dBµV | dB | dBµV | dB | P/F |
| 2 | 546,000kHz | 12.23 | 0.00 | | QPeak | 38.16 | 50.39 | 56.00 | -5.61 | | | |
| 3 | 153,000kHz | 12.26 | 0.00 | | QPeak | 41.82 | 54.08 | 65.84 | -11.76 | | | |
| 5 | 12.996 | 12.27 | 0.00 | | QPeak | 33.02 | 45.29 | 60.00 | -14.71 | | | |
| 1 | 549,000kHz | 12.23 | 0.00 | | C_AVG | 33.22 | 45.45 | | | 46.00 | -0.55 | |
| 4 | 153,000kHz | 12.26 | 0.00 | | C_AVG | 25.61 | 37.87 | | | 55.84 | -17.96 | |
| 6 | 12.981 | 12.27 | 0.00 | | C_AVG | 26.77 | 39.04 | | | 50.00 | -10.96 | |

### 5.2.2 Neutral




| ID | Frequency | Probe | Cable | Atten. | Detector | Meter Read | Meas Level | Limit 1 | Limit 1 Dist. | Limit 2 | Limit 2 Dist. | P/F |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MU | MHz | dB | dB | dB | Type | dBµV | dBµV | dBµV | dB | dBµV | dB | P/F |
| 1 | 546,000kHz | 12.18 | 0.00 | | QPeak | 37.58 | 49.76 | 56.00 | -6.24 | | | |
| 5 | 150,000kHz | 12.21 | 0.00 | | QPeak | 42.89 | 55.10 | 66.00 | -10.90 | | | |
| 7 | 153,000kHz | 12.21 | 0.00 | | QPeak | 42.12 | 54.33 | 65.84 | -11.50 | | | |
| 3 | 12.993 | 12.29 | 0.00 | | QPeak | 31.97 | 44.26 | 60.00 | -15.74 | | | |
| 2 | 549,000kHz | 12.18 | 0.00 | | C_AVG | 32.76 | 44.94 | | | 46.00 | -1.06 | |
| 4 | 12.966 | 12.29 | 0.00 | | C_AVG | 25.48 | 37.77 | | | 50.00 | -12.23 | |
| 6 | 153,000kHz | 12.21 | 0.00 | | C_AVG | 26.39 | 38.60 | | | 55.84 | -17.24 | |

**Result**

The EUT complied with the specification limit.

## 5.3 §15.403(i) 26 dB Emissions Bandwidth

All chains were measured under the guidance of KDB 789033 Section II.C. and KDB 66291 D01. Please see associated annex for details on instrument settings.

| Nominal BW (MHz) | Frequency (MHz) | 99% Bandwidth (MHz) | 26 dB Bandwidth (MHz) |
|---|---|---|---|
| EHT 20 | 5955 | 19.20 | 22.90 |
| EHT 20 | 6195 | 19.10 | 23.80 |
| EHT 20 | 6415 | 19.10 | 22.30 |
| EHT 40 | 5965 | 38.25 | 41.73 |
| EHT 40 | 6205 | 38.25 | 42.48 |
| EHT 40 | 6405 | 38.25 | 42.33 |
| EHT 80 | 5985 | 78.00 | 88.00 |
| EHT 80 | 6225 | 78.00 | 89.00 |
| EHT 80 | 6385 | 77.50 | 88.00 |
| EHT 160 | 6025 | 157.00 | 167.00 |
| EHT 160 | 6185 | 158.00 | 170.00 |
| EHT 160 | 6325 | 158.00 | 168.00 |
| EHT 320 | 6265 | 317.50 | 337.24 |
| HE 20 | 6115 | 19.10 | 23.00 |
| HE 20 | 6195 | 19.20 | 22.10 |
| HE 20 | 6415 | 19.20 | 22.60 |
| HE 40 | 6125 | 38.00 | 44.13 |
| HE 40 | 6205 | 38.25 | 42.33 |
| HE 40 | 6405 | 38.25 | 42.48 |
| HE 80 | 6145 | 77.50 | 89.00 |
| HE 80 | 6225 | 77.50 | 85.50 |
| HE 80 | 6385 | 78.00 | 88.50 |
| HE 160 | 6185 | 157.00 | 170.00 |
| HE 160 | 6325 | 157.00 | 172.00 |

### Result

All chains were tested and the highest bandwidth per chain is reported above.
The 26 dB bandwidths are reported for information purposes. Please see Annex for all bandwidth measurements.

## 5.4 §15.407(a)(3) Maximum Average Output Power

All chains were measured and summed under the guidance of KDB 789033 Section II. E.2. and KDB 66291 D01. Please see associated annex for details on instrument settings.
The maximum average RF conducted output power measured for this device was 23.59 dBm or 228.56 mW. The limit is 30 dBm EIRP, or 1 watt EIRP. The antenna has a gain of 5.8 dBi.

| Modulation (BW) | Frequency (MHz) | Data Rate | TP Setting | Conducted Output Power | EIRP | Measured PSD |
|---|---|---|---|---|---|---|
| EHT 20 | 5955 | Mcs0_Nss4 | 10 | 12.14 | 17.94 | -1.27 |
| EHT 20 | 6195 | Mcs0_Nss4 | 10 | 12.69 | 18.49 | -0.87 |
| EHT 20 | 6415 | Mcs0_Nss4 | 10 | 12.87 | 18.67 | -1.33 |
| EHT 40 | 5965 | Mcs0_Nss4 | 12 | 15.62 | 21.42 | -1.72 |
| EHT 40 | 6205 | Mcs0_Nss4 | 13 | 15.74 | 21.54 | -1.11 |
| EHT 40 | 6405 | Mcs0_Nss4 | 13 | 16.05 | 21.85 | -1.27 |
| EHT 80 | 5985 | Mcs0_Nss4 | 16 | 18.38 | 24.18 | -0.99 |
| EHT 80 | 6225 | Mcs0_Nss4 | 16 | 18.62 | 24.42 | -1.16 |
| EHT 80 | 6385 | Mcs0_Nss4 | 16 | 18.71 | 24.51 | -1.49 |
| EHT 160 | 6025 | Mcs0_Nss4 | 19 | 20.89 | 26.69 | -1.24 |
| EHT 160 | 6185 | Mcs0_Nss4 | 19 | 21.12 | 26.92 | -1.02 |
| EHT 160 | 6325 | Mcs0_Nss4 | 19 | 21.82 | 27.62 | -1.37 |
| EHT 320 | 6265 | Mcs0_Nss4 | 21 | 23.59 | 29.39 | -1.56 |
| HE 20 | 6115 | Mcs0_Nss4 | 10 | 12.07 | 17.87 | -1.27 |
| HE 20 | 6195 | Mcs0_Nss4 | 10 | 12.65 | 18.45 | -0.88 |
| HE 20 | 6415 | Mcs0_Nss4 | 10 | 12.78 | 18.58 | -1.32 |
| HE 40 | 6125 | Mcs0_Nss4 | 13 | 14.88 | 20.68 | -1.48 |
| HE 40 | 6205 | Mcs0_Nss4 | 13 | 15.68 | 21.48 | -1.21 |
| HE 40 | 6405 | Mcs0_Nss4 | 13 | 15.97 | 21.77 | -1.37 |
| HE 80 | 6145 | Mcs0_Nss4 | 16 | 17.81 | 23.61 | -1.36 |
| HE 80 | 6225 | Mcs0_Nss4 | 16 | 18.57 | 24.37 | -1.24 |
| HE 80 | 6385 | Mcs0_Nss4 | 16 | 18.68 | 24.48 | -1.57 |
| HE 160 | 6185 | Mcs0_Nss4 | 19 | 21.05 | 26.85 | -1.08 |
| HE 160 | 6325 | Mcs0_Nss4 | 19 | 21.63 | 27.43 | -1.30 |

| Modulation (BW) | Frequency (MHz) | Data Rate | TP Setting | Conducted Output Power | EIRP | Measured PSD |
|---|---|---|---|---|---|---|
| EHT 20 | 5955 | Mcs0_Nss1 | 7 | 8.99 | 14.79 | -3.88 |
| EHT 20 | 6195 | Mcs0_Nss1 | 7 | 9.21 | 15.01 | -4.18 |
| EHT 20 | 6415 | Mcs0_Nss1 | 7 | 9.74 | 15.54 | -4.37 |
| EHT 40 | 5965 | Mcs0_Nss1 | 9 | 11.42 | 17.22 | -4.41 |
| EHT 40 | 6205 | Mcs0_Nss1 | 10 | 12.64 | 18.44 | -4.06 |
| EHT 40 | 6405 | Mcs0_Nss1 | 10 | 12.92 | 18.72 | -4.18 |
| EHT 80 | 5985 | Mcs0_Nss1 | 12 | 14.60 | 20.40 | -4.37 |
| EHT 80 | 6225 | Mcs0_Nss1 | 13 | 15.41 | 21.21 | -4.22 |
| EHT 80 | 6385 | Mcs0_Nss1 | 13 | 15.79 | 21.59 | -4.32 |
| EHT 160 | 6025 | Mcs0_Nss1 | 16 | 18.09 | 23.89 | -3.78 |
| EHT 160 | 6185 | Mcs0_Nss1 | 16 | 18.14 | 23.94 | -3.89 |
| EHT 160 | 6325 | Mcs0_Nss1 | 16 | 18.95 | 24.75 | -3.90 |
| EHT 320 | 6265 | Mcs0_Nss1 | 19 | 21.44 | 27.24 | -3.72 |

### Result

In the configuration tested, the maximum average RF output power was less than 1 watt EIRP; therefore, the EUT compiled with the requirements of the specification (see spectrum analyzer plots in attached Annex).

## 5.5 §15.407(b)(7) Spurious Emissions

### 5.5.1 Conducted Spurious Emissions

The frequency range from the lowest frequency generated or used in the device to the tenth harmonic of the highest fundamental frequency was investigated to measure any antenna-conducted emissions. The graphs show the measurement data from spurious emissions noted across the frequency range when transmitting at the lowest frequency, middle frequency and upper frequency. Shown below are plots with the EUT turned to the upper and lower channels with the antenna gain of 5.8 dBi accounted for. These demonstrate compliance with the provisions of this section at the band edges.

The emissions must be remaining below -27 dBm EIRP.

**Result**

Conducted spurious emissions were attenuated below the limit; therefore, the EUT complies with the specification.

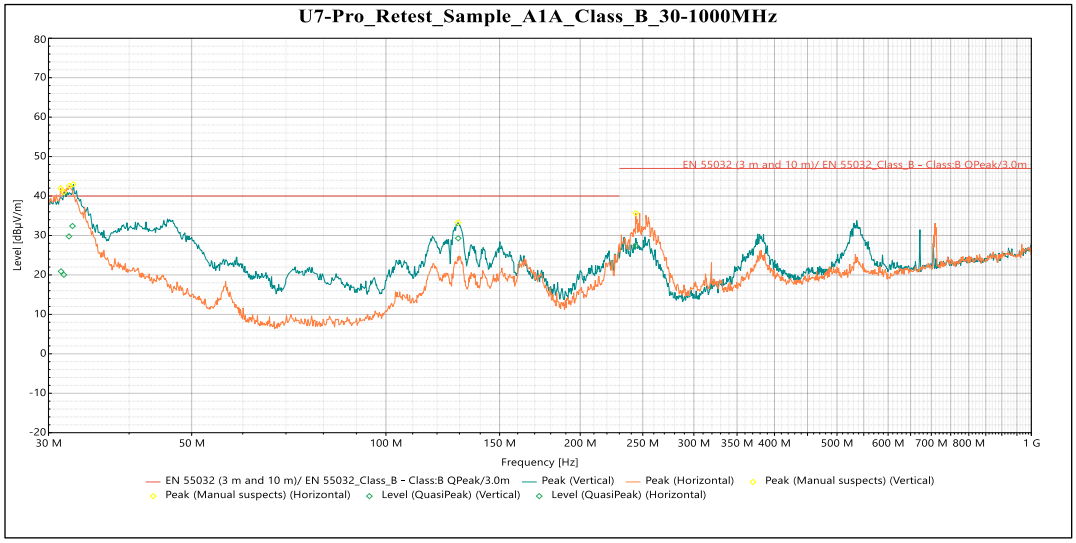
### 5.5.2 Radiated Spurious Emissions in the Restricted Bands of § 15.205

The EUT uses various power settings based on the channel in use. In order to reduce test time, the radiated spurious emissions at the lowest, middle, and highest channel were measured at the maximum power of TP23.

Correction Factor = Antenna Factor + Cable Loss - Pre-Amplifier Gain, and is added to the Receiver reading.

**Result**

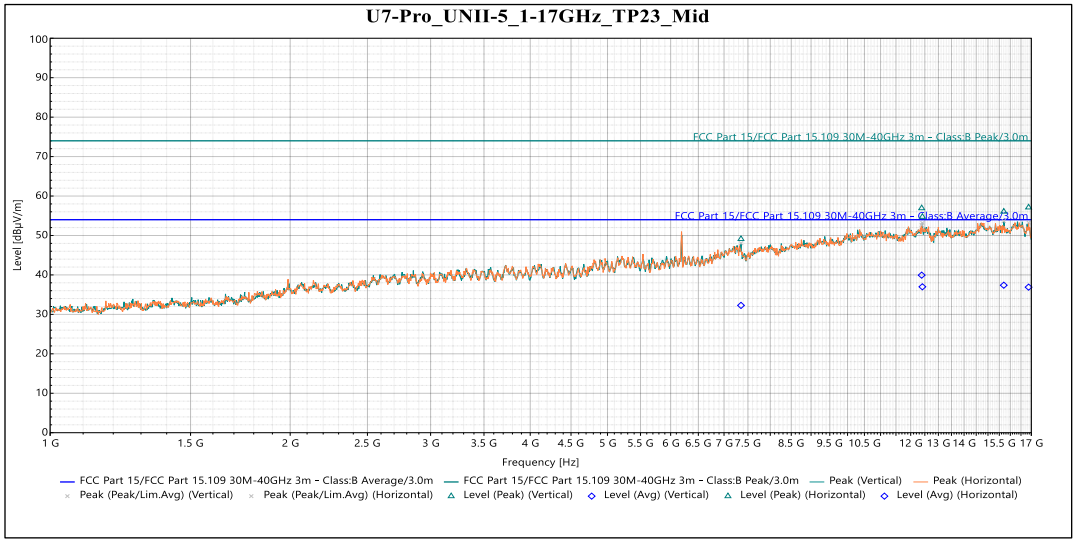
All emissions in the restricted bands of § 15.205 met the limits specified in § 15.209; therefore, the EUT complies with the specification. See Annex for Conducted Band edge plots.




QuasiPeak

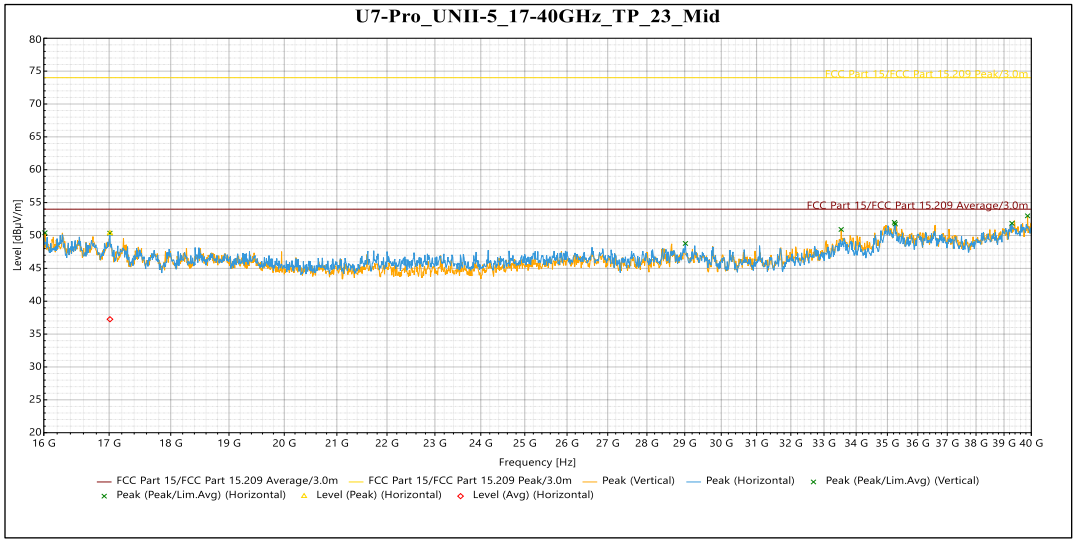
| Frequency | Level (dBµV/m) | Limit (dBµV/m) | Margin | Azimuth (°) | Height | Pol. | Correction (dB) |
|---|---|---|---|---|---|---|---|
| 31.692 MHz | 20.029 | 40 | -19.971 | 69 | 2.759 | Vertical | -8.569 |
| 32.681 MHz | 32.403 | 40 | -7.597 | 199 | 1 | Vertical | -9.148 |
| 129.41 MHz | 29.287 | 40 | -10.713 | 341 | 1.138 | Vertical | -14.232 |
| 31.369 MHz | 20.912 | 40 | -19.088 | 251 | 1.143 | Horizontal | -8.51 |
| 32.273 MHz | 29.759 | 40 | -10.241 | 50 | 3.298 | Horizontal | -8.831 |
| 243.82 MHz | 27.376 | 47 | -19.624 | 278 | 1.52 | Horizontal | -15.915 |

**Table 5: Radiated Emissions 30 – 1000 MHz**




| Frequency | SR # | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Azimuth (°) | Height (m) | Pol. | Correction (dB) |
|---|---|---|---|---|---|---|---|---|
| 7.3515 GHz | Peak | 49.105 | 74 | -24.895 | 177 | 2.398 | Vertical | 10.465 |
| 12.412 GHz | Peak | 54.735 | 74 | -19.265 | 31 | 1.638 | Vertical | 16.315 |
| 15.701 GHz | Peak | 56.045 | 74 | -17.955 | 31 | 1.996 | Vertical | 16.205 |
| 7.3515 GHz | AVG | 32.27 | 54 | -21.73 | 177 | 2.398 | Vertical | 10.465 |
| 12.412 GHz | AVG | 36.987 | 54 | -17.013 | 31 | 1.638 | Vertical | 16.315 |
| 15.701 GHz | AVG | 37.389 | 54 | -16.611 | 31 | 1.996 | Vertical | 16.205 |
| 12.387 GHz | Peak | 56.916 | 74 | -17.084 | 60 | 2.218 | Horizontal | 16.362 |
| 16.867 GHz | Peak | 57.119 | 74 | -16.881 | 7 | 2.897 | Horizontal | 18.552 |
| 12.387 GHz | AVG | 39.941 | 54 | -14.059 | 60 | 2.218 | Horizontal | 16.362 |
| 16.867 GHz | AVG | 36.902 | 54 | -17.098 | 7 | 2.897 | Horizontal | 18.552 |

**Table 6: Transmitting on the Middle Frequency 6195 MHz**




| Frequency | SR # | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Azimuth (°) | Pol. | RBW (Hz) | Correction (dB) |
|---|---|---|---|---|---|---|---|---|
| 17.013 GHz | Peak | 50.362 | 74 | -23.638 | 259 | Horizontal | 1 M | -0.014 |
| 17.013 GHz | AVG | 37.261 | 54 | -16.739 | 259 | Horizontal | 1 M | -0.014 |

**Table 7: Transmitting on the Middle Frequency 6195 MHz**

## 5.6 §15.407(a) Maximum Power Spectral Density

The maximum average power spectral density conducted from the intentional radiator of the antenna shall not be greater than 5 dBm EIRP in any 1 MHz band during any time interval of continuous transmission. Results of this testing are summarized.

**NSS=4 Test Results**

| Modulation (BW) | Frequency (MHz) | Data Rate | TP Setting | Conducted Output Power | Measured PSD |
|---|---|---|---|---|---|
| EHT 20 | 5955 | Mcs0_Nss4 | 10 | 12.14 | -1.27 |
| EHT 20 | 6195 | Mcs0_Nss4 | 10 | 12.69 | -0.87 |
| EHT 20 | 6415 | Mcs0_Nss4 | 10 | 12.87 | -1.33 |
| EHT 40 | 5965 | Mcs0_Nss4 | 12 | 15.62 | -1.72 |
| EHT 40 | 6205 | Mcs0_Nss4 | 13 | 15.74 | -1.11 |
| EHT 40 | 6405 | Mcs0_Nss4 | 13 | 16.05 | -1.27 |
| EHT 80 | 5985 | Mcs0_Nss4 | 16 | 18.38 | -0.99 |
| EHT 80 | 6225 | Mcs0_Nss4 | 16 | 18.62 | -1.16 |
| EHT 80 | 6385 | Mcs0_Nss4 | 16 | 18.71 | -1.49 |
| EHT 160 | 6025 | Mcs0_Nss4 | 19 | 20.89 | -1.24 |
| EHT 160 | 6185 | Mcs0_Nss4 | 19 | 21.12 | -1.02 |
| EHT 160 | 6325 | Mcs0_Nss4 | 19 | 21.82 | -1.37 |
| EHT 320 | 6265 | Mcs0_Nss4 | 21 | 23.59 | -1.56 |
| HE 20 | 6115 | Mcs0_Nss4 | 10 | 12.07 | -1.27 |
| HE 20 | 6195 | Mcs0_Nss4 | 10 | 12.65 | -0.88 |
| HE 20 | 6415 | Mcs0_Nss4 | 10 | 12.78 | -1.32 |
| HE 40 | 6125 | Mcs0_Nss4 | 13 | 14.88 | -1.48 |
| HE 40 | 6205 | Mcs0_Nss4 | 13 | 15.68 | -1.21 |
| HE 40 | 6405 | Mcs0_Nss4 | 13 | 15.97 | -1.37 |
| HE 80 | 6145 | Mcs0_Nss4 | 16 | 17.81 | -1.36 |
| HE 80 | 6225 | Mcs0_Nss4 | 16 | 18.57 | -1.24 |
| HE 80 | 6385 | Mcs0_Nss4 | 16 | 18.68 | -1.57 |
| HE 160 | 6185 | Mcs0_Nss4 | 19 | 21.05 | -1.08 |
| HE 160 | 6325 | Mcs0_Nss4 | 19 | 21.63 | -1.30 |

**NSS=1 Tet Results**

| Modulation (BW) | Frequency (MHz) | Data Rate | TP Setting | Conducted Output Power | Measured PSD |
|---|---|---|---|---|---|
| EHT 20 | 5955 | Mcs0_Nss1 | 7 | 8.99 | -3.88 |
| EHT 20 | 6195 | Mcs0_Nss1 | 7 | 9.21 | -4.18 |
| EHT 20 | 6415 | Mcs0_Nss1 | 7 | 9.74 | -4.37 |
| EHT 40 | 5965 | Mcs0_Nss1 | 9 | 11.42 | -4.41 |
| EHT 40 | 6205 | Mcs0_Nss1 | 10 | 12.64 | -4.06 |
| EHT 40 | 6405 | Mcs0_Nss1 | 10 | 12.92 | -4.18 |
| EHT 80 | 5985 | Mcs0_Nss1 | 12 | 14.60 | -4.37 |
| EHT 80 | 6225 | Mcs0_Nss1 | 13 | 15.41 | -4.22 |
| EHT 80 | 6385 | Mcs0_Nss1 | 13 | 15.79 | -4.32 |
| EHT 160 | 6025 | Mcs0_Nss1 | 16 | 18.09 | -3.78 |
| EHT 160 | 6185 | Mcs0_Nss1 | 16 | 18.14 | -3.89 |
| EHT 160 | 6325 | Mcs0_Nss1 | 16 | 18.95 | -3.90 |
| EHT 320 | 6265 | Mcs0_Nss1 | 19 | 21.44 | -3.72 |

### Result

The maximum average power spectral density was less than the limit of 5 dBm EIRP; therefore, the EUT complies with the specification.

## 5.6.1 OFDMA RU Check

If EUT supports OFDMA multiple partial Resource Unit (RU) configurations were verfired and the worst case mode was tested.

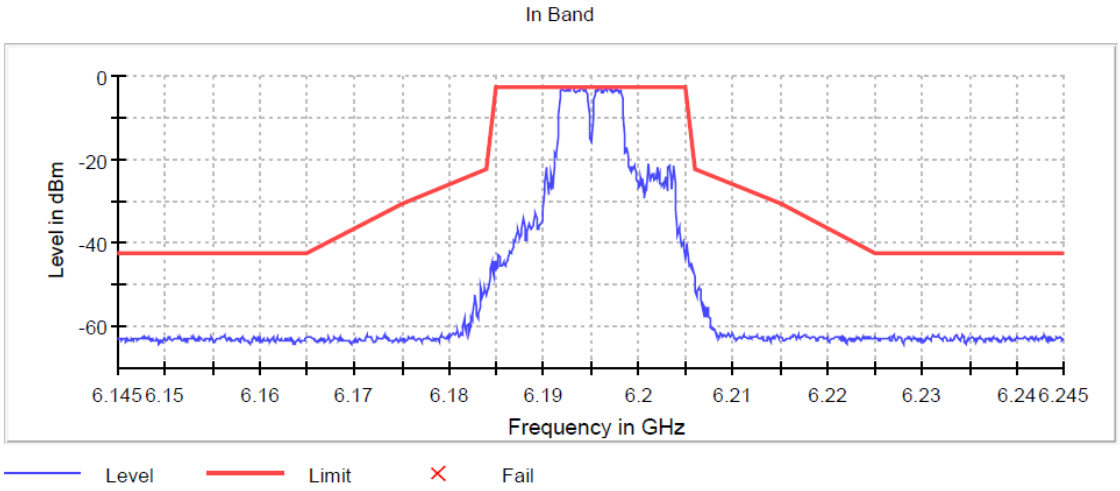



**Figure 5: 6195 20MHz RU Vérification - Center**

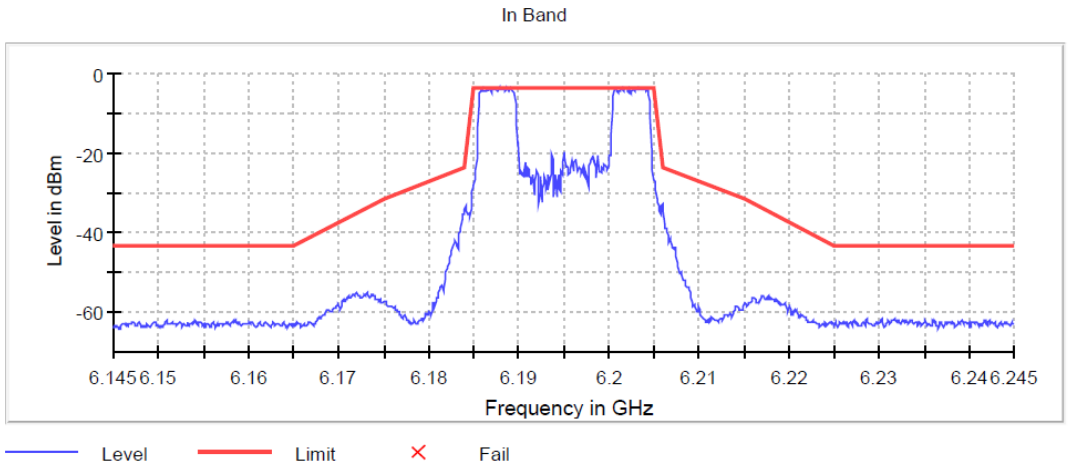



**Figure 6: 6195 20MHz RU Vérification - Edge**

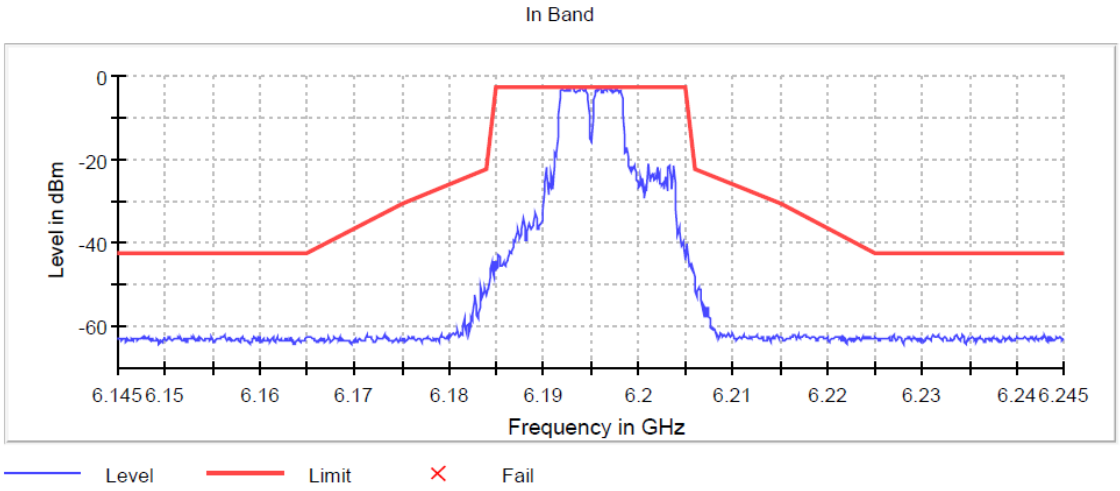



**Figure 7: 6195 20MHz RU Vérification - Center**

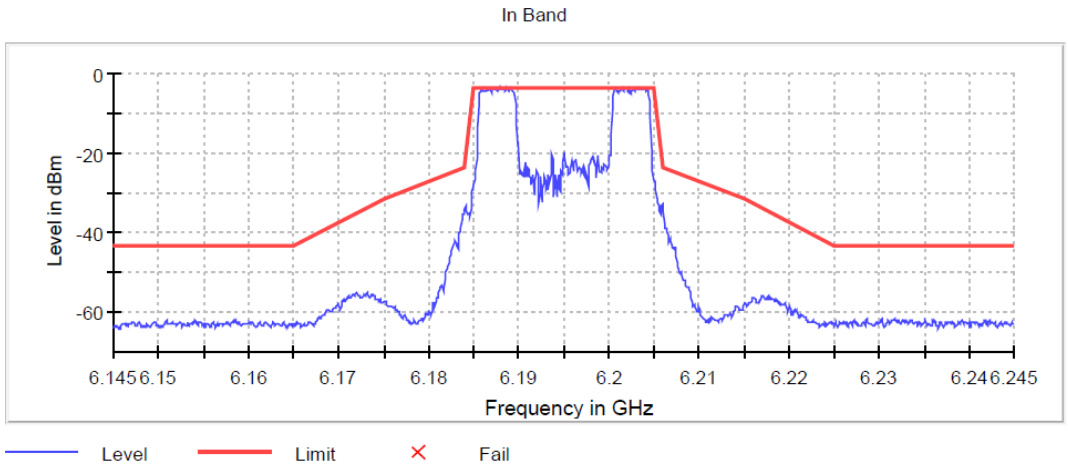



**Figure 8: 6195 20MHz RU Vérification - Edge**

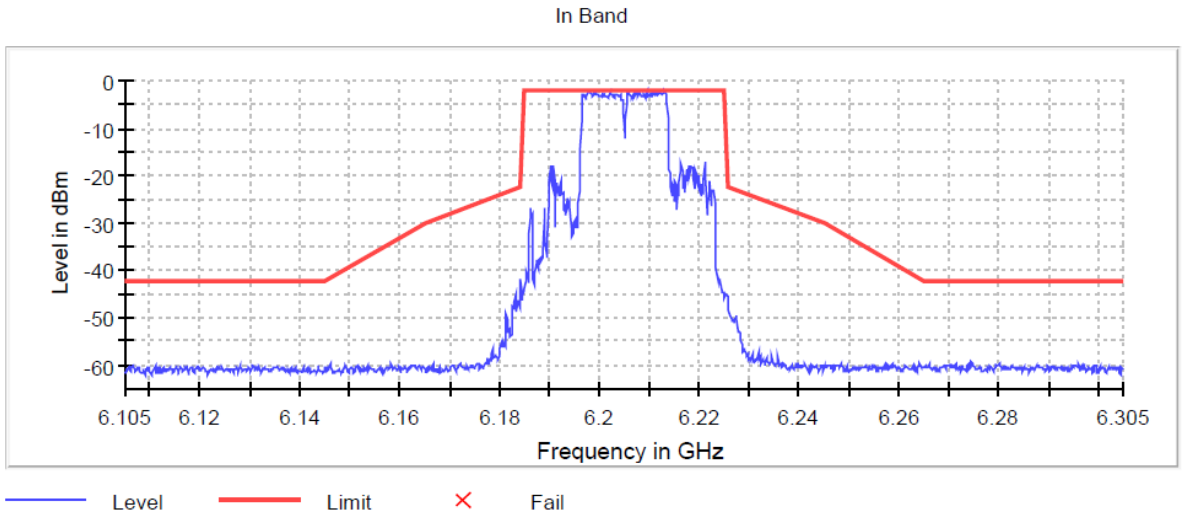



**Figure 9: 6205 40MHz RU Vérification - Center**

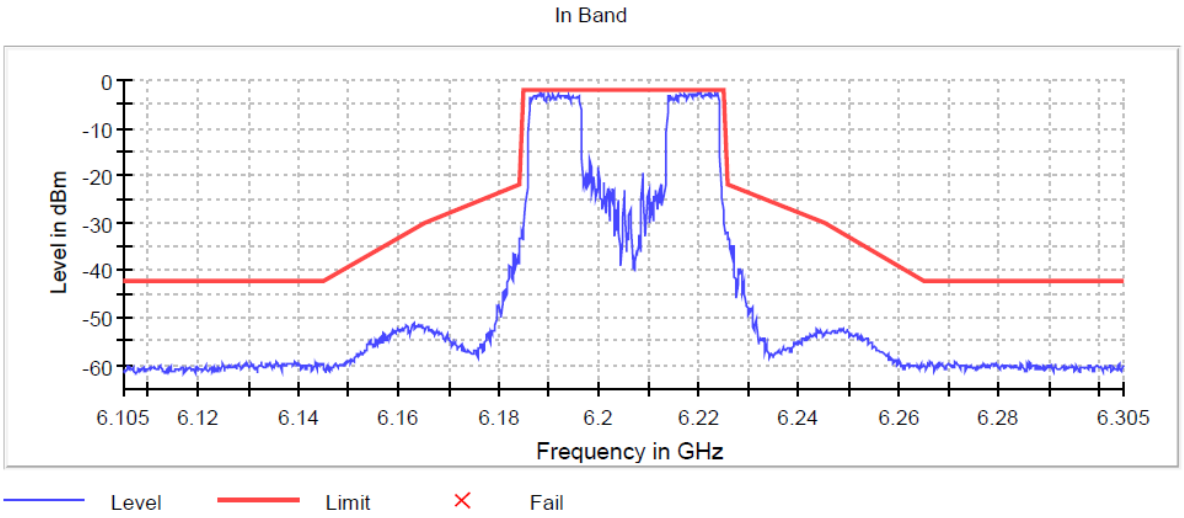



**Figure 10: 6205 40MHz RU Vérification - Edge**

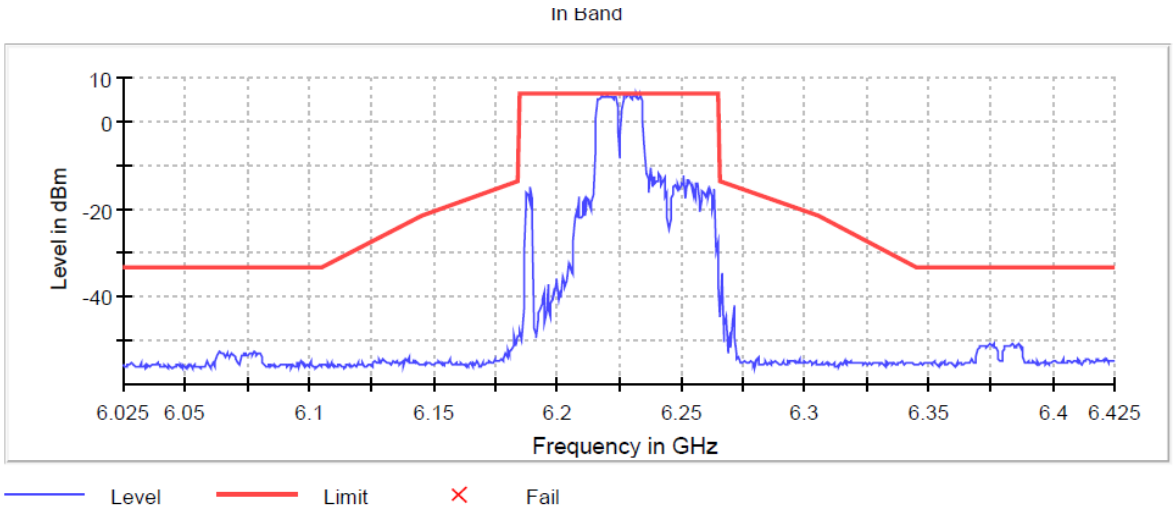



**Figure 11: 6225 80MHz RU Vérification - Center**

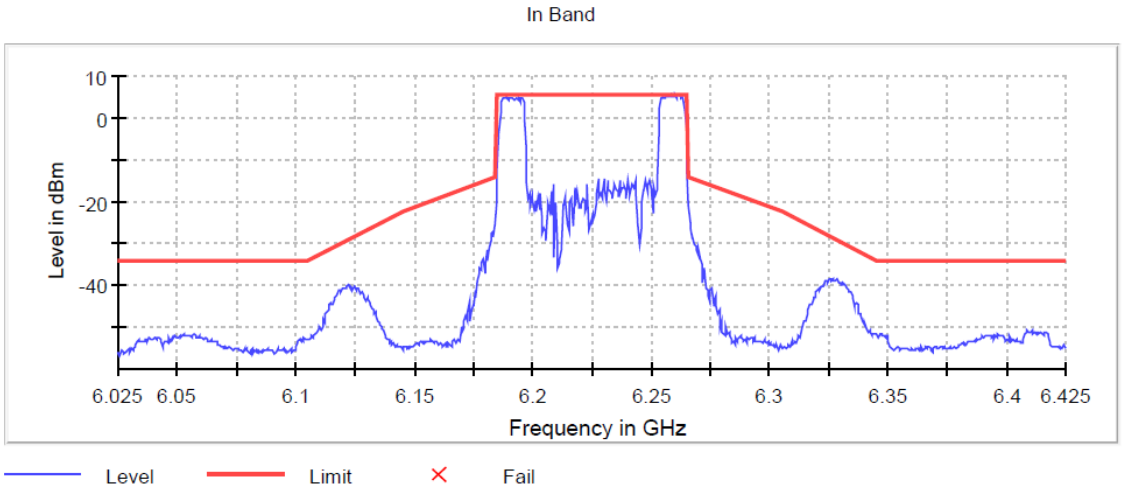



**Figure 12: 6225 80MHz RU Vérification - Edge**

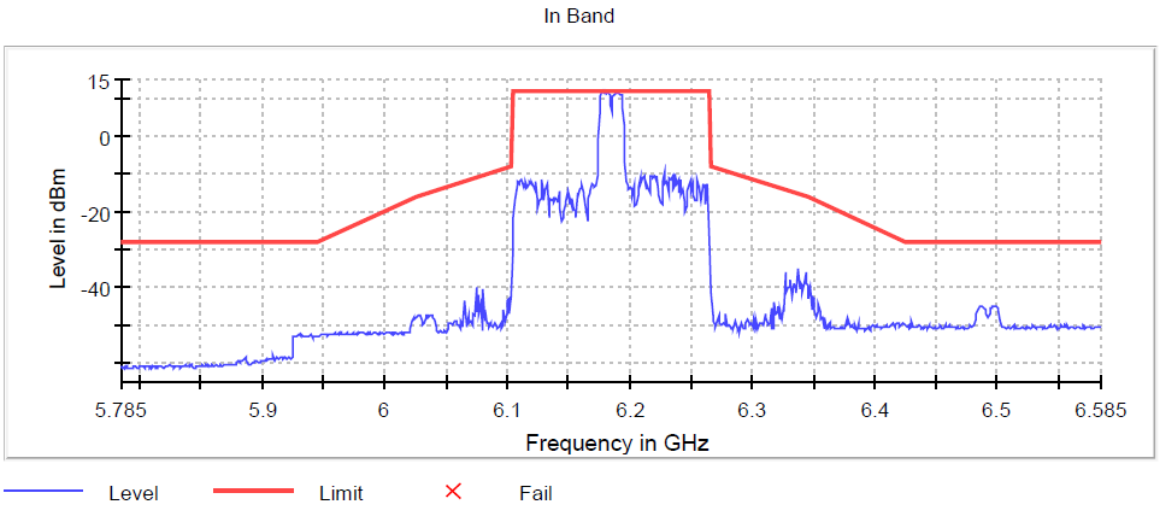



**Figure 13: 6185 160MHz RU Vérification - Center**

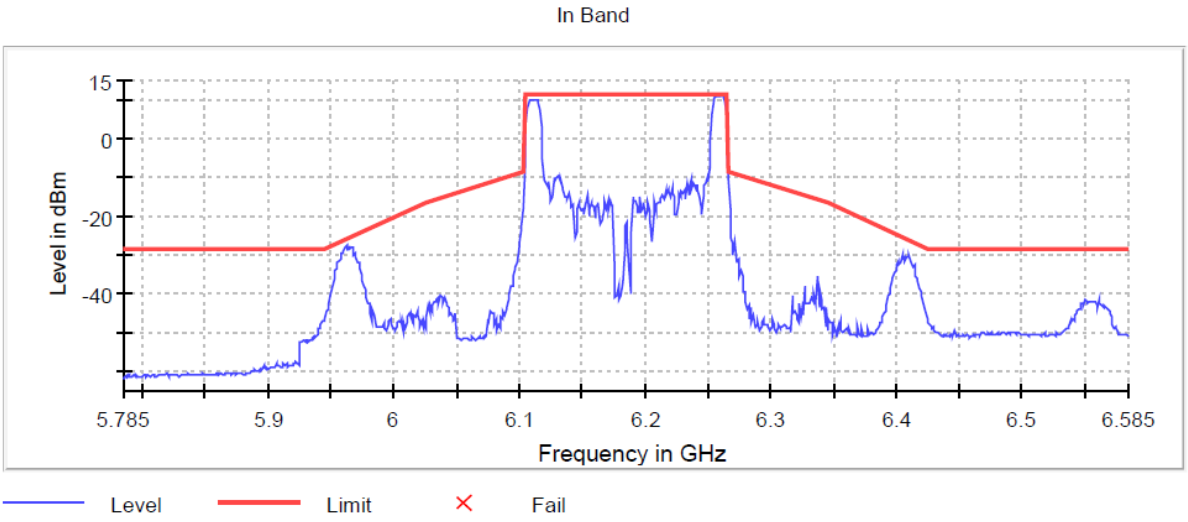



**Figure 14: 6185 160MHz RU Vérification - Edge**

## 5.7 §15.407(d) Contention Based Protocol

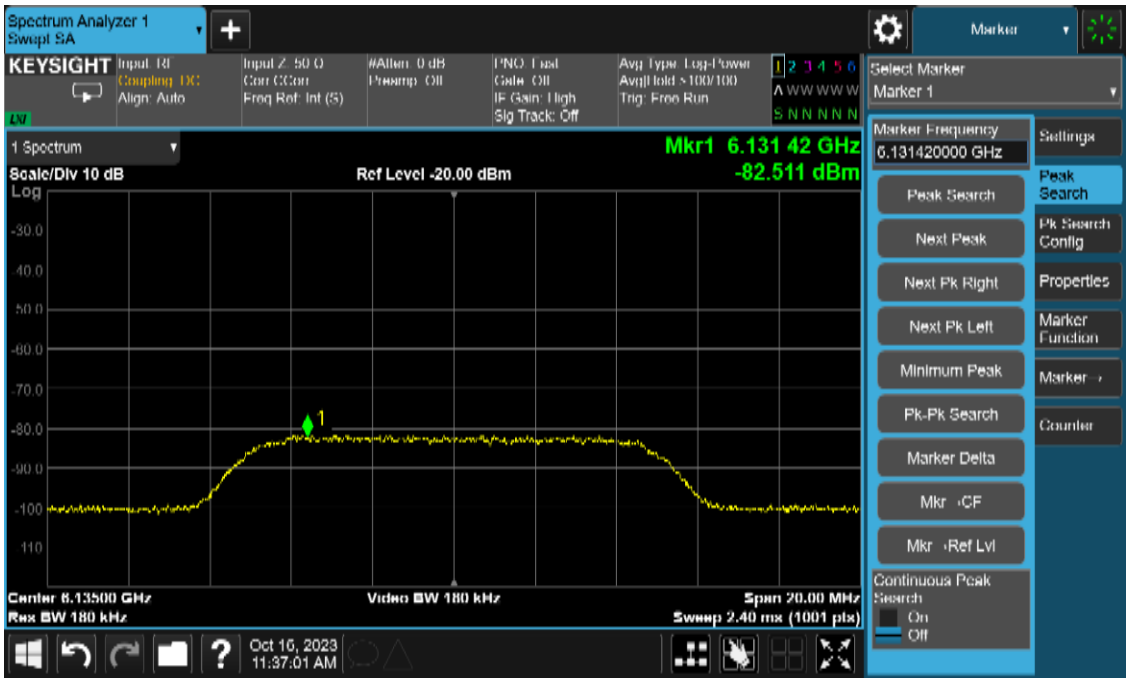
This product was tested and found to be compliant with the requirements of Contention-based Protocol as specified in FCC Part 15.407 and KDB 987594 D02.

Initially the test setup was connected directly to the signal source with all splitters (splitters terminated with a 50-ohm loads on unused ports) and cables in place to verify the AWGN signal is 10MHz wide at a signal level of less than or equal to -82dBm and for conducted measurements the threshold was adjusted for an antenna gain for 0dBi. The level at the signal generator required to achieve the required signal level at the DUT was recorded for use during testing.

The DUT was connected as shown in figure 4 above and set to transmit at a constant duty cycle at each frequency and bandwidth noted in the table below and verified to be communicating with the companion device as intended.

Starting at the levels established above, the AWGN signal was introduced to the DUT and increased to determine a threshold level at where the DUT will terminate with at least a 90% detection rate. The level at the DUT, which the 90% detection rate was achieved was recorded as the “Sensitivity Level” below.

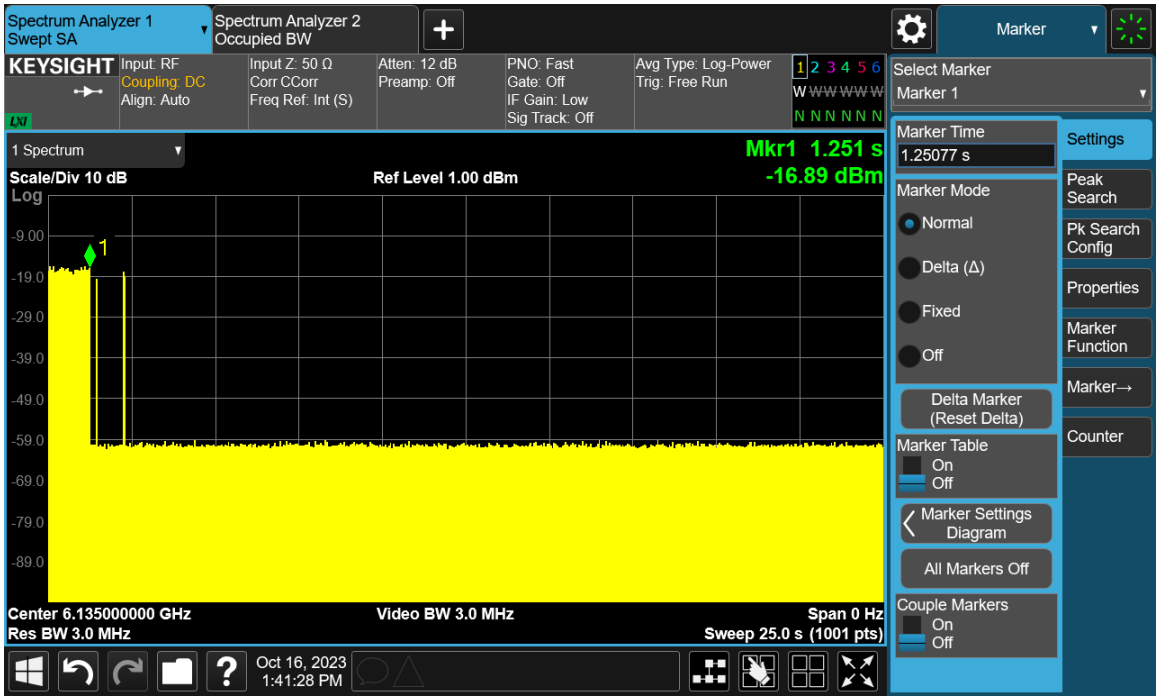
Testing shall be repeated at each applicable channel and bandwidth as noted in Table 1 of KDB 987594 D02.



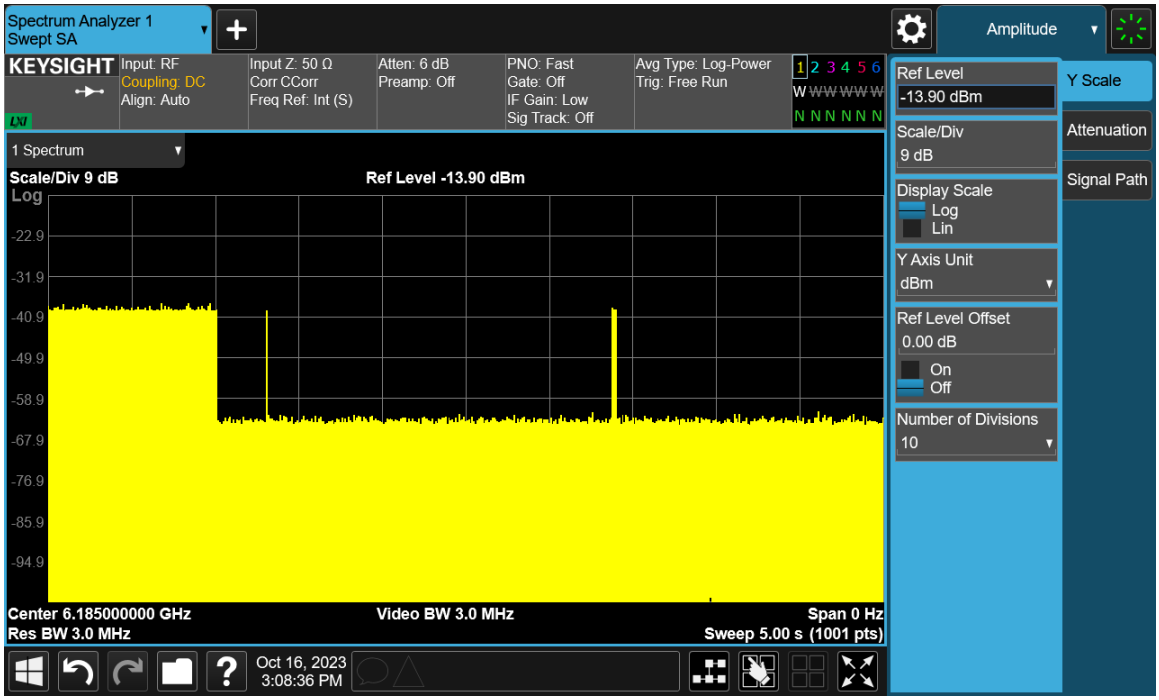

**Plot 1: Level Details**

| Band | $BW_{EUT}$ | $F_{c1}$ | $F_{c2}$ | Signal Power Level (dBm) | Detection Rate (%) | Margin (dB) |
|---|---|---|---|---|---|---|
| UNII-5 5.925 - 6.425GHz | 20 | 6135 | 6135 | -73 | 100 | 16.8 |
| | 160 | 6185 | 6110 | -76 | 100 | 19.8 |
| | | | 6185 | -75 | 100 | 18.8 |
| | | | 6260 | -76 | 100 | 19.8 |
| UNII-6 6.425 - 6.525GHz | 20 | 6455 | 6455 | -73 | 100 | 16.8 |
| | 160 | 6505 | 6430 | -76 | 100 | 19.8 |
| | | | 6505 | -72 | 100 | 15.8 |
| | | | 6580 | -72 | 100 | 15.8 |
| UN1I-7 6.525 - 6.875GHz | 20 | 6695 | 6695 | -72 | 100 | 15.8 |
| | 160 | 6665 | 6590 | -68 | 100 | 11.8 |
| | | | 6665 | -62 | 100 | 5.8 |
| | | | 6740 | -72 | 100 | 15.8 |
| UNII-8 6.875 - 7.125GHz | 20 | 7015 | 7015 | -76 | 100 | 19.8 |
| | 160 | 6985 | 6910 | -70 | 100 | 13.8 |
| | | | 6985 | -70 | 100 | 13.8 |
| | | | 7060 | -73 | 100 | 16.8 |

**Table 8: Trial Table**




**Plot 2: 20MHz Example Detection Trace**




**Plot 3: 160MHz Example Detection Trace**

## Result

The EUT complies with the specification.

-- End of Test Report --