Federal Communications Commission
Office of Engineering and Technology
Laboratory Division Public Draft Review

April 4, 2024

Draft Laboratory Division Publications Report

Title: U-NII 6GHz Devices

Short Title: U-NII 6GHz Devices

Reason: Add guidance for new unlicensed rules under FCC 23-86 effective 03/08/2024 by permitting very low power (VLP) devices under equipment class 6VL in the U–NII–5 (5.925–6.425 GHz) and U–NII–7 (6.525–6.875 GHz) portions of the 6 GHz band.

Publication 987594

Keyword/Subject: UNII-6GHZ, UNII 5-8, 6 GHz, UNII, 6VL

First Category: Unlicensed Service Rules and Procedures

Second Category: UNII devices- 15.401

Question:

What are the requirements for obtaining a Certification for 6 GHz U-NII devices operating in the 5.925-7.125 GHz band under Part 15, Subpart E?

Answer:

The following attachments are guides for obtaining certification for devices operating in the 5.925-7.125 GHz band under Part 15, Subpart E:

- 987594 D01 U-NII 6 GHz General Requirements v03 provides general requirements for filling form 731 and supporting information requirements for all 6 GHz devices.
- 987594 D02 U-NII 6 GHz EMC Measurement v03, test report, exhibits, and RF Measurement Procedures for demonstrating EIRP, Bandwidth, Channel Mask, Band Emissions, Contention Based Protocol (Listen Before Talk), Automatic Power Control (APC) as applicable to 6 GHz devices.
- 987594 D03 U-NII 6 GHz QA v03 Questions and Answers for 6 GHz devices.
- 987594 D04 UN6GHZ Pre-Approval Guidance Checklist v03 provides a guide to submitting a Pre-Approval Guidance (PAG) for item UN6GHZ.
- 987594 D05 AFC DUT Test Harness Testing v01r01 delivers a guide for the DUT test harness for standard access points and fixed client devices.

Attachment List:

987594 D01 U-NII 6GHz General Requirements v03
987594 D02 U-NII 6 GHz EMC Measurement v03
987594 D03 U-NII 6 GHz QA v03
987594 D04 UN6GHZ Pre-Approval Guidance Checklist v03
987594 D05 AFC DUT Test Harness Testing v01r01 (not under draft review)

Attachment 987594 D01 U-NII 6GHz General Requirements v03

Federal Communications Commission
Office of Engineering and Technology
Laboratory Division

Part 15 Subpart E U-NII 6 GHz

General Guidance Bands 5, 6, 7, 8

Month XX, 2024

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Related Attachments under Publication 987594

987594 D01 U-NII 6 GHz General Requirements

987594 D02 U-NII 6 GHz EMC Measurement Procedures

987594 D03 U-NII 6 GHz Q&A

987594 D04 UN6GHZ Pre-Approval Guidance Checklist

987594 D05 AFC DUT Test Harness Testing

1. Introduction

This Knowledge Data Base (KDB) Publication, 987594, provides a guide for obtaining equipment authorization under the certification procedures for products and modules that operate under Code of Federal Regulations (CFR) Title 47, Part 15 Subpart E—UNLICENSED NATIONAL INFORMATION INFRASTRUCTURE DEVICES[1] for U-NII Bands 5-8. This publication requires that the reader be familiar with the FCC's Equipment Authorization[2] (EA) procedures and regulations. This KDB publication consists of 5 attachments:

1. **987594 D01 U-NII 6 GHz General Requirements**. This document provides a general overview of how to complete a certification.
2. **987594 D02 U-NII 6 GHz EMC Measurement Procedures**. Test Lab guidance for EMC testing is required for certification.
3. **987594 D03 U-NII 6 GHz Q&A**. A set of additional guidance based on questions and answers.
4. **987594 D04 UN6GHZ Pre-Approval Guidance Checklist**. Guidance for TCBs submitting a PAG when required for 6 GHz.
5. **987594 D05 AFC DUT Test Harness Testing**. Guidance for testing devices must be authorized operation through the Automated Frequency Coordination (AFC) Database System.

2. U-NII Bands Overview

Table 1- Overview of U-NII Rules

Band	Band GHz	Rules	Notes	KDB Pub
U-NII 1	5.15-5.25	15.407(a)(1)	Indoor Use/Outdoor Restrictions	789033 (U-NII)
U-NII 2A	5.25-5.35	15.407(a)(2)	Indoor/Outdoor/DFS	789033 (U-NII) 905462 (DFS)
U-NII 2B	5.35-5.47	Not Available		
U-NII 2C	5.47-5.725	15.407(a)(2)	Indoor/Outdoor/DFS	789033 (U-NII) 905462 (DFS)
U-NII 3	5.725-5.85	15.407(a)(3)(i)	Indoor/Outdoor	789033 (U-NII) 926956 (&)
U-NII 4	5.850-5.895	15.407(a)(3)(ii) –(v)	Indoor	789033 291074
ITS[3]	5.895-5.925	95 Subpart L and 90 Subpart M	On-board units (OBU) must transmit signals to other OBUs and Roadside Units (RSU).	FCC 20-164[4]
Band	Band GHz	Rules	Notes	KDB Pub

[1] The 6 GHz rules initially became effective as of July 27, 2020 for Low-Power Indoor and Standard Power devices. The rules were further enhanced under FCC 23-86 effective 03/08/2024 by permitting very low power (VLP) devices. See Electronic Code of Federal Regulations (e-CFR) at: https://www.ecfr.gov/current/title-47#block-menu-block-4#block-menu-block-4 Part 15 Radio Frequency Devices, Subpart E - Unlicensed National Information Infrastructure Devices.

[2] Equipment Authorizations under the certification procedures require FCC-recognized Telecommunication Certification Body (TCB) approval. Parties unfamiliar with FCC Equipment Authorization procedures and FCC Rules should consult with Telecommunications Certification Bodies listed in the Equipment Authorization general guidance page http://www.fcc.gov/oet/ea to ensure a complete understanding of the process and steps necessary to obtain FCC equipment approval.

[3] Not applicable to this Publication.

[4] The rules adopted by FCC 20-164 First Report and Order in November 2020 created the U-NII-4 band by splitting the Intelligent Transportation Service band into Unlicensed operations in the 5.850-5.895 GHz and Intelligent Transportation Systems (ITS) operation in the 5.895-5.925 GHz.

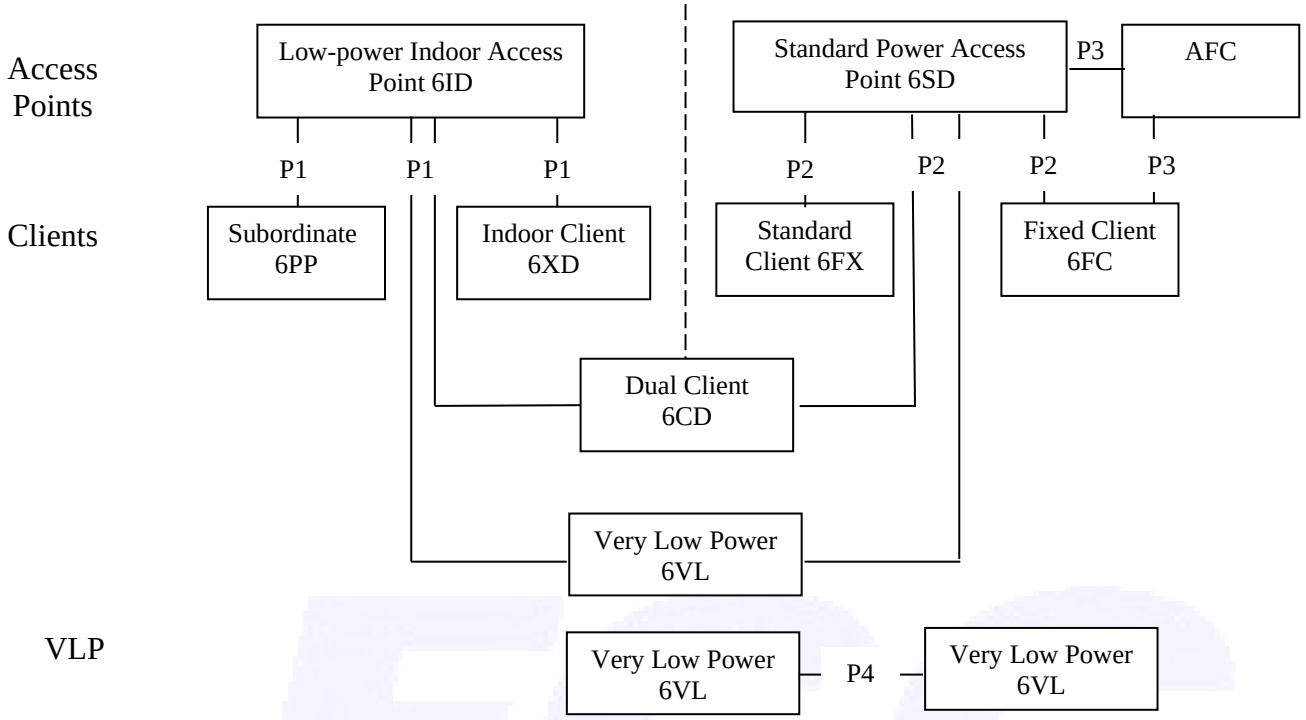
U-NII 5	5.925-6.425	15.407(a)(4) – (8)	Low-power Indoor AP, Subordinates, Indoor Clients Standard Power AP, Fixed & Standard Clients VLP	789033 (U-NII) 987594 (6 GHz Band)[5]
U-NII 6	6.425-6.525	15.407(a)(5), (6), (8)	Low-power Indoor AP, Subordinates, Indoor Clients	
U-NII 7	6.525-6.875	15.407(a)(4) – (8)	Low-power Indoor AP, Subordinates, Indoor Clients Standard Power AP, Fixed & Standard Clients VLP	
U-NII 8	6.875 - 7.125	15.407(a)(5), (6), (8)	Low-power Indoor AP, Subordinates, Indoor Clients	
The transition period ended on June 2, 2015, for marketing DTS in the 5 GHz Band.				

2.1. Equipment classes for U-NII bands 5-8 Overview.

Eight equipment classes apply to certification for devices operating under Part 15 Subpart E for U-NII bands 5-8, as illustrated in Figure 1[6].

1. **6ID:** 15E 6 GHz Low-power indoor access point operating in U-NII bands 5-8.
2. **6PP:** 15E 6 GHz Subordinate indoor device. These devices are controlled by a low-power indoor access point (P1) and operate in U-NII bands 5-8.
3. **6XD**: 15E 6 GHz Low-power Indoor client. These devices are controlled by a low-power indoor access point (P1) and operate in U-NII bands 5-8.
4. **6CD**: 15E 6 GHz Dual client. These devices are controlled by either a low-power indoor access point or standard power access point (P1 & P2) and operate in U-NII bands 5-8.
5. **6SD:** 15E 6 GHz Standard power access point. These devices are managed by the Automatic Frequency Coordination (AFC) system (P3) and operate in U-NII bands 5 and 7.
6. **6FX**: 15E 6 GHz Standard client. These devices are controlled by a Standard power access point managed by the AFC system (P2) and operate in U-NII bands 5 and 7.
7. **6FC**: 15E 6 GHz Fixed client. These devices are associated with a standard power access point (P3) and operate in U-NII bands 5 and 7.
8. **6VL:** 15E 6 GHz VLP device operating in U-NII bands 5 & 7.

[5] This KDB publication 987594 D01-D05 provides a guide for U-NII bands 5-8.
[6] P1, P2 notes the type of Access Point with which the client and subordinate must be associated. P3 notes that standard Access Points and Fixed Client devices are managed by the AFC. P4 designates communicating with other VLP devices.



- P1 Client, subordinate, and VLP devices under the control of low-power indoor access points.
- P2 Client and VLP devices under the control of standard access points.
- P3 Standard Power Access Point and Fixed Client devices managed by the AFC.
- P4 VLP devices communicating with other VLP devices are not controlled by either a standard or a low-power indoor access point.

Figure 1 – Part 15 Subpart E Equipment Classes

3. Indoor Devices (6ID, 6PP, 6XD) & Dual Clients (6CD) operating in the 5.925-7.125 GHz band

These devices must use a contention-based protocol (CBP) such as "listen before talk" that provides interference protection for incumbent services. The contention-based protocol can allow multiple users to share the same spectrum among low-power indoor access points, subordinates, and clients. The contention-based protocol "listen before talk" must be demonstrated in the test report based on this publication's requirements in attachment D02.

The operation of transmitters in the 5.925-7.125 GHz band is prohibited for controlling or communicating with unmanned aircraft systems.

All U-NII devices must have a security description (15.407(i), Device Security) to demonstrate protection against third-party software modification.[7] (see KDB Pub. 789033).

3.1. Low-power indoor access points (6ID) operating in the 5.925-7.125 GHz band

A low-power indoor access point (6ID) is a device that operates in a master mode, as defined in Section 15.202, which can transmit without receiving an enabling signal. This mode can select a channel and initiate a network by sending enabling signals to client devices. A low-power indoor access point shall provide an indoor identification or method to enable clients or subordinates to operate indoors at a power level and power spectral

[7] Third parties include end-users, professional installers, and authorized distributors. Non-third parties are only the Grantee or Contactors working on behalf of the Grantee. The Grantee remains the responsible party.

density according to the rules for indoor access points (6ID). The clients' or subordinates' responsibility is to operate at a power level no greater than granted.

These devices may operate as a bridge, peer-to-peer connection, connector between the wired and wireless segments of the network, or relay between wireless network segments.

These devices are limited to indoor locations, have an integrated antenna, and cannot have or use a weatherized enclosure.

Low-power indoor access point devices are prohibited on oil platforms, cars, trains, boats, and aircraft, except for large planes flying above 10,000 feet in the 5.925-6.425 GHz band.

Low-power indoor access points must be powered by a wired connection, not battery power. They may use battery backup only during power outages.

FCC ID: E-labelling is permitted on devices qualifying for e-labelling.

Label information required in the exhibit types ID Label/Location Info:

- FCC ID
- Indoor Use only

The device user manual must contain the following information. The user manual must be filed as an exhibit in the application filing.

- FCC regulations restrict the operation of this device to indoor use only.
- This device is prohibited from being operated on oil platforms, cars, trains, boats, and aircraft, except it can be operated in large aircraft while flying above 10,000 feet in the 5.925-6.425 GHz band.
- Transmitters in the 5.925-7.125 GHz band are prohibited from operating to control or communicate with unmanned aircraft systems.

3.2. Subordinate device (6PP) operating in the 5.925-7.125 GHz band

A Subordinate device includes equipment such as Wi-Fi extenders and mesh networks. To share the same propagation channel path, it must also be controlled by a low-power indoor access point (6ID).

Being under the control of a low-power indoor access point is an association process where the subordinate passively scans or listens in the 6 GHz band for a low-power indoor access point (6ID) available channel. The subordinate may initiate a brief probe message requesting to join a low-power indoor access point network and ask to be associated with a specific access point.

When associated with a low-power indoor access point (6ID), subordinate devices may wirelessly connect to other access points, subordinate devices, and client devices.

A subordinate device may have a direct connection to the internet via a wired connection or other means such as cellular. However, it may not source the internet to other access points, clients or subordinate devices.

These devices are limited to indoor locations, must have an integrated antenna, and cannot have or use a weatherized enclosure. They are prohibited on oil platforms, cars, trains, boats, and aircraft, except large aircraft, while flying above 10,000 feet. Subordinate devices must not be used to connect devices between separate buildings or structures.

FCC ID: E-labelling is permitted on devices qualifying for e-labelling.

Label information required in the exhibit types ID Label/Location Info:

- FCC ID

- Indoor Use only

The device user manual must contain the following information. The user manual must be filed as an exhibit in the application filing.

- FCC regulations restrict the operation of this device to indoor use only.
- This device is prohibited from operating on oil platforms, cars, trains, boats, and aircraft, except it can be operated in the 5.925–6.425 GHz bands in large aircraft while flying above 10,000 feet.
- Transmitters in the 5.925-7.125 GHz band are prohibited from operating to control or communicate with unmanned aircraft systems.

Applications for a subordinate device may demonstrate via an attestation (see Appendix B, for example) that the device can only operate under a low-power indoor access point or demonstrate being controlled by a low-power indoor access point, indoor access point development board, or appropriate test equipment.

Subordinate devices must be powered by a wired connection, not battery power. They may use battery backup only during power outages.

3.3 Indoor Clients (6XD) operating in the 5.925-7.125 GHz band.

An indoor client device, where a client device is defined in Sec. 15.202, is limited to indoor locations and is under the control of a low-power indoor access point (6ID) or subordinate (6PP).

A client may initiate brief messages to associate with a low-power indoor access point or subordinate and establish a connection only after receiving a confirmation signal confirming that an AP is present and operating on a particular channel. After being associated, the indoor client can only initiate transmission with that access point.

An indoor client device must demonstrate via an attestation (see Appendix B, for example) that the device can only operate under the control of a low-power indoor access point or subordinate.

An indoor client device with a direct connection to the internet cannot source the internet to other access points, clients, or subordinate devices (see 3.5 below).

Indoor client devices (6XD) are prohibited from connecting directly to other client devices. For networking restrictions, see section 3.5 below.

FCC ID: E-labelling is permitted on devices qualifying for e-labelling.

Label information required in the exhibit types ID Label/Location Info:

- FCC ID

The device user manual must contain the following information. The user manual must be filed as an exhibit in the application filing.

- Transmitters in the 5.925-7.125 GHz band are prohibited from operating to control or communicate with unmanned aircraft systems.

3.4 Dual Client (6CD)

6CD is an equipment class for a client device under the control of either a low-power indoor access point or a standard power access point. Dual client devices must demonstrate operation under the respective requirements for low-power indoor and standard power access points.

A dual-client device must demonstrate:

- When controlled by a low-power indoor access point or subordinate, the device is restricted to the 5.925-7.125 GHz band. It is limited to a maximum power of +24 dBm EIRP and a power spectral density limit of −1 dBm EIRP in any 1-megahertz band.
- When under the control of a standard power access point, the device is restricted to the 5.925-6.425 GHz and 6.525-6.875 GHz bands and its transmit power is limited to 6 dB below the standard power access point's transmit power authorized by the AFC not to exceed a limit of 30 dBm EIRP and a power spectral density limit of 17 dBm EIRP in any 1-megahertz band.

When controlled by a low-power indoor access point or subordinate device, these devices must use a contention-based protocol (CBP) such as "listen before talk" that provides interference protection for incumbent services. The contention-based protocol allows multiple users to share the same spectrum among low-power indoor access points, subordinates, and clients. The contention-based protocol "listen before talk" must be demonstrated in the test report. A test method for showing compliance to CBP requirements is shown in attachment D02[8].

Applications for a dual client device must demonstrate via an attestation (see Appendix B, for example) that the device operates under the control of a low-power indoor access point, subordinate, and standard access point. A dual-client device with a direct connection to the Internet cannot source the Internet to other access points, clients, or subordinate devices (see 3.5 below).

Dual-client devices are prohibited from connecting directly to any other client device. See section 3.5 below for networking restrictions.

FCC ID: E-labelling is permitted on devices qualifying for e-labelling.

Label information required in the exhibit types of ID Label/Location Info:

- FCC ID

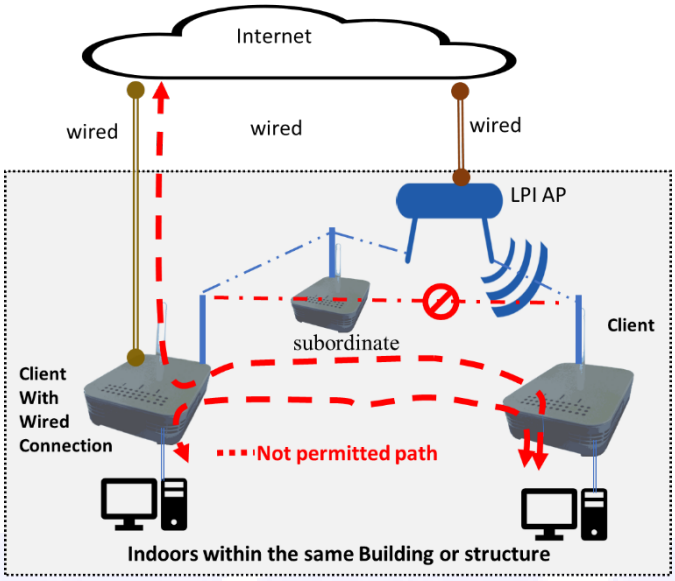
The device user manual must contain the following information. The user manual must be filed as an exhibit in the application filing.

- Transmitters in the 5.925-7.125 GHz band are prohibited from operating to control or communicate with unmanned aircraft systems.

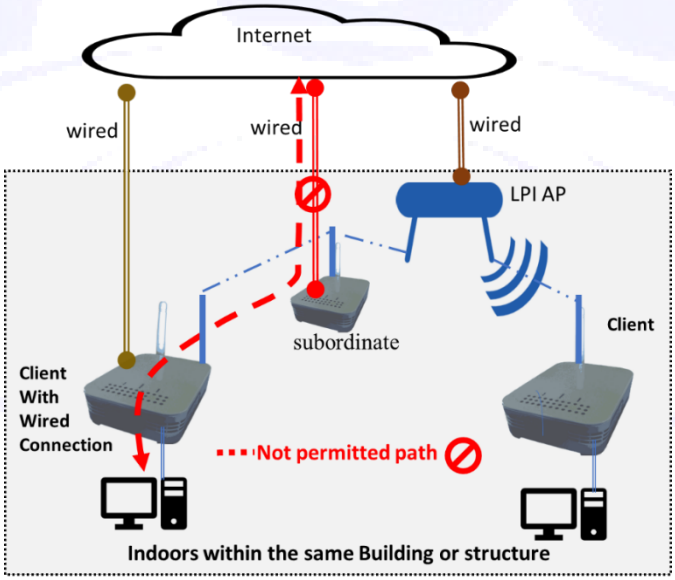
3.5 Networking Restrictions for Clients and Subordinates

Client devices are prohibited from connecting directly to another client device. A client device (6XD and 6CD) may connect to the Internet or a network via a wired connection or other means, such as cellular. However, it may not source the Internet/network to different clients or subordinate devices or provide direct peer-to-peer connections to other clients or subordinates.

[8] The contention-based protocol applies to a dual client independent of whether it is associated with an indoor or standard access point. 15.407 (d)(6) Indoor access points, subordinate devices, and client devices operating in the 5.925-7.125 GHz band must also employ a contention-based protocol.

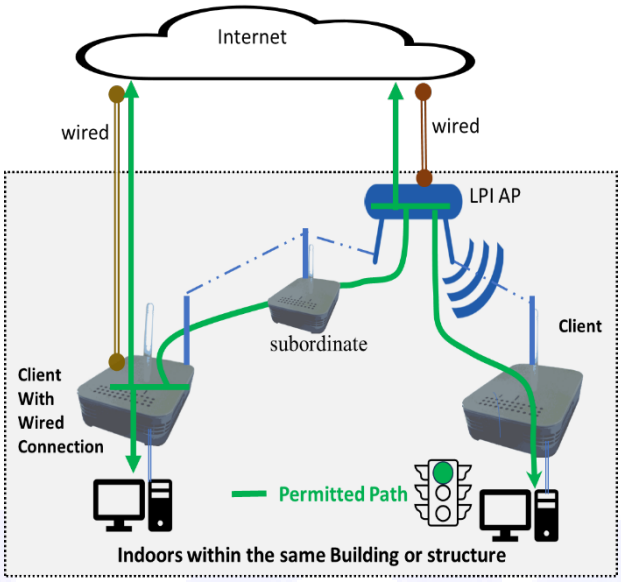


Client devices are prohibited from connecting directly to another client device.



Subordinate devices (6PP) cannot directly connect to the internet.[9]

[9] 47 CFR 15.403 “Subordinate Device”



Permitted Operation of Indoor Access Points (6ID), Subordinates (6PP) and Clients (6XD,6CD)

3.6 Summary of Application Requirements for indoor and dual client exhibits.

Table 2 - Summary of Application Requirements for Indoor and Dual Client Exhibits

[N] .. [1],[2]…[15] identifies a note code in Table 8 for requirements for Form-731 Application, exhibits and information.		6ID	6PP	6XD	6CD	
					Indoor AP	Standard AP
Labelling and Manual						
[11]	Labeling: Indoor Only	X	X			
[12]	Manual: FCC regulations restrict the operation of this device to indoor use only. It is prohibited on oil platforms, cars, trains, boats, and aircraft, except it is permitted in large aircraft while flying above 10,000 feet.	X	X			
[14]	Manual: Prohibited for control of or communications with unmanned aircraft systems	X	X	X	X	X
	Restrictions, Operation & Attestation					
[1]	Attestation: Indoor Access Point 6ID (Appendix B)	X				
[2]	Attestation: Indoor Client 6XD (Appendix B)			X		
[3]	Attestation: Indoor Subordinate 6PP (Appendix B)		X			
[4]	Attestation: Dual Client 6CD (Appendix B)				X	X
[15]	UNII Security	X	X	X	X	X
Demonstrate in Test report. See D02.						
[5]	Contention-Based Protocol.	X	X	X	X	
[6]	Fundamental Maximum EIRP (dBm)	30	30	24	24	30 max & 6dB below Std. AP
[7]	Fundamental power spectral density in any 1-megahertz band. (dBm/MHz EIRP)	5	5	-1	-1	17 max & 6dB below AP
[8]	Fundamental bandwidth	<= 320 MHz				
[9]	Emissions outside the 6 GHz Band within any one-megahertz band (EIRP).	-27 dBm				
[10]	Channel Mask	Compliance with DO2 Channel Mask				

4. Standard Power Access Points and Associated Clients (6SD, 6FX, 6FC)

Standard power APs and Fixed clients are prohibited on oil platforms, cars, trains, boats, and aircraft.

The operation of transmitters in the 5.925-7.125 GHz band is prohibited for controlling or communicating with unmanned aircraft systems.

All U-NII devices must have a security description (15.407(i), Device Security) to protect against software modification by unauthorized parties (see KDB 789033).

Label information is required in the exhibit types. ID Label/Location Info FCC ID E-labelling is permitted on devices qualifying for e-labelling.

4.1 Standard Power Access Point (6SD)

Operates in the 5.925-6.425 GHz and 6.525-6.875 GHz bands.

An Automated Frequency Coordination System manages it.

A standard power access point must provide relevant information to an associated client so that the client can adjust its EIRP to a minimum of 6 dB lower than what is authorized by the AFC for the standard power access point for any given channel.

These devices may operate as a bridge, peer-to-peer connection, connector between the wired and wireless segments of the network, or relay between wireless network segments.

FCC ID: E-labelling is permitted on devices qualifying for e-labelling.

Label information required in the exhibit types ID Label/Location Info:

- FCC ID

The device user manual must contain the following information. The user manual must be filed as an exhibit in the application filing.

- The operation of this device is prohibited on oil platforms, cars, trains, boats, and aircraft.
- Operation of transmitters in the 5.925-7.125 GHz band is prohibited for control of or communications with unmanned aircraft systems.

Geolocation exhibits are required. See section 10 below.

EMC test reports guidance provided in 987594 D02 U-NII 6 GHz EMC Measurement

AFC DUT test harness guidance, provided in 987594 D05 Standard AP and Fixed Client Testing.

4.2 Standard Client Device (6FX)[10]

A device that is only associated with a standard power access point.

FCC ID: E-labelling is permitted on devices qualifying for e-labelling.

Label information required in the exhibit types ID Label/Location Info:

- FCC ID

The device user manual must contain the following information. The user manual must be filed as an exhibit in the application filing.

- Transmitters in the 5.925-7.125 GHz band are prohibited from operating to control or communicate with unmanned aircraft systems.

[10] A standard client device (6FX) and a dual client device (6CD) differ from an indoor client device (6XD). The standard client device (6FX) and dual client device (6CD) needs to demonstrate in the filing that they can auto-adapt their power under the control of a standard power access point (6SD). The indoor client device (6XD) can only associate with an indoor access point (6ID) or subordinate (6PP). A dual client device (6CD) can associate with either an indoor access point (6ID), subordinate (6PP), or standard power access point (6SD), and when associated with a standard power access point (6SD), must adapt its power. See 15.407(a)(7). Any client device that is also an AP just for configuring Wi-Fi network credentials is also an indoor access point (6ID) and filed with separate 731 applications as a composite.

A Standard client device with a direct connection to the internet cannot source the internet to other access points, clients, or subordinate devices (see section 3.5).

4.3. Fixed Client (6FC)

A device intended as customer premise equipment permanently attached to a structure operates only on channels provided by an AFC, has a geolocation capability, complies with the antenna pointing angle requirements, and can only connect with a standard power access point.

Operates in the 5.925-6.425 GHz and 6.525-6.875 GHz bands.

An AFC manages it and can connect with standard power access points.

A Fixed Client (6FC) client device cannot directly connect to the Internet to source data from other clients associated with the Fixed Client.

FCC ID: E-labelling is permitted on devices qualifying for e-labelling.

Label information required in the exhibit types of ID Label/Location Info:

- FCC ID

The device user manual must contain the following information. The user manual must be filed as an exhibit in the application filing.

- The operation of this device is prohibited on oil platforms, cars, trains, boats, and aircraft.
- Operation of transmitters in the 5.925-7.125 GHz band is prohibited for control of or communications with unmanned aircraft systems.

Geolocation exhibits are required. See section 10 below.

EMC test reports guidance provided in 987594 D02 U-NII 6 GHz EMC Measurement

AFC DUT test harness guidance provided in 987594 D05 Standard AP and Fixed Client Testing

4.4 Summary of Application Requirements for Standard Power Exhibits

Table 3 - Summary of Application Requirements for Standard Power Exhibits

[N] .. [6],[7]…[29] identifies a note code in Table 8 sections E for requirements for Form-731 Application, exhibits, and information		6SD Standard Power Access Point	6FC Fixed Client	6FX Standard Client
	Labelling and Manual			
[13]	Manual: FCC regulations restrict the operation of this device on oil platforms, cars, trains, boats, and aircraft	X	X	
[14]	Manual: Prohibited for control of or communications with unmanned aircraft systems	X	X	X
Operation Descriptions and Attestations				
[15]	UNII Security – 15.407(i)	X	X	X
[25]	AFC Security – 15.407(k)(8)(v)	X	X	
[17]	Geolocation General Description	X	X	
[18]	Geolocation Justification Report	X	X	
[19]	Geolocation Accuracy After a power cycle (If applicable)	X	X	
[21]	Power cycle Re-authorization	X	X	
[23]	Daily contact with AFC & Grace Period	X	X	
[24]	Security of Connection to External Geolocation Source	X	X	
[22]	Network Element/ Proxy Ops Description if required (see D05)	X		
[27]	Attestation: Standard Power Access Point (Appendix B)	X		
[28]	Attestation: Fixed Client (Appendix B)		X	
[29]	Attestation: Standard Client (Appendix B)			X
Demonstrate in Test report. See D02 & D05.				
[16]	AFC DUT test Harness Report D05	X	X	
[26]	Operates 6 dB below Standard Power AP D02			X
[6]	Fundamental Maximum EIRP (dBm)	36 dBm	36 dBm	30 max & 6dB below Std. AP
[7]	Fundamental power spectral density in any 1-megahertz band. (dBm/MHz EIRP) D02	23		17 max & 6dB below AP
[20]	Maximum EIRP above 30 degrees D02	125 mW (21 dBm) - when installed outdoors		
[8]	Fundamental bandwidth	<= 320 MHz		
[9]	Emissions outside the 6 GHz Band within any one-megahertz band (EIRP). D02	-27 dBm		
[10]	Channel Mask	Compliance with D02 Channel Mask		

5. Very Low Power Device (6VL)

A device that operates in the 5.925-6.425 GHz and 6.525-6.875 GHz bands and has an integrated antenna. These devices do not need to operate under the control of an access point.

FCC ID: E-labelling is permitted on devices qualifying for e-labelling.

Label information required in the exhibit types ID Label/Location Info:

- FCC ID

The device user manual must contain the following information. The user manual must be filed as an exhibit in the application filing.

- The operation of this device is prohibited on oil platforms and aircraft, except that operation of this device in 5.925-6.425 GHz is permitted in large aircraft while flying above 10,000 feet.
- Installation on outdoor fixed infrastructure is prohibited.

EMC test reports guidance provided in 987594 D02 U-NII 6 GHz EMC Measurement.

Employ a contention-based protocol[11], Transmit Power Control and prioritize channels above 6105 MHz.

5.1 Summary of Application Requirements for VLP Exhibits

Table 4 – Summary of Application Requirements for VLP Exhibits

[N] .. [1],[2]…[15] identifies a note code in Table 8 for requirements for Form-731 Application, exhibits and information.		6VL			
Labelling and Manual					
[32]	Manual: Operation prohibited on oil platforms and aircraft, except that operation of this device in 5.925-6.425 GHz is permitted in large aircraft while flying above 10,000 feet	X			
[33]	Manual: Installation on outdoor fixed infrastructures prohibited.	X			
	Restrictions, Operation & Attestation				
[34]	Attestation: Very Low Power 6VL (Appendix B)	X			
[15]	UNII Security	X			
Demonstrate in Test report. See D02					
[5]	Contention-Based Protocol.	X			
[35]	Transmit Power Control	X			
[6]	Fundamental Maximum EIRP (dBm)	14			
[7]	Fundamental power spectral density in any 1-megahertz band. (dBm/MHz EIRP)	-5			
[8]	Fundamental bandwidth	<= 320 MHz			
[9]	Emissions outside the 6 GHz Band within any one-megahertz band (EIRP).	-27 dBm			
[10]	Channel Mask	Compliance with DO2 Channel Mask			

[11] 47 CFR 15.407(d)(6)

6. Multiple Rule Parts (Composite Devices)

6 GHz devices can be authorized under multiple rule parts and equipment classes. Either as an initial application or after an initial application. 6 GHz equipment classes can be added after an initial application under the same FCC ID[12] if the change is only software changes. This is not done as a C2PC but as an initial application under the same FCC ID.

The new equipment class should be submitted as a Class III permissive change if the original application was approved as a software-defined radio (SDR).

7. Application Restrictions.

Products that are certified in the 6 GHz U-NII bands as Low-power indoor access points (6ID) and subordinate (6PP) devices have restrictions that apply to the entire Product's Form Factor (PFF), i.e., cannot have an outdoor weatherized enclosure, must have an integrated antenna, cannot operate on battery power, include a product label "indoor use only" and instruct the users the product cannot be used outdoors. For example, a product that contains certifications for equipment classes 6ID and 6PP and DTS and NII in 2.4 bands and U-NII bands 1, 2A, 2C, 3, and 4 is restricted to an indoor PFF.

The grantee shall clearly describe how each restriction is ensured and indexed by the rule part in the operational description and user manual.

8. Modules

Except for subordinate devices, all equipment classes are permitted to be modules under Sec. 15.212. Furthermore, as indicated above, different modules can be a composite under one FCC ID.

Table 5 – Modules

Composite device	Low-power indoor AP	Subordinate device	Client Indoor Only	Dual Client	Standard power AP	Standard Client	Fixed Client	VLP
	6ID	6PP	6XD	6CD	6SD	6FX	6FC	6VL
Module permitted	Yes	No[13]	Yes	Yes	Yes	Yes	Yes	Yes

No host controls or configuration settings (selections, scripts, interface protocol) can set, configure, or adjust the air interface RF emission parameters to meet the grant conditions. The module must demonstrate in the filing that the total compliance as a stand-alone module is independent of any host. The restrictions for modifying or controlling these parameters include the host manufacturer or any third party under the U-NII security restrictions.

The manufacturer may demonstrate an alternative method.[14] Specific to a host, host agreement, or contract and qualify as a limited module.

[12] Many 6 GHz devices will be composite devices. Composite devices have two meanings: (1) A Form 731 composite refers to a filing for multiple equipment classes certified under one FCC ID. (2) The second meaning, under §2.947(f) Measurement procedure, refers to the compliance responsibilities under multiple rules, including transmitters and unintentional radiators under part 15B under SDoC and Certification.

[13] A subordinate device may not be certified as a module (15.403).

A module grantee must extend requirements such as labeling, indoor use, power, restrictions, etc., to the host manufacturer through the integration instructions (see Publication KBB 996369 D03). The integration instructions shall be in sufficient detail so that the host manufacturer must adhere to these requirements and restrictions as a condition for using the module's certification.

[14] Depending on the proposed method, when a module cannot demonstrate compliance in a standalone mode independent of a host, this will require shared host responsibility between the host responsible party and the module Grantee, with a C2PC for each host or host type.

9. Overall Summary

Table 6 - Overall Summary

Type	Eq Class		U-NII Bands				Contention Based Protocol	Under control of	Antenna Restriction	Max EIRP (dBm)	APC 6 dB Below AP	Module	Restrictions Notes
			5	6	7	8							
Low-power indoor access point	6ID	In-door	X	X	X	X	X	NA	Integral	30	NA	X	a c d i o
Subordinate	6PP		X	X	X	X	X	Indoor AP 6ID By Attestation	Integral	30	NA	Not Permitted	a c d e g i k o
Indoor Client	6XD		X	X	X	X	X	Indoor AP 6ID By Attestation	15.203	24	NA	X	a e g i j o
Dual Client	6CD		X	X	X	X	X	Indoor AP 6ID By Attestation	15.203	24	NA	X	a e g i j o
		In-door Outdoor	X		X		NA	Standard AP 6SD By Attestation		30	Yes		a e h i j o
Standard Power Access Point	6SD		X		X		NA	AFC	15.203	36	NA	X	a b i
Standard Client	6FX		X		X		NA	Standard AP 6SD	15.203	30	Yes	X	a e h j o
Fixed Client	6FC		X		X		NA	Standard AP 6SD/AFC	15.203	36	NA	X	a b e f h j i o
VLP	6VL	In-door Outdoor	X		X		X		Integral	14		X	l m n o

Restriction Notes:

a. Prohibited for control of or communications with unmanned aircraft systems.
b. Prohibited on oil platforms, cars, trains, boats, and aircraft,
c. It is prohibited on oil platforms, cars, trains, boats, small aircraft, and large aircraft under 10,000 feet.
d. It is indoor only, powered by a wired connection, has an integrated antenna, is not battery-powered, and does not have a weatherized enclosure.
e. No direct internet connection permitted.
f. Limited for installation on fixed infrastructures.
g. limited to indoor use by low-power indoor access point associations.

h. is limited to operation through association with a standard power access point.
i. Attestation Required.
j. Under the control of an access point, a network cannot be initiated.
k. Modules not permitted.
l. Prohibited on outdoor infrastructure.
m. Prohibited on oil platforms and aircraft, except when flying above 10,000 feet in large aircraft in the 5.925-6.425 GHz band.
n. Prioritize channels above 6.105 GHz.
o. Contention Based Protocol

10. RF Exposure

Per Sec. 15.407(f), application filings for all U-NII devices must address RF exposure compliance as detailed in KDB Pub. 447498 and other KDB publications referenced therein. For U-NII 6-7 GHz band portable devices (subject to MPE power density limits, not SAR limits), until the FCC publishes specific additional exposure evaluation guidance, applicants and test labs may submit a KDB inquiry for review of the RF exposure evaluation plan before completing testing and submitting to a TCB, consistent with KDB Pub. 388624 PAG requirements by a TCB under PAG OVER6G.

11. Geolocation approval procedure for Standard power access points (6SD) and fixed client (6FC)

11.1 Automated Frequency Coordination (AFC) Database.

Standard power access point (6SD) and fixed client (6FC**)** devices need to connect to an FCC-approved.[15] Automated Frequency Coordination (AFC) Database for authorization to transmit on any frequency in the 5.925-6.425 GHz and 6.525-6.875 GHz bands and at a power level based on geolocation coordinates and area provided to the AFC by that device. Authorization is required whenever the device is initially activated, relocated, and, at a minimum, at least once a day. The authentication protocol includes the device's credentials, granted FCC ID, geographic coordinates, and location uncertainty (in meters), with a confidence level of 95%[16]. The AFC responds with available frequencies and permitted power for the requested operation for that geolocation area. In addition, 6SD and 6FC devices shall seek re-authorization with the AFC to re-obtain operating parameters after a power on-off-on cycle with an exception for devices that use Geolocation Accuracy after the Power Cycle (see section 10.2.3) that shall be approved through a Persistent Inquiry Approval (PIA) Procedure (see section 10.3).

Standard power access point (6SD) and fixed client (6FC) must confirm their operating frequency and power with the AFC at least once daily. In case of failure to contact the AFC or no response from the AFC[17], the standard power access point (6SD) and fixed client (6FC) devices shall cease operation[18] By 11:59 p.m. the following day. The devices may resume transmissions only after reestablishing contact with the AFC system and receiving information for permitted frequencies and power levels.

11.2 Exhibits for 731 filing

6SD and 6FC devices require the following 731 exhibits: a Geolocation General Description, a Geolocation Justification Report, and, if applicable, a Geolocation Accuracy Demonstrating that the Standard Access Point did not Move After a Power Cycle. See sections 11.2.1, 11.2.2, and 11.2.3 below. These 731 exhibits can be pre-approved by the commission using a one-time procedure described in section 11.3 below and referred to as a Persistent Inquiry Approval (PIA) procedure.

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[15] AFC Approval is not an equipment authorization certification procedure under Part 2 Subpart J of CFR Title 47 of the rules and is not the subject of this publication. See DA/FCC #: DA-22-1146, Docket/RM: 21-352. Available at https://www.fcc.gov/edocs.

[16] Uncertainty of the requested coverage area with a 95% confidence level is provided by 6SD and 6FX devices in the device to AFC spectrum inquiry request message as specified in “AFC System to AFC Device Interface Specification,” available from Wi-Fi Alliance.

[17] Failure to contact the AFC or no response does not include a power cycle event. After a power cycle see 11.2.3 Geolocation Accuracy After a Power Cycle.

[18] 47 CFR 15.407(k)(8)(iv)`

11.2.1 Geolocation General Description

A general description shall provide an overview of the geolocation system. This document shall be written for the general public's knowledge level without referring to the technical details of geo-location technologies such as GPS communications and the details that justify the 95% confidence level claim. The document shall provide:

- A general overview of the method used by the 6SD and 6FC, which uses either an internal geolocation capability or a secured connection to an external geolocation device or service to automatically[19] determine the standard power access point's geographic coordinates and location uncertainty with a confidence level of 95%.
- Attestation confirming the location uncertainty with a 95% confidence level.
- State that daily AFC confirmation will be performed before and after a power cycle operation (either AFC re-authorization or, if applicable, the approved “Geolocation Accuracy after a Power Cycle” operation).

This description shall be filed as a 731 exhibit in the Operational Description folder. Short-term confidentiality is permitted.

11.2.2 Geolocation Justification Report

A justification report is required to support the assertion that devices meet the location uncertainty with a 95% confidence level. This document is filed in the operational description folder. When the Grantee manages this information as confidential, the Geolocation Justification Report may be held as a long-term confidential 731 exhibit, as permitted by CFR 47 §§ 0.457(d) and 0.459 of the FCC Rules (see KDB 726920).

This document must demonstrate the testing method and calculations used to justify the location uncertainty with a 95% confidence level claim, e.g., via testing and statistical data. This report is expected to contain the following:

- An overview of the geolocation system, identifying all significant sections and components with block diagrams. The information shall identify any independent geolocation technology not part of the device certification (such as handsets, tablets, etc.). Details about geolocation technology chip manufacturers and antenna information (including gain) are required for geolocation technology reception.
- A description is required to explain how the 95% confidence level claim is justified. Since each manufacturer may have different methods, this description has no hard and fast requirements. We expect the narrative to include sample sizes, different installation environments, locations, variations when different or independent subsystems are used, test setup, the accuracy of survey markers or bench systems, and other relevant factors that affect the accuracy.
- A list or graph of the data utilized to determine the confidence interval.
- Explain how the confidence interval area is established for any particular device.
- For independent geo-location technologies such as GPS devices,[20] Describe the number of different manufacturers, models, and types of devices used and what factors determine the geolocation reported to the AFC.

[19] 47 CFR 15.407(k)(9)(i) geolocation capability must be automatic. Manual keying geolocation into the device is not permitted.
[20] Independent systems are devices such as handsets and tablets with separate geolocation technologies such as GPS that are not part of the certified equipment but are required for the 6SD and 6FC devices to automatically determine their geolocation.

- A description of the security features (i.e., how end users are prevented from bypassing the AFC protocol).
- Describe how height is determined and entered.[21]
- Grantee should note: The PIA is accepted as the grantee's claim as a declaration that devices using this method, as described in the general description and justification report, comply with the geolocation requirements. The FCC accepted this claim without performing a hypothesis test or challenging its mathematical method. Under the current rules 47 CFR 2.945(b), after equipment authorization, the Commission may request a sample or a voucher to purchase the equipment and test the hypothesis to confirm compliance.
- Acceptance of this PIA for obtaining a Grant of approval is a declaration that for geolocation systems based on GNSS signals are only received from U.S. licensed Satellites or approved satellites under 47 CFR § 25.137. Example: GLONASS and BeiDou are not permitted.

11.2.3 Geolocation Accuracy Demonstrating that the Standard Access Point did not Move After a Power Cycle

A power cycle[22] occurs when a device is moved, or there is a temporary power failure. Some devices can automatically determine their location and re-authenticate with the AFC to reestablish operations. When geolocation is automatically acquired after a power failure, these devices do not require Geolocation Accuracy Demonstrating that the Standard Access Point did not Move After a Power Cycle PIA.

There may be other devices that do not automatically obtain geolocation information and rely upon operator intervention. Suppose these devices have built-in mechanisms to detect that it has not moved during a temporary power failure. In that case, a Geolocation Accuracy Demonstrating that the Standard Access Point did not Move After a Power Cycle description exhibit shall be submitted as a PIA.[23] The Geolocation Accuracy after a Power Cycle exhibit shall describe the method used to determine that the device has not been moved.

If approved, that device could continue operating based on the AFC authorization provided before the temporary power failure. The device is limited to a temporary power failure event by the once-a-day confirmation schedule established with the AFC before the power failure. The device shall maintain its daily schedule and accuracy through any temporary power failure. The Geolocation Accuracy After a Power Cycle did not move description shall state that the method does not affect the 95% confidence requirement.

11.3 Persistent Inquiry Approval (PIA) Procedure

Persistent Inquiry Approval (PIA)[24] is an equipment authorization inquiry procedure. It allows the commission to review the Geolocation General Description, a Geolocation Justification Report, and, if applicable, a Geolocation Accuracy after the Power Cycle description. This inquiry will require the first category to be " Equipment Authorization" and the second category to be "Geolocation."

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[21] Elevation/height objects provided by 6SD and 6FC devices, in the spectrum inquiry request message as specified in "AFC System to AFC Device Interface Specification," available from Wi-Fi Alliance.

[22] Power cycle is when the power source cycles from on to off to on.

[23] A Power cycle re-authorization test [21] is different from Geolocation Accuracy after a Power Cycle [19], see Table 8 – Note Code References.

[24] PIA is not a Pre-Approval Guidance (KDB Publication Number: 388624). A PIA does not mean a PAG is or is not still required. It is an inquiry and is recommended that the Grantee submits the PIA. It is recommended since the Grantee is responsible for its geolocation accuracy and power cycle operation. Any misunderstandings between a third party and the commission will not alleviate the Grantee's responsibility for its accuracy.

Once reviewed under this procedure, 731 applications for (6SD) and (6FC) devices can submit the same PIA descriptions[25] as 731 exhibits[26] for Certification to demonstrate compliance, which will be considered reviewed and permitted under the original PIA procedure.

- The inquiry is used to review a manufacturer's claim for geolocation. It is recommended that the Grantee submit it to seek approval.
- As a practical matter, the geo-location solution provider may also submit the inquiry as long as the solution is self-contained and the grantee embeds the self-contained solution as-is without any modification. The Grantee shall be responsible for the operation and submit the third-party PIA with their application, a third-party geo-location solution as described in the PIA Geolocation General Description and Geolocation Justification Report submitted by the third party.
- Although not recommended, if a Grantee chooses to have a test laboratory or TCB submit a PIA, it shall also include a signed letter from the Grantee giving that laboratory or TCB authority to seek approval.
- The PIA does not imply Commission approval of the accuracy of the data presented. It is a technical testament by the Grantee to meet the geographic coordinates and location uncertainty (in meters) with a confidence level of 95% or the geolocation accuracy after a power cycle.
- The PIA itself (a copy of the actual KDB inquiry) shall be included in the Grantee's application for the certification to allow the TCB/Commission to confirm the original PIA approval. This is also required for a third-party PIA.
- The PIA is not public, and the 731 exhibits Geolocation Justification Report and Geolocation Accuracy Demonstrating that the Standard Access Point did not Move After a Power Cycle description may be submitted as long-term confidential exhibits.
- The TCB submitting the 731 applications shall ensure that the 4 exhibits (as called out in the PIA Acceptance Letter) are supplied.
- If the TCB chooses or suspects the tracking number is not correct or legitimate, it should submit a separate inquiry to confirm the PIA tracking number.
- Any changes to the current provided PIA (significantly changes the method) requires a new PIA.
- Filing the required documents with each application for certification for a standard power access point (6SD) or a fixed client (6FC) provides the affirmation that the device complies with the geolocation confidence required by 47 CFR 15.407(k)(9)(i).

[25] The term "PIA descriptions" refers to the Geolocation General Description, a Geolocation Justification Report, and, if applicable, a Geolocation Accuracy after Power Cycle description submitted in the inquiry for the initial Inquiry and reviewed by the Commission.

[26] "731 exhibits" when referenced in this Section, refers to the 731 exhibits submitted to the Equipment Authorization System for Certification. The "731 exhibits" shall be the same information as the "PIA descriptions."

Appendix A
Exhibits Reference Guide

The tables "Exhibits Reference Guide" below provide a reference Guide for uploading exhibits for U-NII 6 GHz applications. The "Y" Indicates that an exhibit must be uploaded, or an application error will result. The note number [N] provides additional guidance for U-NII 6 GHz applications. A blank means an exhibit may or may not be required depending on the application and indicates that an error will not occur when an exhibit is not uploaded. However, an exhibit may be required for other reasons. For example, Class III applications adding an equipment class require many exhibits to be uploaded, similar to an original application, such as test reports, operational descriptions, security, etc. The absence of a "Y" does not mean an exhibit is not required.

The test laboratory and TCB Scope are A4- U-NII Devices & low-power transmitters using spread spectrum techniques for all equipment classes.

The frequency range for Form 731 listed on the grant shall be the contiguous frequency span of operation as authorized for that equipment class, from the channel center frequency of the lowest-frequency channel for any bandwidth to the channel center frequency of the highest-frequency channel for any bandwidth.

Table 7 - Exhibits Reference Guide

Exhibit Type	Application Type	LPI AP	Subordinate device	LPI Client	Dual Client	Std AP	Std Client	Fixed Client	VLP
		6ID	6PP	6XD	6CD	6SD	6FX	6FC	6VL
ID Label/Location	Original Equipment	Y[11]	Y[11]	Y	Y	Y	Y	Y	Y
	Change in ID	Y[11]	Y[11]	Y	Y	Y	Y	Y	Y
	Class II PC								
	Class III PC								

Exhibit Type	Application Type	LPI AP	Subordinate	Client indoor	Dual Client	Std AP	Std Client	Fixed Client	VLP
		6ID	6PP	6XD	6CD	6SD	6FX	6FC	6VL
Attestation	Original Equipment	Y [1] Y[30]	Y[3] Y[30]	Y [2] Y[30]	Y [4] Y[30]	Y [21] [23] [24] [27] [30]	Y[29] Y[30]	Y [21] [23] [24] [28] [30]	Y[30] Y[34]
	Change in ID	Y[30]	Y[30]	Y[30]	Y[30]	Y[30]	Y[30]	Y[30]	Y[30]
	Class II PC	Y[30]	Y[30]	Y[30]	Y[30]	Y[30]	Y[30]	Y[30]	Y[30]
	Class III PC	Y[30]	Y[30]	Y[30]	Y[30]	Y[30]	Y[30]	Y[30]	Y[30]

Exhibit Type	Application Type	LPI AP	Subordinate	Client indoor	Dual Client	Std AP	Std Client	Fixed Client	VLP
		6ID	6PP	6XD	6CD	6SD	6FX	6FC	6VL
External Photos	Original Equipment	Y	Y	Y	Y	Y	Y	Y	Y
	Change in ID	Y	Y	Y	Y	Y	Y	Y	Y
	Class II PC								
	Class III PC								

Exhibit Type	Application Type	LPI AP	Subordinate	Client indoor	Dual Client	Std AP	Std Client	Fixed Client	VLP
		6ID	6PP	6XD	6CD	6SD	6FX	6FC	6VL
Block Diagram	Original Equipment	Y	Y	Y	Y	Y	Y	Y	Y
	Change in ID								
	Class II PC								
	Class III PC								

Exhibit Type	Application Type	LPI AP	Subordinate	Client indoor	Dual Client	Std AP	Std Client	Fixed Client	VLP
		6ID	6PP	6XD	6CD	6SD	6FX	6FC	6VL
Schematics	Original Equipment	Y	Y	Y	Y	Y	Y	Y	Y
	Change in ID								
	Class II PC								
	Class III PC								

Exhibit Type	Application Type	LPI AP	Subordinate	Client indoor	Dual Client	Std AP	Std Client	Fixed Client	VLP
		6ID	6PP	6XD	6CD	6SD	6FX	6FC	6VL
Test Reports	Original Equipment	Y[5] to [10]	Y[5] to [10]	Y[5] to [10]	Y[5] to [10] [26]	Y[6] to [10] [16] [20] [25]	Y[6] to [10] [26]	Y[6] to [10] [16] [20] [25]	Y[5] to Y[10] Y[35]
	Change in ID								
	Class II PC								
	Class III PC								

Exhibit Type	Application Type	LPI AP	Subordinate	Client indoor	Dual Client	Std AP	Std Client	Fixed Client	VLP
		6ID	6PP	6XD	6CD	6SD	6FX	6FC	6VL
Test Set UP Photos	Original Equipment	Y	Y	Y	Y	Y	Y	Y	Y
	Change in ID								
	Class II PC								
	Class III PC								

Exhibit Type	Application Type	LPI AP	Subordinate	Client indoor	Dual Client	Std AP	Std Client	Fixed Client	VLP
		6ID	6PP	6XD	6CD	6SD	6FX	6FC	6VL
Internal Photos	Original Equipment	Y	Y	Y	Y	Y	Y	Y	Y
	Change in ID								
	Class II PC								
	Class III PC								

Exhibit Type	Application Type	LPI AP	Subordinate	Client indoor	Dual Client	Std AP	Std Client	Fixed Client	VLP
		6ID	6PP	6XD	6CD	6SD	6FX	6FC	6VL
Parts List/Tune-Up Info	Original Equipment								
	Change in ID								
	Class II PC								
	Class III PC								

Exhibit Type	Application Type	LPI AP	Subordinate	Client indoor	Dual Client	Std AP	Std Client	Fixed Client	VLP
		6ID	6PP	6XD	6CD	6SD	6FX	6FC	6VL
User Manual	Original Equipment	Y[12] [14]	Y[12] [14]	Y [14]	Y [14]	Y[13] [14]	Y[14]	Y[13][14]	Y[32] Y[33]
	Change in ID								
	Class II PC								
	Class III PC								

		LPI	Sub	Client indoor	Dual Client	Std AP	Std Client	Fixed Client	VLP
Notes			liate						

Exhibit Type	Application Type	LPI AP	Subordinate	Client indoor	Dual Client	Std AP	Std Client	Fixed Client	VLP
		6ID	6PP	6XD	6CD	6SD	6FX	6FC	6VL
RF Exposure	Original Equipment	Y [31]	Y [31]	Y [31]	Y [31]	Y [31]	Y [31]	Y [31]	Y[31]
	Change in ID								
	Class II PC	Y [31]	Y [31]	Y [31]	Y [31]	Y [31]	Y [31]	Y [31]	Y[31]
	Class III PC	Y [31]	Y [31]	Y [31]	Y [31]	Y [31]	Y [31]	Y [31]	Y[31]

Exhibit Type	Application Type	LPI AP	Subordinate	Client indoor	Dual Client	Std AP	Std Client	Fixed Client	VLP
		6ID	6PP	6XD	6CD	6SD	6FX	6FC	6VL
Operational Description	Original Equipment	Y	Y	Y	Y	Y[17] [18] [19] [22]	Y	Y [17] [18] [19] [22]	Y
	Change in ID								
	Class II PC								
	Class III PC								

Exhibit Type	Application Type	LPI AP	Subordinate	Client indoor	Dual Client	Std AP	Std Client	Fixed Client	VLP
		6ID	6PP	6XD	6CD	6SD	6FX	6FC	6VL
Cover Letter	Original Equipment								
	Change in ID	Y	Y	Y	Y	Y	Y	Y	Y
	Class II PC	Y	Y	Y	Y	Y	Y	Y	Y
	Class III PC	Y	Y	Y	Y	Y	Y	Y	Y

Exhibit Type	Application Type	LPI AP	Subordinate	Client indoor	Dual Client	Std AP	Std Client	Fixed Client	VLP
		6ID	6PP	6XD	6CD	6SD	6FX	6FC	6VL
SDR Software/ Security Info	Original Equipment	*	*	*	*	*	*	*	*
	Change in ID	*	*	*	*	*	*	*	*
	Class II PC								
	Class III PC								
	* required for SDR devices.								

Table 8 – Note Code References

Notes		LPI AP	Sub ordi nate	Client indoor	Dual Client	Std AP	Std Client	Fixed Client	VLP
		6ID	6PP	6XD	6CD	6SD	6FX	6FC	6VL
[1]	Attestations: Indoor Access Point 6ID Appendix B	X							
[2]	Attestations: Indoor Client 6XD (Appendix B)			X					
[3]	Attestations: Indoor Subordinate 6PP (Appendix B)		X						
[4]	Attestations: Dual Client 6CD (Appendix B)				X				
[5]	Contention-based protocol.	X	X	X	X				X
[6]	Fundamental Maximum EIRP (dBm).	X	X	X	X	X	X	X	X
[7]	Fundamental power spectral density in any 1-megahertz band. (dBm/MHz EIRP).	X	X	X	X	X	X	X	X
[8]	Fundamental bandwidth	X	X	X	X	X	X	X	X
[9]	Emissions outside of the 6 GHz Band any 1-megahertz band (EIRP).	X	X	X	X	X	X	X	X
[10]	Channel Mask.	X	X	X	X	X	X	X	X
[11]	Labeling: Indoor Only	X	X						
[12]	Manual: FCC regulations restrict the operation of this device to indoor use only. It is prohibited to operate on oil platforms, cars, trains, boats, and aircraft, except that it is permitted to operate in the 5.925–6.425 GHz bands in large aircraft while flying above 10,000 feet.	X	X						
[13]	Manual: FCC regulations restrict the operation of this device on oil platforms, cars, trains, boats, and aircraft.					X		X	
[14]	Manual: Prohibited for control of or communications with unmanned aircraft systems	X	X	X	X	X	X	X	
[15]	UNII Security	X	X	X	X	X	X	X	X
[16]	DUT Test Harness Report					X		X	

Notes		LPI AP	Sub ordinate	Client indoor	Dual Client	Std AP	Std Client	Fixed Client	VLP
		6ID	6PP	6XD	6CD	6SD	6FX	6FC	6VL
[17]	Geolocation General Description					X		X	
[18]	Geolocation Justification Report					X		X	
[19]	Geolocation Accuracy After a power cycle: If applicable					X		X	
[20]	Measurement of emission at elevation angles higher than 30° from the horizon					X		X	
[21]	Power cycle re-authorization test when geolocation is automatically acquired after power failure					X		X	
[22]	Network Element/ Proxy Ops Description if required (see D05).					X		X	
[23]	Daily contact with AFC & Grace Period					X		X	
[24]	Security of Connection to External Geolocation Source					X		X	
[25]	AFC Security * part of test report					X		X	
[26]	Operates 6dB below Standard Power AP				X		X		
[27]	Attestations: Standard Power AP 6SD (Appendix B)					X			
[28]	Attestations: Fixed Client 6FC (Appendix B)							X	
[29]	Attestation: Standard Client 6FX (Appendix B)						X		
[30]	Attestation: FCC 22-84 covered equipment per 986446 D01 Covered Equipment Guidance	X	X	X	X	X	X	X	X
[31]	RF Exposure exhibit per KDB publication 447498	X	X	X	X	X	X	X	X
[32]	Manual: Operation prohibited on oil platforms and aircraft, except that operation of this device in 5.925-6.425 GHz is permitted in large aircraft while flying above 10,000 feet								X
[33]	Manual: Installation on outdoor fixed infrastructures prohibited								X
[34]	Attestation: Very Low Power 6VL (Appendix B)								X
[35]	Transmit Power Control								X

Appendix B
Attestation Example

We, Grantees Name, attest that this device under FCC ID: XXX complies with device protocol requirements and operational restrictions: for (all that apply - indoor client 6XD, subordinate 6PP, Dual Client 6CD).

Note for Modules:

- Device protocol attestation and contention-based protocols apply to functions permanently embedded in the module and cannot be host-dependent. Otherwise, the module must be restricted and filed as a Software-Defined Radio or with joint responsibility agreements.
- Device Restriction statements: We, the grantee, will document the physical restrictions associated with the equipment classes for host products (wired power, integral antenna, non-weatherized enclosure) as conditions of use through the host manufacturer's integration instructions.

Indoor Access Point 6ID:

1. Device Protocol Attestation Statement:
    a. Statement for modules only: As demonstrated in the test report, Contention-Based Protocol is permanently embedded in the module and is not host-dependent.
    b. Statement describing the indoor access point's method to control the associated client/subordinate power control.
2. Statement acknowledging device restrictions:
    a. Low-power indoor Access Point. An Access Point operating in the 5.925-7.125 GHz band shall be supplied power from a wired connection, have an integrated antenna, not be battery-powered, and not have a weatherized enclosure.
    b. This device's operation will not be allowed on oil platforms, cars, trains, boats, and aircraft, except that operation of this device is permitted in large aircraft while flying above 10,000 feet only in the 5.925-6.425 GHz band.
    c. Indoor access points, including drones, are prohibited for control of or communications with unmanned aircraft systems.

Indoor Client 6XD:

1. Device Protocol Attestation Statement:
    a. Statement for modules only: As demonstrated in the test report, Contention-Based Protocol is permanently embedded in the module and is not host-dependent.
    b. Statement that the device will only associate and connect with a low-power indoor access point or subordinate device and never directly connect to other client devices.
    c. Statement that this device will always initiate transmission under the control of a low-power indoor AP or subordinate except for brief transmissions before joining a network. These short messages will only occur if the client has detected an indoor AP or subordinate operating on a channel. These brief messages will have a time-out mechanism such that they will not continually repeat the request if they do not receive a response from an AP.
    d. Statement that transmissions will be lower or equal to the power advertised by the indoor low-power access point or subordinate and never above the maximum output power allowed by the FCC grant for equipment class 6XD.
    e. Statement for modules only: As demonstrated in the test report, the contention-based protocol is permanently embedded in the module and is not host-dependent.

2. Understanding of Statement acknowledging device restrictions:
    a. Prohibited for control of or communications with unmanned aircraft systems, including drones.

Indoor Subordinate 6PP:

1. Device Protocol Attestation Statement:
    a. Statement for modules only: As demonstrated in the test report, Contention-Based Protocol is permanently embedded in the module and is not host-dependent.
    b. Statement that this device will always be under the control of a low-power indoor AP and will only initiate brief messages to be under the control of an indoor low-power AP. These short messages will only occur if the subordinate has detected a low-power indoor AP operating on a channel. These short messages will have a time-out mechanism such that they will not continually repeat the request if they do not receive a response from an AP.
    c. Statement that once under control of an indoor access point, a subordinate will initiate connections with clients, other access points, or other subordinate devices at a lower power or equal to the power advertised by the access point controlling the subordinate and never above the maximum output power allowed by the FCC grant for equipment class 6PP.
    d. Statement describing the subordinate's method to inform the associated client/subordinate of its permitted maximum power.
    e. Statement for modules only: The contention-based protocol demonstrated in the test report is permanently embedded in the module and is not host-dependent.
2. Statement acknowledging device restrictions:
    a. Indoor Access Point. This Access Point operates in the 5.925-7.125 GHz band. A wired connection powers it, but it has an integrated antenna, is not battery-powered, and does not have a weatherized enclosure.
    b. The operation of this device will not be allowed on oil platforms, cars, trains, boats, and aircraft, except that this device's operation is permitted in large aircraft while flying above 10,000 feet.
    c. Prohibited for control of or communications with unmanned aircraft systems, including drones.
    d. Has no direct connection to the internet.

Dual Client 6CD:

1. Device Protocol Attestation Statement:
    a. This device will only associate and connect with a low-power indoor Access Point, subordinate device, or standard access point and never directly link to other client devices.
    b. Statement that this device will always initiate transmission under the control of a low-power indoor AP, subordinate, or standard AP, except for brief communications before joining a network. These quick messages will only occur if the client has detected an indoor AP, subordinate, or standard access point operating on a channel. These brief messages will have a time-out mechanism such that they will not continually repeat the request if they do not receive a response from an AP.
    c. Statement that this device, when associated and connected with a low-power indoor access point, subordinate or standard access point device, will operate at a power lower as advertised by the indoor access point, subordinate, or standard access point (at some point in time testing will be required but FCC will provide advance notice before the requirement takes effect):
        i. lower or equal to the power advertised by the low-power indoor access point or subordinate and never above the maximum output power allowed by the FCC grant for clients associated with indoor clients or subordinates.
        ii. lower than 6 dB below the power of the standard access point advertised.
    d. Statement for modules only: Contention-based protocol, as demonstrated in the test report, is permanently embedded in the module and is not host-dependent protocol shown in the test report.

2. Statement acknowledging device restrictions:
   a. Prohibited for control of or communications with unmanned aircraft systems, including drones.

Standard Power Access Point 6SD:

1. Device Protocol Attestation Statement:
   a. Statement: this device will contact an AFC system at least once daily to obtain the latest list of available frequencies and the maximum permissible power the standard power device may operate with on each frequency at the standard power device's location. If the device fails to contact the AFC system during any given day successfully, the standard device may continue to operate until 11:59 p.m. of the following day, at which time it will cease operations until it re-establishes contact with the AFC system and re-verifies its list of available frequencies and associated power levels - 15.407(k)(8)(iv)
   b. Statement: this device will automatically acquire geolocation and re-register with AFC to obtain frequency and power values after a power cycle.
   c. Statement: If using an external geolocation source, this device will be connected to the standard power device using a secure connection that ensures that only an external geolocation source approved for use with that standard power device provides geographic coordinates to that standard power device. Alternatively, an extender cable may connect a remote receive antenna to a geolocation receiver within a standard power device.
2. Statement Acknowledging device restrictions:
   a. Prohibited for control of or communications with unmanned aircraft systems, including drones.

Fixed Client 6FC:

1. Device Protocol Attestation Statement:
   a. Statement: this device will contact an AFC system at least once daily to obtain the latest list of available frequencies and the maximum permissible power the standard power device may operate with on each frequency at the standard power device's location. If the device fails to contact the AFC system during any given day successfully, the standard device may continue to operate until 11:59 p.m. of the following day, at which time it will cease operations until it re-establishes contact with the AFC system and re-verifies its list of available frequencies and associated power levels - 15.407(k)(8)(iv)
   b. Statement: this device will automatically acquire geolocation and re-register with AFC to obtain frequency and power values after a power cycle.
   c. Statement: If using an external geolocation source, this device will be connected to the standard power device using a secure connection that ensures that only an external geolocation source approved for use with that standard power device provides geographic coordinates to that standard power device. Alternatively, an extender cable may connect a remote receiver antenna to a geolocation receiver within a standard power device.
2. Statement acknowledging device restrictions:
   b. Prohibited for control of or communications with unmanned aircraft systems, including drones.

Standard Client 6FX:

1. Device Protocol Attestation Statement:

a. Statement that this device will only associate and connect with a Standard Power Access Point and never directly link to other client devices.
b. Statement that this device will always initiate transmission under the control of a Standard Power Access Point except for brief communications before joining a network. These quick messages will only occur if the client has detected a Standard Power Access Point operating on a channel. These short messages will have a time-out mechanism such that they will not continually repeat the request if they do not receive a response from an AP.
c. Statement that this device, when associated and connected with a Standard Power Access Point, will operate at a power level as described:
    i. lower or equal to the maximum output power allowed by the FCC.
    ii. At least 6 dB below the power of the Standard Power Access Point.

2. Statement acknowledging device restrictions:
    a. Prohibited for control of or communications with unmanned aircraft systems, including drones.

Very Low Power 6VL:

1. Device Protocol Attestation Statement:
    a. Statement that this device will prioritize spectrum above 6.105 GHz (provide details on how this is implemented).
    b. Statement that this device will use Transmit Power Control (TPC). Provide details on mechanisms that trigger TPC (for example, environment, performance, bandwidth, etc.).
2. Statement acknowledging device restrictions:
    a. Operation is prohibited on oil platforms and aircraft, except that operation of this device in 5.925-6.425 GHz is permitted in large aircraft flying above 10,000 feet.

Change Notice:

12/16/2020: 987594 D01 U-NII 6 GHz General Requirements v01r01 replaces 987594 D01 U-NII 6GHz General Requirements v01 to correct Table 6. The previous version, v01, erroneously indicated that indoor and dual clients required an integral Antenna. It was updated to display, along with other devices, that 15.203 applies.

2/04/2021: 987594 D01 U-NII 6 GHz General Requirements v01r02 replaces 987594 D01 U-NII 6GHz General Requirements v01r01 to update Appendix A Exhibits Reference Guide.

05/20/2021: 987594 D01 U-NII 6 GHz General Requirements v01r03 replaces 987594 D01 U-NII 6GHz General Requirements v01r02 to update Appendix A Exhibits Reference Guide. Note 13 for Dual Client 6CD was removed because it was noted in error.

05/24/2021: 987594 D01 U-NII 6 GHz General Requirements v01r04 replaces 987594 D01 U-NII 6GHz General Requirements v01r03. Table 1 typo correction, 14.407 (a) (3) was corrected to 15.407(a)(3) for U-NII 3 band 5.725-5.85.

08/07/2023: D01 U-NII 6 GHz General Requirements v02 replaces 987594 D01 U-NII 6GHz General Requirements v01r03. Phase 2 restriction removed Table 5, and Table 6 is now Table 5.

08/09/2023: D01 U-NII 6GHz General Requirements v02r01 replaces 987594 D01 U-NII 6GHz General Requirements v02. Corrected errors in sections 3.3 Indoor Clients (6XD) and 3.4 Dual Client 6CD, table 3, and Table 7 notes–[12] and [13] removed requirements for user manual stating restriction on oil platforms, cars, trains, boats, and aircraft for client devices. Clarified section 3.1. Low-power indoor access points (6ID) and in note [12] that under 47 CFR 15.407(d)(1) indoor access points in the 5.925–7.125 are permitted in large aircraft while flying

above 10,000 feet. Appendix B attestation Dual Client 6CD: corrected error under the control of a low-power indoor AP, subordinate or ~~from client~~ to standard AP.

08/22/2023: 987594 D01 U-NII 6GHz General Requirements v02r02 replaces 987594 D01 U-NII 6GHz General Requirements v02r01. v02r02 clarifies the previous change notice of 08/09/2023: change for clarification: “indoor access points in the 5.925–7.125 are permitted in large aircraft while flying above 10,000 feet to “indoor access points in the 5.925-6.425 are permitted in large aircraft while flying above 10,000 feet **“.** No other changes were made in the body of the publication.

XX/NN/2024: 987594 D01 U-NII 6GHz General Requirements v03 replaces 987594 D01 U-NII 6GHz General Requirements v02r02. v03 updates 987594 to add new unlicensed rules under FCC 23-86 effective 03/08/2024 by permitting meager power (VLP) devices under equipment class 6VL in the U–NII–5 (5.925–6.425 MHz) and U–NII–7 (6.525–6.875 MHz) portions of the 6 GHz band.

Attachment 987594 D02 U-NII 6 GHz EMC Measurement v03

Federal Communications Commission
Office of Engineering and Technology
Laboratory Division

Month, XX 2024

GUIDELINES FOR COMPLIANCE TESTING OF
UNLICENSED NATIONAL INFORMATION INFRASTRUCTURE 6 GHz (U-NII) DEVISES
PART 15, SUBPART E

I. INTRODUCTION

This document guides determining 6 GHz U-NII device emissions compliance under FCC rules, Part 15, Subpart E.

This document includes acceptable procedures for measuring emission bandwidth, maximum conducted output power, power spectral density, unwanted emissions in and out of the restricted bands, in-band emissions, and contention-based protocol. For equipment under test (EUT) that can transmit on multiple outputs simultaneously (e.g., MIMO or beamforming devices), see KDB Publication 662911 for additional guidance.

All EUT operating modes and data rates must satisfy all requirements. The operating mode and data rate that is the worst case for one test may not be the worst case for another. Data rate settings may have a significant effect on test results.

Note that average emission measurements in the restricted bands are based on continuous transmission by the U-NII device during the measurement interval. Downward adjustment of test data based on the device's actual operational duty cycle is not permitted.

II. MEASUREMENT PROCEDURES

A. General Guidance & Frequency Stability

Refer to KDB 789033

B. Duty Cycle (x), Transmission Duration (T), and Maximum Power Control Level

Refer to KDB 789033 or as specified in this section where applicable.

C. Emission Bandwidth (EBW)

Refer to KDB 789033

D. 99% Occupied Bandwidth

Refer to KDB 789033

E. Maximum Conducted Output Power

Refer to KDB 789033. Any methods specified in KDB 789033 for conducted power can be used.

F. Maximum Power Spectral Density (PSD)

Refer to KDB 789033

G. Unwanted Emission Measurement

Use the guidance in KDB 789033 for measurements below 1000 MHz and above 1000 MHz. Unwanted emissions outside of restricted bands are measured with an RMS detector. In addition, 15.35(b) applies where the peak emissions must be limited to no more than 20 dB above the average limit.

H. Measurement of emission at elevation angles higher than 30° from the horizon

For an outdoor standard power access point and fixed client device operating in the 5.925-6.425 GHz and 6.525-6.875 GHz bands, the maximum EIRP at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm). This restriction leads to a general requirement for the antenna pattern: if the EIRP within the 3 dB elevation beamwidth of any radiation lobe is higher than 125 mW, this lobe must be controlled, either mechanically or electrically, so that the 3 dB elevation beamwidth of this lobe is below the 30° elevation angle relative to the horizon.

For compliance purposes, the filing must include information for all antenna types. For antennas to be considered similar, their patterns and other characteristics must also be identical.

Note: Elevation angle is defined as 0° is horizontal and 90° is straight-up.

1. For fixed infrastructure, not electrically or mechanically steerable beam antenna

a) If elevation plane radiation pattern is available:

i) Determine the device's intended mounting elevation angle and define a 0° reference angle on the elevation plane radiation pattern.

ii) Indicate any radiation pattern between 30° and 90° with the highest gain.

iii) Calculate the EIRP based on this highest gain and conducted output power.

iv) Compare to the 125 mW limit to establish compliance.

v) Include the elevation pattern data in the application filing with the test report to show how the calculations are made.

Note: For MIMO devices, take the maximum gain of each antenna and apply the guidance in KDB Publication 662911 to calculate the overall gain, including directional gain, for the maximum EIRP calculation.

b) If the elevation plane radiation pattern is <u>not</u> available, but the antenna type (such as dipole omnidirectional, Yagi, parabolic, or sector antenna) has a symmetrical elevation plane pattern referenced at the main beam, and all lobes on the central beam elevation plane have highest gains. The following measurement method is acceptable to determine compliance:

i) Determine the device’s intended mounting elevation angle referenced to the horizon.

ii) Rotate the EUT antenna by 90° around the central beam axis in a horizontal position to transform the measurement in elevation angle into an azimuth angle and define a 0° reference angle based on the device’s intended mounting elevation angle.

iii) Move the test antenna along the horizontal arc or rotate the turntable with the EUT antenna placed at the center, between 30° and 90° relative to the 0° reference angle, and then continue down from 90° to 30° on the other side of the pattern while maintaining the test antenna pointing at a constant distance to the EUT antenna. Search for the spot with the highest measured emission. Both horizontal and vertical polarization shall be investigated to determine the maximum radiated emission level.

Note: Moving the test antenna along the horizontal arc or rotating the turntable shall be performed in an angular step size as small as possible but not larger than 3°.

iv) Calculate the EIRP based on the highest measured emission. Compare to the limit of 125 mW to determine compliance.

v) The antenna pattern measurements must be included in the filing.

2. For All Other Antenna Types

For all other antenna types (such as patch antennas, array antennas, antennas with irregular radiator shapes, etc.) that have any combination of the following characteristics:

- Asymmetrical, complex radiation patterns
- 2-D or 3-D steerable beam
- Portable/mobile, not fixed infrastructure device

Provide the following information in the report:

a) Describe what type of antenna is used.

b) Determine by calculation, measurement, or simulation all radiation lobes/beams with EIRP higher than 125 mW within a 3-dB elevation beamwidth.

c) Explain how these antenna beams are controlled to be kept below the 30° elevation angle. The explanation should include device installation instructions, mechanical control, electro-mechanical control, or software algorithms if the beams are electrically controlled by software.

I. Contention Based Protocol

Indoor access points, subordinate devices, all client devices, and VLP devices operating in the 5.925-7.125 GHz band (herein referred to as unlicensed devices) must use a contention-based protocol to avoid co-channel interference with incumbent devices sharing the band. To ensure incumbent co-channel operations are technology-agnostic, unlicensed devices are required to detect co-channel radio frequency energy (energy detection) and avoid simultaneous transmission.

Unlicensed low-power indoor devices must detect co-channel radio frequency power that is at least -62 dBm or lower. Upon detection of energy in the band, unlicensed low-power indoor devices must vacate the channel (in which the incumbent signal is transmitted) and stay off the incumbent channel as long as detected radio frequency power is equal to or greater than the threshold (-62 dBm)[27]. The -62 dBm (or lower) threshold is referenced to a 0 dBi antenna gain.

[27] An unlicensed low-power indoor device must use its contention-based protocol to ensure a channel is available each time it intends to transmit, including on the same channel(s) previously used after any continuous transmission ends.

To ensure incumbent operations are reliably detected in the band, low-power indoor devices must detect RF energy throughout their intended operating channel. For example, an 802.11 device that plans to transmit a 40 MHz-wide signal (on a primary 20 MHz channel and a secondary 20 MHz channel) must detect energy throughout the entire 40 MHz channel. Additionally, low-power indoor devices must detect co-channel energy with 90% or greater certainty.

Test Procedure

a) Simulating Incumbent Signal

The incumbent signal is assumed to be noise-like. One example of such transmission could be Digital Video Broadcasting (DVB) systems that use Orthogonal Frequency Division Multiplexing (OFDM). Incumbent systems may also use different bandwidths for their transmissions. A 10 MHz-wide additive white Gaussian noise (AWGN) signal is selected to simulate and represent incumbent transmission.

b) Required number of tests

Incumbent and EUT (access point, subordinate, or client) signals may occupy different channel portions. Depending on the EUT transmission bandwidth and incumbent signal center frequency (simulated by a 10 MHz-wide AWGN signal), the center frequency of the EUT signal may fall within the incumbent's occupied bandwidth (Figure 1. a), or outside of it (Figure 1. b).

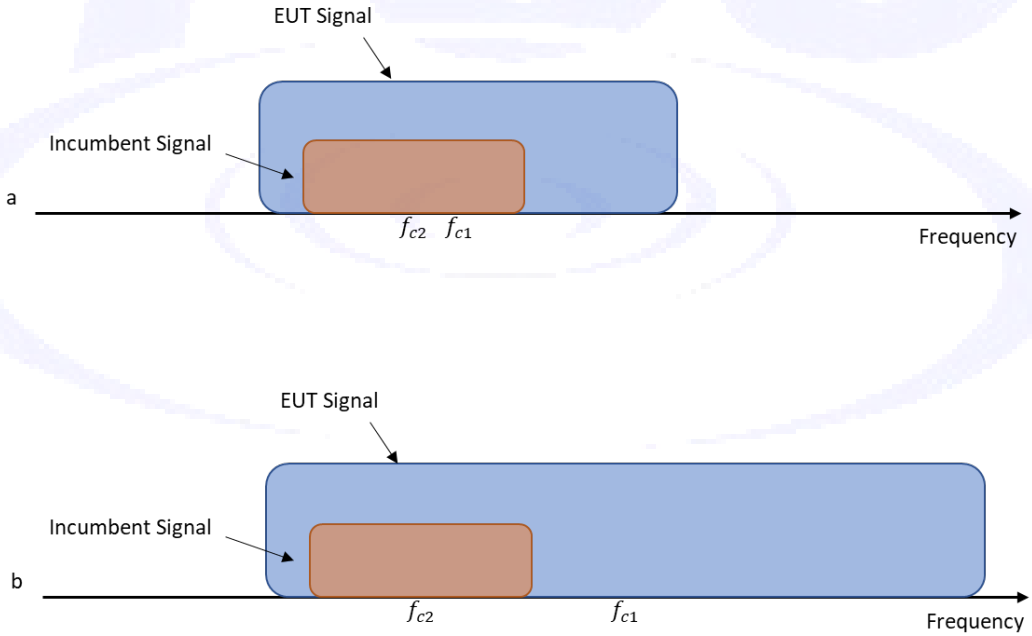

Figure 1. Two possible scenarios where a) center frequency of EUT transmission falls within the incumbent's bandwidth, or b) outside of it

To ensure EUT reliably detects an incumbent signal in both scenarios shown in Figure 1, the detection threshold test may be repeated more than once with the incumbent signal (having center frequency. f_{c2})

tuned to different center frequencies within the UT transmission bandwidth. The criteria specified in Table 1 determine how many times the detection threshold test must be performed;

Table 1. Criteria to determine the number of times detection threshold test may be performed

If	Number of Tests	Placement of Incumbent Transmission
$BW_{EUT} \leq BW_{Inc}$	Once	Tune incumbent and EUT transmissions ($f_{c1} = f_{c2}$)
$BW_{Inc} < BW_{EUT} \leq 2BW_{Inc}$	Once	Incumbent transmission is contained within BW_{EUT}
$2BW_{Inc} < BW_{EUT} \leq 4BW_{Inc}$	Twice. Incumbent transmission is contained within BW_{EUT}	Incumbent transmission is close to the EUT channel's lower and upper edges.
$BW_{EUT} > 4BW_{Inc}$	Three times	Incumbent transmission is located as closely as possible to the lower edge of the EUT channel, in the middle of the EUT channel, and as closely as possible to the upper edge of the EUT channel.

Where:

BW_{EUT}: Transmission bandwidth of EUT signal
BW_{Inc}: Transmission bandwidth of the simulated incumbent signal (10 MHz wide AWGN signal)
f_{c1}: The center frequency of EUT transmission
f_{c2}: Center frequency of the simulated incumbent signal

c) Test Setup

The first step is configuring the EUT to transmit with a constant duty cycle to ensure it can detect co-channel energy.[28] A signal generator (or similar source) capable of generating band-limited additive white Gaussian noise (AWGN) is required to simulate an incumbent signal. Depending on the EUT antenna configuration, the AWGN signal can be provided to the EUT receiver via a conducted method (Figure 2) or a radiated method (Figure 3). Figure 2 shows the test setup conducted where a band limited AWGN signal was generated at a shallow power level and injected into the EUT's antenna port. The AWGN signal power level is then incrementally increased. At the same time, the EUT transmission is monitored on a signal analyzer 2 to verify if the EUT can sense the AWGN signal and subsequently cease its transmission. A triggered measurement, as shown in Figure 2, is optional and assists with determining the time it takes the EUT to stop transmission (or vacate the channel) upon detecting RF energy. If the EUT has only one antenna port, an AWGN signal source can be connected to the same antenna port.

[28] The EUT does not have to be configured to transmit with constant duty cycle if the sole purpose of the test is to verify whether the EUT can detect the incumbent signal and cease transmission upon detection. However, if it is desired to also determine the time it takes the EUT to cease transmission, then having a constant duty cycle will help with an accurate measurement of the time it takes the EUT to detect an incumbent signal and cease transmission.

d) Step-by-Step Procedure, Conducted Setup

1. Configure the EUT to transmit with a constant duty cycle.
2. Set the EUT's operating parameters, including power level, operating frequency, modulation, and bandwidth.
3. Set the signal analyzer center frequency to the nominal EUT channel center frequency. The signal analyzer's span range shall be between two times and five times the EUT's OBW. Connect the EUT's output port to signal analyzer 2, as shown in Figure 2. Ensure that the attenuator 2 provides enough attenuation to prevent the signal analyzer two receiver overloading.
4. Monitor signal analyzer two and verify that the EUT operates and transmits with the parameters set in step 2.
5. Using an AWGN signal source, generate (but do not transmit, i.e., RF OFF) a 10 MHz-wide AWGN signal. Use Table 1 to determine the center frequency of the 10 MHz AWGN signal relative to the EUT's channel bandwidth and center frequency.
6. Set the AWGN signal power to a shallow level (more than 20 dB below the -62 dBm threshold). Connect the AWGN signal source via a 3-dB splitter to signal analyzer one and the EUT, as shown in Figure 2.
7. Transmit the AWGN signal (RF ON) and verify its characteristics on the signal analyzer 1.
8. Monitor signal analyzer 2 to verify if the AWGN signal has been detected and the EUT has ceased transmission. If the EUT continues to transmit, incrementally increase the AWGN signal power level until it stops transmitting.
9. (Including all losses in the RF paths) Determine and record the AWGN signal power level (at the EUT's antenna port) at which the EUT ceased transmission. Repeat the procedure at least ten times to verify the EUT can detect an AWGN signal with a 90% (or better) level of certainty.
10. Refer to Table 1 to determine the number of times the detection threshold testing needs to be repeated. If testing is required more than once, go back to step 5, choose a different center frequency for the AWGN signal, and repeat the process.

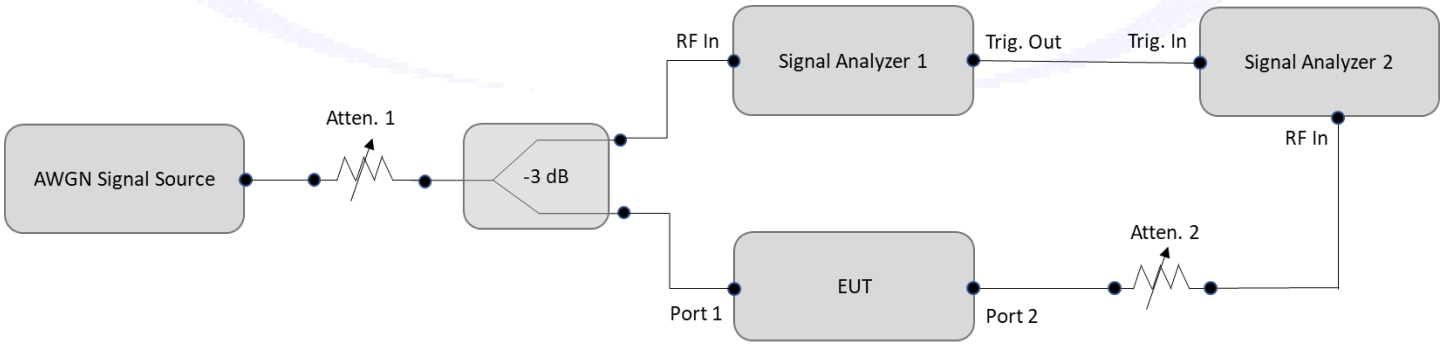

Figure 2. Contention-based protocol test setup conducted method

e) Step-by-Step Procedure, Radiated Setup

To perform the same test in a radiated fashion, it is imperative to ensure that the AWGN signal can be emitted in a controlled environment, the AWGN radiated signal can illuminate the EUT antenna entirely, and the AWGN signal power level can be accurately measured at the EUT antenna's exact location. Figure 3 shows the radiated test setup where the AWGN signal is generated and transmitted via antenna 1. It should be noted that antenna one must be selected so that its 3 dB beamwidth can illuminate the EUT entirely. To ensure the AWGN signal level can be accurately measured at the EUT location, the EUT is initially replaced by antenna two, which has a known gain, as shown in Figure 3. The radiated signal level is then measured using antenna 2. Antennas 1 and 2 are aligned and placed at a distance R more significant than the far-field distances of both antennae 1 and 2. The AWGN signal power level is measured by the signal analyzer 1. The measured power P_{meas} is then corrected by the gain of antenna two and by all cable losses and attenuations to determine the AWGN signal power level at antenna 2, according to

$$P_2 = P_{meas} + L - G_2 \quad (1)$$

The EUT is placed precisely where antenna 2 was, as shown in Figure 4.

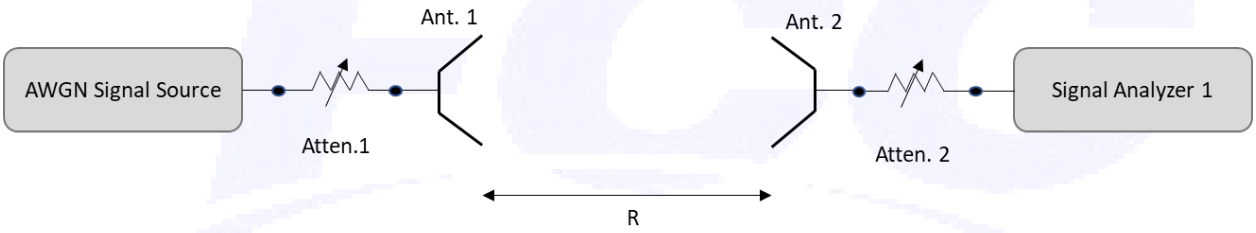

Figure 3. Contention-based protocol test setup, radiated method, power measurement

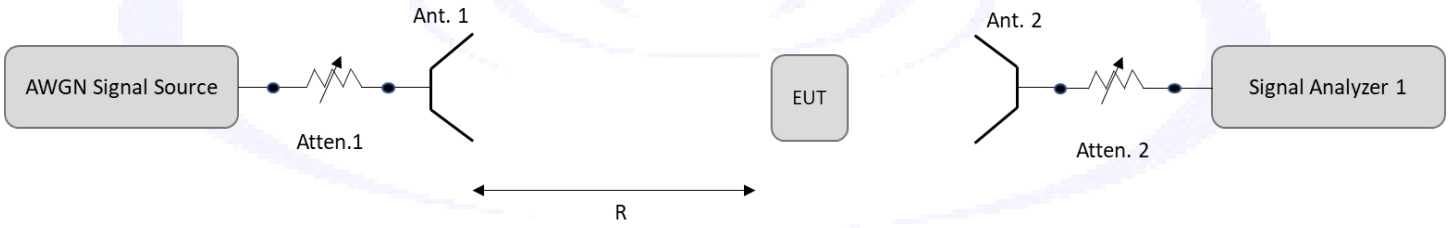

Figure 4. Contention-based protocol test setup, radiated method, detection threshold measurement

The following is a step-by-step procedure for testing the contention-based protocol using the radiated setup described above:

1. Using the AWGN signal source, generate (but do not transmit, i.e., RF OFF) a 10 MHz-wide AWGN signal. Use Table 1 to determine the center frequency of the 10 MHz AWGN signal relative to the EUT's channel bandwidth and center frequency.
2. Connect the AWGN signal source to antenna 1, as shown in Figure 3, and transmit the signal (RF ON).
3. Measure the AWGN signal power level using signal analyzer 1 and antenna 2. Align antenna two and antenna 1 to maximize emission.
4. Using equation 1, correct the measured power by antenna 2's gain and all cable losses and attenuations to obtain the AWGN signal power level at antenna 2P_2.

5. Set the corrected power to a shallow level (more than 20 dB below the -62 dBm threshold).
6. Place the EUT exactly where antenna 2 was. Configure the EUT to transmit a constant duty cycle.
7. Set the EUT's operating parameters, including power level, operating frequency, modulation, and bandwidth.
8. Set the signal analyzer one center frequency to the nominal EUT channel center frequency. The signal analyzer's span range shall be between two times and five times the EUT OBW.
9. Monitor signal analyzer 1 to verify if an AWGN signal has been detected and the EUT has ceased transmission. If the EUT continues to transmit, incrementally increase the AWGN signal power level until it stops transmitting.
10. Determine and record the AWGN signal power level at which the EUT ceased transmission. Repeat the procedure at least ten times to verify the EUT can detect the AWGN signal with a 90% (or better) level of certainty.
11. Refer to Table 1 to determine the number of times the detection threshold testing needs to be repeated. If testing is required more than once, go back to step 1, choose a different center frequency for the AWGN signal, and repeat the process.

J. In-Band Emissions (Mask Figure 5)

1. Connect the output of the antenna port to a spectrum analyzer or EMI receiver with appropriate attenuation to avoid damaging the instrumentation.
2. Set the reference level of the measuring equipment by procedure 4.1.5.2 of ANSI C63.10-2013.
3. Measure the 26 dB EBW using the test procedure 12.4.1 of ANSI C63.10-2013. (This will be used to determine the channel edge.)
4. Measure the power spectral density (which will be used for emissions mask reference) using the following procedure:
   a) Set the span to encompass the entire 26 dB EBW of the signal.
   b) Set RBW = same RBW used for 26 dB EBW measurement.
   c) Set VBW ≥ 3 X RBW
   d) Number of points in sweep ≥ [2 X span / RBW].
   e) Sweep time = auto.
   f) Detector = RMS (i.e., power averaging)
   g) Trace average at least 100 traces in power averaging (rms) mode.
   h) Use the peak search function on the instrument to find the spectrum's peak.
5. the channel bandwidth is defined as 26 dB EBW or 99% of the occupied bandwidth to develop the emission mask.
6. Using the measuring equipment limit line function, develop the emissions mask based on the following requirements. The emissions power spectral density must be reduced below the peak power spectral density (in dB) as follows:
   a) Suppressed by 20 dB at 1 MHz outside of the channel edge. (The channel edge is the 26-dB point on either side of the carrier center frequency).

b) Suppressed by 28 dB at one channel bandwidth from the channel center.

c) Suppressed by 40 dB at one- and one-half times the channel bandwidth from the channel center.

7. Adjust the span to encompass the entire mask as necessary.
8. Clear trace.
9. Trace average at least 100 traces in power averaging (rms) mode.
10. Adjust the reference level as necessary so that the channel's crest touches the top of the emission mask.

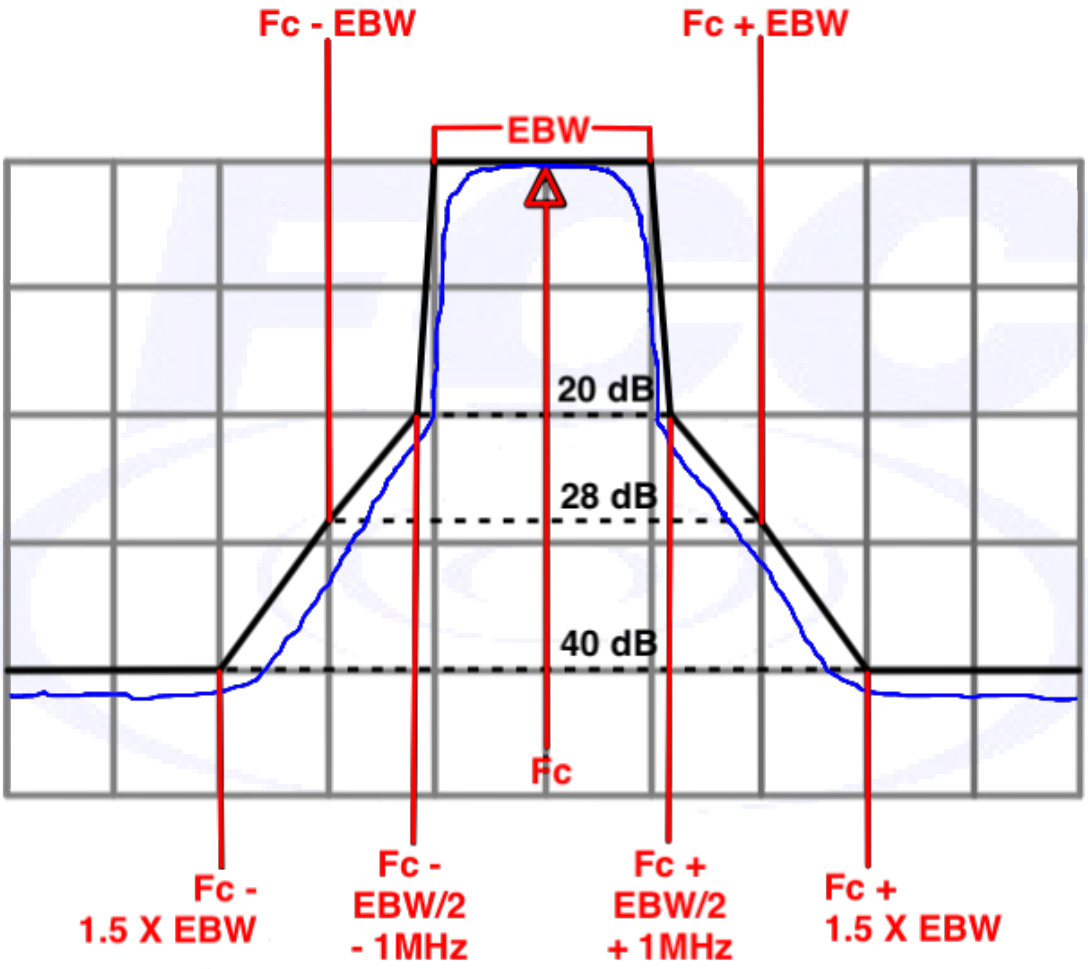

Figure 5. Generic Emission Mask

If a device utilizes channel puncturing, additional requirements shall be met.

1. Standard Power Devices:

   a. The device shall meet the FCC mask for the total nominal bandwidth regardless of whether the punctured channel portion is at the channel edge or internal to the channel. For example, suppose a 40-megahertz sub-channel is punctured from a 160-megahertz channel. In that case, this new configuration shall still meet the FCC mask based on a 160-megahertz nominal bandwidth, i.e., at the edges of the nominal channel. As defined here, nominal bandwidth refers to 20, 40, 80, 160 & 320 megahertz bandwidths. Test data shall be provided for each nominal bandwidth capable of puncturing with at least one configuration where the puncturing is at the outer edge of the nominal bandwidth and several configurations where the puncturing is internal to the nominal bandwidth (puncturing using 20*N subchannels, where N is an integer). The mask is constructed based on 26 dB bandwidth, and

   b. When deployed, the device must comply with all the AFC requirements; i.e., the power transmitted within the punctured region must be at or below the power that an AFC would permit for communicating across the punctured channels' bandwidth.

2. Low Power Indoor Devices: Channel puncturing is not permitted because, unlike standard power devices that receive channel/power information from the AFC, LPI devices have no mechanism for ascertaining the level of suppression needed in the punctured region to protect incumbent operations.

K. Dual Client Test, Demonstration of Proper Power Adjustment based on Associated AP

A client device may connect to a Standard Power AP with a maximum power level of 30 dBm EIRP or a Low Power indoor AP, but the power level is limited to a maximum of 24 dBm EIRP. If a client has the flexibility to connect to both APs, verification is needed to show that it can distinguish between the two configurations and then control the power levels accordingly.

TEST PROCEDURE:

1. Connect equipment as shown in Figure 6 below.
2. Adjust Atten 2 to Standard Power AP to facilitate error-free communication with the Client (Atten 1 should be set to High on the RF path to the Low Power AP).
3. Configure the Client and APs to associate and send data (stream data). The client must be configured to transmit at its highest power level. Initially, because the attenuation on Atten 1 is set high, the Client will only associate with the Std Power AP.
4. Verify transmission between the Client and the Standard Power AP. Additional attenuators may be required to protect measurement equipment. Measure the Client RF power using any of the methods in C63.10 for NII devices.
5. Gradually increase Atten 2 while decreasing Atten 1. This simulates the Client moving from outdoors to indoors. At some level of attenuation, the Client should associate with the Low-Power indoor AP. Verify transmission between the Client and the Low-Power AP.
6. Measure the RF power of the Client device using the same method as in step 4. Verify the power is no more than 24 dBm EIRP.

Note – measuring Client RF power reliably from a directional coupler measurement port may be tricky. Due to coupling, some energy from the AP will show up on the measurement port. Signal isolation techniques on the measurement analyzer will need to be used.

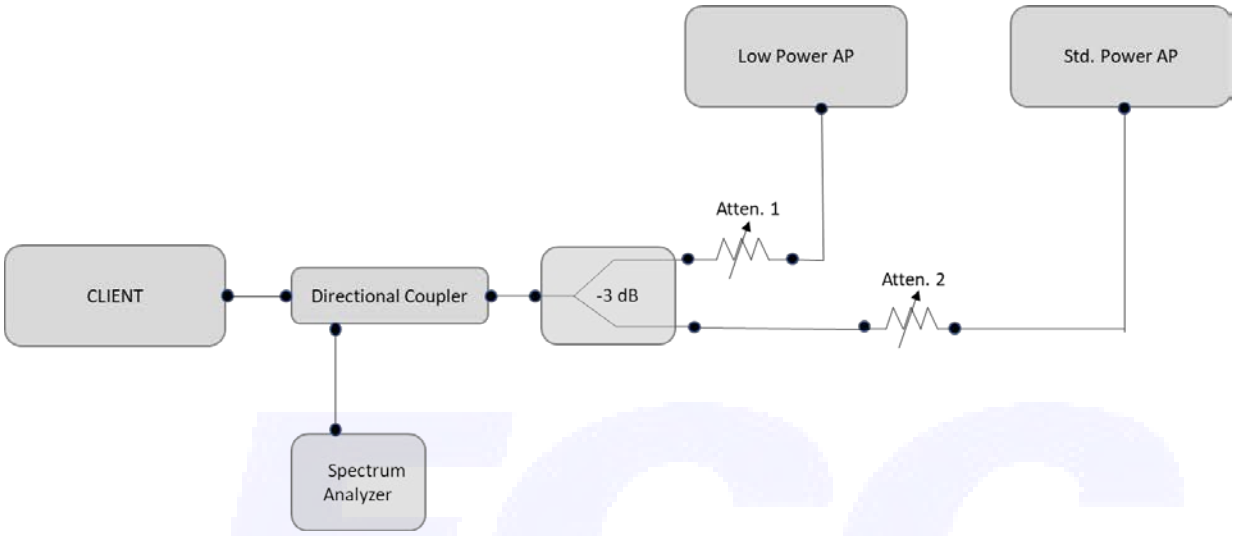

Figure 6. Test setup for conducted testing

L. Proper Power Adjustment, Client Devices Connected to a Standard Power Access Point

A client device that connects to a Standard Power AP must limit its power to a minimum of 6 dB lower than its associated Standard Power access point's authorized transmit power. The term "authorized" means the AFC-approved power level for the AP to use on a particular channel.

Test procedure to show that the client device can lower its power accordingly.

TEST PROCEDURE:

1. Connect equipment as shown in Figure 7 below.
2. In the figure, the Std Power AP can be configured using a developmental board, an Access Point incorporated with test software, or any other hardware configuration that adequately demonstrates proper client power adjustment.
3. Adjust Atten 1 to Std Power AP to facilitate error-free communication with the Client but protect the Client receiver from overload or damage.
4. Configure the Client and AP to associate and send data (stream data). The AP should be configured so its registered power is 36 dBm EIRP.
5. Verify transmission between the Client and the Standard Power AP. Additional attenuators may be required to protect measurement equipment. Measure the Client RF power using any of the methods in C63.10 for NII devices. Use this power and its antenna gain to calculate the Client EIRP.
6. The Client EIRP should be minimally 6 dB lower than the APs.
7. Repeat Steps 2 through 5 at two other selected measurement points—the first at the midpoint and the second at the client's lowest rated power, as declared by the manufacturer.

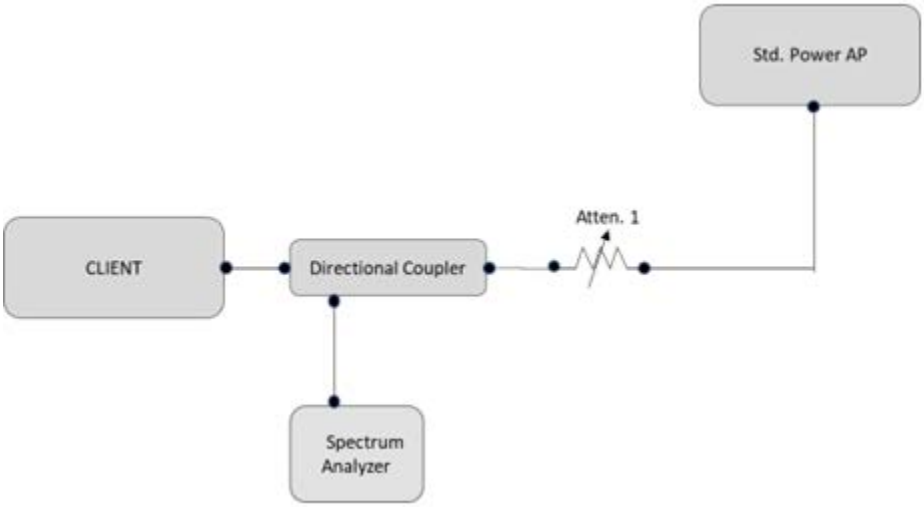

Figure 7. Test setup for conducted testing

M. Transmit Power Control, Very Low Power Devices

Very low-power devices operating in the 5.925–6.425 and 6.525-6.875 GHz bands shall employ a TPC mechanism. A very low-power device must operate at least 6 dB below the maximum EIRP PSD value of -5 dBm/MHz.

This requirement shall be demonstrated both through attestation and testing.

Attestation Requirements:

1. An attestation from the manufacturer will declare that their device meets the requirements of § 15.407 (d)(10).
2. The attestation shall also declare that the TPC mechanism of the device is not user-configurable.
3. In addition, the attestation will describe in detail how the TPC is implemented, including but not limited to how the TPC mechanism is triggered (for example, environment, performance, and air interface). This information may be kept confidential if necessary to protect trade secrets.

Testing Requirements:

1. The EMC test report will demonstrate TPC performance through testing.
2. The test method and test setup shall be described in detail.

Change Notice:
02/04/2021: 987594 D02 U-NII 6GHz EMC Measurement v01r01 replaces 987594 D02 U-NII 6GHz EMC Measurement v01. Changes to the document include the following:

- Added additional qualifiers to the statement “unlicensed low power indoor devices must vacate the channel (in which incumbent signal is transmitted) and stay off the incumbent channel as long as detected radio frequency power is equal to or greater than the threshold (-62 dBm).” to clarify the unlicensed low power indoor devices must vacate only the channel that is occupied by the incumbent signal.
- I added footnote one on page 4 to emphasize that unlicensed low-power indoor devices must always use contention-based protocol and transmit on every channel they intend to use, including the same channel(s) previously used after any continuous transmission ends.

08/7/2023: 987594 D02 U-NII 6 GHz EMC Measurement v02 replaces 987594 D02 U-NII 6 GHz EMC Measurement v01r01. Phase 2 restriction removed.

08/9/2023: 987594 D02 U-NII 6 GHz EMC Measurement v02r01 replaces 987594 D02 U-NII 6 GHz EMC Measurement v02. Phase 2 restriction was removed, and section II was clarified. MEASUREMENT PROCEDURES section L. From “a Standard Power AP must limit its power to no more than 6 dB below its associated Standard Power access point's authorized transmit power” to “ a Standard Power AP must limit its power to a minimum of 6 dB lower than its associated Standard Power access point's authorized transmit power” and clarified TEST PROCEDURE: step 6 from “one at the midpoint and the second at the lower end of the operating power range of the client” to “ the first at the midpoint and the second at the lowest rated power of the client as declared by the manufacturer.”

XX/NN/2024: 87594 D02 U-NII 6 GHz EMC Measurement v03 replaces 87594 D02 U-NII 6 GHz EMC Measurement v02r01. v03 updates 987594 to add new unlicensed rules under FCC 23-86 effective 03/08/2024 by permitting meager power (VLP) devices under equipment class 6VL in the U–NII–5 (5.925–6.425 MHz) and U–NII–7 (6.525–6.875 MHz) portions of the 6 GHz band.

Attachment 987594 D03 U-NII 6 GHz QA v03

Federal Communications Commission
Office of Engineering and Technology
Laboratory Division

Month XX, 2024

Part 15 Subpart E U-NII 6 GHz
Questions and Answers

Q1. What are the different types of devices that can be certified for 6 GHz U-NII use?

A1. Allowed device types are as follows:

i. **Standard Power Access Point**—These devices can be installed indoors or outdoors, and an AFC database can be utilized to determine available channels and power levels. The access point must limit its EIRP to 21 dBm above 30-degree antenna elevation angles if installed outside.

ii. **The client is connected to Standard Power Access Point.** These devices can be used indoors or outdoors. They must maintain an EIRP level at least 6 dB below that of the associated AP.

iii. **Fixed Client Device** – Indoor/Outdoor client device that connects to a Standard Power Access point and is installed in a fixed location. These devices shall have the exact certification requirements as Standard Power Access Points (AFC required, power levels, etc.).

iv. **Low-Power indoor Access Point**—This type is limited to indoor use. It must not have a weatherized enclosure, be powered from a wired connection, run on batteries, or have an integrated antenna. A contention-based protocol is required to protect incumbent users.

v. **Clients connected to low-power indoor Access Points—clients that connect to low-power** indoor Access Points and use a contention-based protocol.

vi. **Subordinate Device**—a device such as an indoor extender that is under the control of a low-power indoor Access Point, is supplied power from a wired connection, has an integral antenna, does not have a weatherized enclosure, and is not used to connect devices between separate buildings and structures. It must use a contention-based protocol. Power limits are the same as those of a low-power indoor access point.

vii. **Dual Client:** These client devices can connect to Standard Power APs and low-power indoor APs.

viii. **Very Low Power—**Indoor/Outdoor devices that do not need to be controlled by an access point or an AFC.

Q2. Can these devices be certified for vehicular use?

A2. Except for VLP, these devices cannot be used on cars, trains, boats, or aircraft. Low-power indoor and associated client devices can operate on large aircraft above 10,000 feet.

Q3. Is modular approval allowed for these devices?

A3. Yes, except for Subordinate devices.

Q4. How is linear interpolation interpreted when constructing the mask?

A4. The rules specify PSD suppression values in dB (logarithmic scale). When linearly interpolating, the dB values must first be converted to a linear scale. After interpolating in linear terms, the PSD values should be converted back into dB.

Q5. Is Transmit Power Control (TPC) required for client devices?

A5. TPC is required for all client devices connected to Standard Power Access Points, excluding Fixed Client devices. The TPC mechanism shall limit client power to 6 dB below its associated Standard Power APs authorized transmit power level. TPC is not required for client devices connected to Low-Power indoor Access Points and Subordinate devices. TPC is also required for VLP.

Q6. Can a Client device be certified for outdoor and indoor use?

A6. Yes. A Dual Client device may work with a Standard and low-power indoor AP. In this case, the client shall meet all the requirements for an Outdoor Client and an Indoor Client. Additionally, testing must show that the client properly adjusts its power when transitioning from Outdoor to Indoor.

Q7. Can a Client device directly connect to another Client device?

A7. Direct Client-to-client communication is prohibited except for VLP devices.

Q8. Can new 6 GHz bands be added to an existing U-NII grant under the same FCC ID?

A8. Yes. If hardware or enclosure changes have not been made, a new original equipment application can be filed under the same FCC ID. Suppose the granted application is not already a composite. In that case, the TCB shall send an inquiry to the FCC to request that the FCC place the application in audit mode, thereby allowing the TCB to modify the existing grant to identify the device as a composite.

Q9. If a device operates in U-NII bands 5, 6, 7, and 8, does the test lab need to test at least three channels (L, M, & H) in each sub-band of operation?

A9. Yes. LMH in band 5, LMH in band 6, and so forth. An exception exists for the contention-based protocol test, where only one channel in each supported sub-band needs to be tested. The narrowest and widest bandwidths in each channel shall be measured.

Q10. If a device only operates in one sub-band (for example, U-NII-6), does OOBE need to be shown in other sub-bands (for example, U-NII-5&7)?

A10. No. Compliance with OOBE limits only applies outside the 5.925 – 7.125 GHz band. All in-band emissions need to meet the channel mask.

Q11. How are operating channels listed on an equipment authorization grant?

A11. The frequency range for Form 731 listed on the grant shall be the contiguous frequency span of operation as authorized for that equipment class from the channel center frequency of the lowest to the highest frequency. 99% of the occupied bandwidth must be contained within all the U-NII subbands authorized for that equipment class.

For example:

- A device such as a low-power indoor access point operating in all 6 GHz U-NII bands (5-8) would list the frequency range for all channels of operation as one-line entry across all 6 GHz U-NII bands (5-8). Channels spanning within U-NII subbands (i.e., 5 & 6, 6 & 7, 7 & 8) are not required to be separately listed on Form 731. 99% of the occupied bandwidth of any channel must be contained within U-NII bands (5-8).

- A device such as a standard power access point operating in U-NII bands (5 & 7) would list the frequency range for each contiguous frequency span of operation in U-NII sub-band five and U-NII sub-band seven separately. In no case are channels permitted to span across U-NII bands that they are not authorized in (i.e., across 5 & 6, 6 & 7, and 7 & 8). 99% of the occupied bandwidth of any channel must be contained within each of its respective U-NII subbands (e.g., 5) separately.

Q12. How does one determine if an enclosure is not weatherized?

A12. There are many factors in determining if an indoor device meets the requirement of not having a weatherized enclosure. If the enclosure has openings to vent heat, it is not weatherized. The IP rating of a device could potentially be used. For example, if a device has been certified for IP 65 (Ingress Protection Code, IEC standard 60529), there is a good chance that the device can be used outdoors. However, test labs and TCBs shall review the user manual and other documentation to verify that the device cannot be used outdoors and that the intent of the requirement is met.

Q13. Can the smallest 26 dB bandwidth be used for all channels with the same nominal bandwidth when performing the mask measurement?

A13. Yes. For a 20 MHz nominal bandwidth, the smallest measured 26 dB bandwidth may be used for all 20 MHz channels. As a practical matter, the nominal bandwidth may also be used, provided it can be shown that the 26 dB bandwidth is always > the nominal bandwidth.

Q14. Is the 6 dB reduction required on the PSD and the conducted power for a client device connected to a standard power access point?

A14. Yes.

Q15. During contention-based protocol testing, once the EUT has detected an AWGN signal and ceased transmission, is it allowed to send intermittent control signals?

A15. No. Signals of any kind are allowed to be sent.

Q16. What data is required to be submitted for contention-based protocol testing?

A16. In addition to showing that the device stops transmitting at the required threshold, we would also like to see the AWGN signal levels at which the device starts transmitting again. What is the lowest AWGN signal level the EUT detects and determines the medium is busy?

Q17. Can the Standard power equipment class be added to the existing LPI AP?

A17. A 6ID device may add 6SD by submitting a new application with the same FCC ID. However, this device cannot be used outdoors because of the form factor restrictions. A new ID is required when the device is installed outdoors with a new weatherized enclosure.

Q18. Can 99% bandwidth be used to show compliance with the 320 MHz maximum bandwidth requirement?

A18. Yes. The test report must show the 99% and 26 dB bandwidth for all bandwidths used by the device.

Change notice:
08/07/2023: 987594 D03 U-NII 6 GHz QA v02 replaces 987594 D03 U-NII 6 GHz QA v01. Phase 2 restriction removed.

XX/NN/2024: 987594 D03 U-NII 6 GHz QA v03 replaces 987594 D03 U-NII 6 GHz QA v02. v03 updates 987594 to add new unlicensed rules under FCC 23-86, effective 03/08/2024, by permitting very low-power (VLP) devices under equipment class 6VL in the U–NII–5 (5.925–6.425 MHz) and U–NII–7 (6.525–6.875 MHz) portions of the 6 GHz band.

Attachment 987594 D04 UN6GHZ Pre-Approval Guidance Checklist v03

Federal Communications Commission
Office of Engineering and Technology
Laboratory Division

Month XX, 2022

UN6GHZ PRE-APPROVAL GUIDANCE CHECKLIST

UN6GHZ

This publication attachment provides a guide to submitting a Pre-Approval Guidance (PAG) for item UN6GHZ when required by publication 388624 D02 Pre-Approval Guidance List.

U-NII devices authorized in U-NII Bands 5.925-7.125 GHz under the guidance of KDB Publication 987594, except when related to a C2PC in U-NII bands 5.925-7.125 GHz for an already certified module addressing RF exposure conditions for a specific host(s).

Checklist for PAG Review

1. Antennas

1.1 The filing must include information about all the antennas, i.e., type, gain, and relative positions within the host.

1.2 Show how the (aggregate, if applicable) antenna gain was computed/measured (as in TCB Workshop Presentation Aggregate Antenna Gain Review, April 2021). Provide equation(s) used to calculate Directional Gain and provide an example of how the DG was calculated with the antenna gain of individual antennas. Provide details (references or attached documents) on how the individual antenna gains were derived, i.e., declared by the host manufacturer, based on the datasheet, or measured. Since the CBP needs to detect a small signal, the worst-case scenario to consider is when the receiver has the lowest antenna gain.

1.3 For the conducted test in MIMO cases, show that the testing was done for the path with the lowest antenna gain.

2. Contention Based Protocol (CBP)

2.1 CBP testing shall be performed on one channel in each sub-band of operation for both the narrowest and widest bandwidths.

2.2 Use three separate 10 MHz AWGN signals when testing a 160 MHz channel. The simulated incumbent signal must be a 10 MHz wide AWGN signal.

2.3 Report the lowest AWGN signal detectable by EUT.

2.4 Verify that the testing was performed with the AWGN signal set to the lowest level (for example, -100 dBm) and increased until the EUT detects and stops transmitting.

For example, a table like the following (or similar) shall be reported:

UNII Band	…	…	…
Channel Number	…	…	…
Bandwidth (MHz)	…	…	…
EUT Frequency (MHz)	…	…	…
AWGN Frequency (MHz)	…	…	…
AWGN Power (dBm)	-65.5	-70.4	-80.0
Antenna Gain (dB)	3	3	3
Path Loss (dB)	0.2	0.2	0.2
Adjusted Power (dBm)	-68.3	-73.2	-82.8
Detection Limit (dBm)	-62	-62	-62
EUT Tx Status[1]	OFF	Minimal	ON

[1] The AWGN level is reported for the following conditions:
- OFF = AWGN level at which no transmission is detected, consistently for a minimum period of 10 seconds
- Minimal: AWGN level at which the system begins to trigger the transmission switch-off, albeit not being kept off consistently
- ON = AWGN level at which no impact on the transmission is detected, consistently for a minimum period of 10 seconds

2.5 If measurements are conducted, the detection threshold must be corrected to refer to a 0 dBi gain antenna and include all the applicable losses (cables, etc.). For instance, the report should show (at least):

Detection Level = Injected AWGN Power (dBm) – Antenna Gain (dBi) + Path Loss (dB)

2.6 Include plots showing EUT has stopped transmitting after detection of AWGN signal.

2.7 Describe whether channel puncturing and bandwidth reduction mechanisms are supported. The report needs to include a plot as an example for at least one of the AWGN signals used.

2.8 If radiated testing is used, show that spot checks were done to identify which side of the EUT has the lowest sensitivity to the incumbent signal detection, and that side was indeed chosen for the test.

3. Client Device Limitations

3.1 The client device (per the definition in 47 CFR § 15.202) is limited to indoor locations and does not connect directly to the Internet or other clients.

3.2 Requires attestation (as a Form 731 exhibit) stating that the device can only operate under the control of a low-power indoor access point and subordinate.

3.3 No vehicular use, except large aircraft above 10000 ft.

3.4 Transmit Power Control (TPC) is required for client devices connected to Standard Power Access Points, excluding Fixed Client devices.

3.5 Show/justify enclosure is not weatherized for Subordinate and APs.

4. Emission Mask

4.1 Power spectral density suppression complies with 47 CFR § 15.407(b)(6).

4.2 If EUT supports OFDMA, discuss testing of partial Resource Unit (RU) configurations. In any case, the mask's shape shall be based on the full RU.

4.3 OOBE limits only apply outside of the 5.925-7.125 GHz band. All in-band emissions need to meet the channel mask. If a higher RBW for the in-band Emissions Mask is used (i.e., a more conservative case), that should be noted.

5. Filing

Fundamental signal: 99% of the occupied bandwidth must be contained within all the U-NII sub-bands authorized for that equipment class

6. Hearing Aid Compatibility (HAC)

6.1 Confirm that VoLTE cannot be transported over 5G NR sub 6 GHz. If so, it must be stated in the OTT declaration of pre-installation of OTT voice service and test report.

6.2 Manufacture must provide an attestation (cover letter) confirming that the results using ABM1 values obtained from VoLTE connections over LTE bands and ABM2 values for 5G NR sub 6 GHz connections over the same bands provide a reasonable representation of the HAC rating over the 5G NR sub 6 GHz connections.

7. Labelling

7.1 Label showing indoor only for Subordinate and APs.

7.2 E-labelling may be acceptable if proper justification is provided.

8. Modular Certifications (when applicable)

8.1 Modular approval letter to be uploaded with the application.

8.2 No subordinate devices can be modules.

8.3 Show notification for the host manufacturer about referencing KDB Publication 996369 D04 Module Integration Guide

9. RF Exposure

9.1 Demonstrate applicable classification (portable/mobile/fixed) about worst-case scenario use cases

9.2 Address $f > 6$ GHz RF exposure via most recent applicable KDB or TCB Workshop procedures

9.3 Address all applicable simultaneous transmission conditions using the compliance condition $TER \leq 1$, where TER (total exposure ratio) in this context is defined as:

$$TER = \sum_{k=1}^{N_S} \left(\frac{SAR_k}{SAR_{\text{lim}}} \right) + \sum_{k=1}^{N_f} \left(\frac{MPE_{field,\,k}}{MPE_{field,\,\text{lim}}} \right)^2 + \sum_{k=1}^{N_{PD}} \left(\frac{MPE_{PD,\,k}}{MPE_{PD,\,\text{lim}}} \right)$$

NS, Nf, and NPD refer to sources requiring SAR, field-MPE, or PD-MPE, respectively; k refers to measured or estimated values for the source k, and “lim” refers to the corresponding applicable compliance limit. Simultaneous transmit evaluations and test exemption analyses may use SPLSR per KDB Publication 447498.

10. Security

Providing a specific exhibit with a device security description is required (complying with 47 CFR § 15.407(i))

11. Spurious Emissions

Show that measurements are made at the prescribed antenna heights, per KDB Publication 987594 D01, including measurements along all three axes, as per ANSI C63.10

12. Standard Power Access Points and Fixed Client

Provide Geolocation General Description document and Geolocation Justification Report. Additionally, if applicable, provide Geolocation Accuracy After a Power Cycle description.

13. AFC DUT Test Harness Report

An appendix includes a separate test report showing EUT meets the AFC testing requirements, including the Tool Report provided from the AFC DUT test harness and the applicable DUT spectrum inquiry request/response logs.

14. Operating Modes

List all modes of operation, such as:

1. Is channel puncturing supported?
2. If indoor AP is a composite of LPI and St. power, does it support dividing a single channel between the LPI client and Standard client? And if so, is power boosting supported?
3. Are Partial RU configurations supported?

15. Transmit Power Control (TPC) for VLP

16. Channel Prioritization above 6105 MHz for VLP

Change Note:
08/07/2023: 987594 D04 UN6GHZ Pre-Approval Guidance Checklist v02 replaces 987594 D04 UN6GHZ Pre-Approval Guidance Checklist v01. Phase 2 questions 12-14 added.
03/22/2024: Added VLP

XX/NN/2024: 987594 D04 UN6GHZ Pre-Approval Guidance Checklist v03 replaces 987594 D04 UN6GHZ Pre-Approval Guidance Checklist v02. v03 updates 987594 to add new unlicensed rules under FCC 23-86, effective 03/08/2024, by permitting very low-power (VLP) devices under equipment class 6VL in the U–NII–5 (5.925–6.425 MHz) and U–NII–7 (6.525–6.875 MHz) portions of the 6 GHz band.