

# FCC Integration Manual — VAH\_100

FCC ID: KKVW4M-VAH100

## Revision History

| Revision   | Description of Changes                       |
|------------|----------------------------------------------|
| 2025-05-14 | Initial Draft                                |
| 2026-01-28 | Missing details were completed               |
| 2026-02-05 | Correction, product description, warning 15B |
| 2026-03-02 | Product description extension                |

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## Scope

This manual provides FCC-required integration instructions for the modular transmitter VAH\_100 (FCC ID:KKVW4M-VAH100). It is intended for host manufacturers/integrators to ensure continued compliance when integrating the module into a host product. The module operates exclusively in the 5 GHz band (5150–5850 MHz) as authorized for this device. U-NII-1 is restricted to indoor-only use.

## Product Description

The VAH\_100 is a 5 GHz wireless LAN module operating in the U-NII bands from 5150 MHz to 5850 MHz, as tested under FCC ID:KKVW4M-VAH100. The module supports IEEE 802.11a and 802.11n operation using a single transmit/receive chain with 20 MHz and 40 MHz channel bandwidths, as documented in the FCC Part 15.407 test report.

Operation in the U-NII-2A and U-NII-2C bands includes Dynamic Frequency Selection (DFS), and compliance with DFS requirements—Channel Availability Check, In-Service Monitoring, Channel Move Time, and Non-Occupancy Period—was verified in the FCC DFS test report.

The module is approved for mobile exposure conditions and must be installed to ensure a minimum separation distance of 20 cm between the antenna and the user, as demonstrated in the RF exposure evaluation.

## List of Applicable FCC Rules Compliance Basis

This module was evaluated for compliance with the following FCC rules:

| FCC Rule                 | Title                                           |
|--------------------------|-------------------------------------------------|
| <b>47 CFR §15.203</b>    | Antenna requirement                             |
| <b>47 CFR §15.205</b>    | Restricted bands of operation                   |
| <b>47 CFR §15.209</b>    | Radiated emission limits; general requirements. |
| <b>47 CFR §15.407</b>    | U-NII intentional radiators                     |
| <b>47 CFR §15.407(h)</b> | DFS requirements (Master devices)               |
| <b>47 CFR §2.1091</b>    | RF exposure (mobile devices)                    |

Certification was based on the following test reports:

- RF Test Report / MPE Evaluation: 2502T30221E-RF-00A
- DFS Test Report: 2502T30221E-RF-00B
- EMC / Part 15B Report: 2502T30221E-RF-00C

### Device Identity and Intended Use

| Parameter               | Description                                                      |
|-------------------------|------------------------------------------------------------------|
| Product Name            | VAH_100                                                          |
| Model Number            | 10033191                                                         |
| FCC ID                  | KKVW4M-VAH100                                                    |
| Device Type             | 5 GHz U-NII WLAN Access Point (Master)                           |
| Intended Use            | Integration into host systems requiring 5 GHz Wi-Fi connectivity |
| Exposure Category       | Mobile device, min. 20 cm separation                             |
| Indoor-Only Restriction | U-NII-1 operation (5150–5250 MHz) indoor-only                    |

### Radio Technologies & Operating Bands

#### Modulation and Standards

| Feature              | Details                          |
|----------------------|----------------------------------|
| WLAN Standards       | IEEE 802.11a/n                   |
| Modulation Types     | OFDM: BPSK, QPSK, 16-QAM, 64-QAM |
| Supported Bandwidths | 20 MHz (HT20), 40 MHz (HT40)     |

#### Supported Frequency Bands

| UNII Band   | Frequency Range | Channel Set | Notes                           |
|-------------|-----------------|-------------|---------------------------------|
| U-NII-1     | 5150–5250 MHz   | 36-48       | Indoor-only; DFS Not applicable |
| U-NII-2A    | 5250–5350 MHz   | 52-64       | DFS required                    |
| U-NII-2C/2e | 5470–5725 MHz   | 100-144     | DFS required                    |
| U-NII-3     | 5725–5850 MHz   | 149-165     | DFS not applicable              |

A complete list of center frequencies and HT20/HT40 channels is provided in RF report 2502T30221E-RF-00A, Section 3.1.

### Antenna System

| Parameter            | Value                                                                              |
|----------------------|------------------------------------------------------------------------------------|
| Antenna Type         | Dipole                                                                             |
| Antenna Gain         | 4.7 dBi (all 5 GHz bands)                                                          |
| Impedance            | 50 $\Omega$                                                                        |
| Attachment           | Unique coupling, compliant with §15.203, see <i>Antenna Compliance</i> for details |
| Modification Allowed | No changes to type/gain/cables/adaptor types permitted                             |

### Power and Physical Integration

| Parameter               | Description                                                        |
|-------------------------|--------------------------------------------------------------------|
| Supply Voltage          | 3.3 V DC (host regulated)                                          |
| Physical Interface      | M.2 Key A+E slot                                                   |
| Mechanical Requirements | Follow standard M.2 integration guidelines and thermal constraints |

## Module Identification

|                            |                                                                  |
|----------------------------|------------------------------------------------------------------|
| <b>Model</b>               | <b>VAH_100</b>                                                   |
| <b>FCC ID</b>              | KKVW4M-VAH100                                                    |
| <b>Chipset</b>             | Atheros AR9382                                                   |
| <b>Radio configuration</b> | Single transmit/receive chain                                    |
| <b>Bands present</b>       | 5 GHz U-NII bands (5150–5850 MHz) as authorized on the FCC grant |

## Modular Approval Basis

This transmitter is approved under the modular rules of 47 CFR §15.212. Integration must follow all instructions herein; any deviation may require a permissive change or a new authorization.

## Installation Restrictions

- Band limitation: Operate only within the authorized 5 GHz U-NII bands (per the FCC grant for this device). Operation outside the granted bands is not permitted.
- Software configuration: All functions required by §15.407 (e.g., DFS where applicable) shall remain enabled and unmodified. Region settings and channel availability must not be user-modifiable.
- Co-location: This module was certified stand-alone; simultaneous transmission with other radios was not evaluated. Host manufacturers must follow FCC KDB 996369 D04 procedures for simultaneous transmission evaluation.
- Mechanical: Install the module in the M.2 Key A+E slot according to standard M.2 integration practices.
- No external/user-accessible RF connectors (e.g., QMA, U.FL, etc.) are permitted; the as-shipped RF chain must remain inaccessible to end-users.

## Electrical & Power Supply Requirements

Supply: 3.3 V nominal (host-regulated). The host shall ensure stable operation of the module according to its hardware specifications.

## Conditions for Maintaining Modular Approval

- Do not change antenna type/model/gain, adapters, or RF cabling from the certified configuration.
- Do not modify the RF chain (amplifiers, filters, matching).
- Do not alter authorized bands/channels/power/DFS /region controls via firmware, drivers, or tools.
- No co-location with other transmitters unless evaluated and authorized.
- Any change affecting RF characteristics requires a Class II Permissive Change or a new certification before marketing.

## Antenna Compliance

This FCC ID complies via the §15.203 “unique coupling” option and §15.212(a)(1)(iv):  
The antenna system uses a unique coupler at all connections between module and antenna.

The antenna and all intermediate RF cable/adaptor assemblies are part of the certified configuration and must not be altered, removed, or substituted. Any change affecting antenna type, gain, or the RF connector/cable/adaptor chain requires a Class II Permissive Change or a new FCC authorization before marketing.

## RF Exposure / Separation Distance (Integrator Instructions)

This transmitter has been evaluated for mobile exposure and complies with MPE. Integrators shall ensure the antenna is installed  $\geq 20$  cm from users during normal operation. For portable configurations ( $< 20$  cm), a separate SAR evaluation and FCC authorization are required before marketing.

## Authorized Frequency Range

Operation is limited to 5150–5350 / 5470–5725 / 5725–5850 MHz as authorized on the FCC grant. Do not enable channels outside the certified set or alter bandwidth/channelization beyond the authorized configuration.

## U-NII Operational Requirements

Operation shall comply with 47 CFR § 15.407 band-specific rules. U-NII-1 (5150–5250 MHz) operation is restricted to indoor use only. U-NII-2A (5250–5350 MHz) and U-NII-2C (5470–5725 MHz) require DFS; these functions must remain enabled and unmodified. U-NII-3 (5725–5850 MHz) must meet the applicable edge and OOB limits.

## DFS Requirements — Integration Notes

The host must not constrain traffic timing or radio control in a manner that impairs radar detection or channel move/closing behavior. Do not bypass CAC, In-Service Monitoring, Channel Move/Closing, or the Non-Occupancy period. These behaviors were verified during certification for 20 MHz and 40 MHz modes in U-NII-2A/2C.

DFS functionality must remain under full control of the module’s firmware and may not be bypassed or influenced by host software.

## **Software / Firmware Controls**

Do not modify software/firmware in any way that changes authorized RF parameters (bands, channels, bandwidths, output power, DFS, or region controls). End users and third parties must not be able to alter RF parameters.

## **Host Labeling Requirements**

If the module's FCC ID is not visible after integration, the host must display: "Contains FCC ID: KKVW4M-VAH100". The label must be readily visible (physical or e-label per KDB 784748).

## **End-User Manual Statements**

The host manufacturer must include the following statement in the final product's user manual:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

## **§15.21 Warning Requirement**

The host manufacturer must include the following FCC §15.21 warning in the end-user documentation:

"Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment."

## Host Product Compliance (Part 15B)

The host manufacturer remains responsible for compliance with any other applicable FCC rules not covered by the module grant, including Part 15 Subpart B for unintentional radiators. Verify conducted and radiated emissions of the final product with the integrated module.

The host manufacturer must include in the end-user documentation:

### **FCC Part 15B Class B – Interference Statement (Required)**

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help

## Test Modes

If engineering test modes are used for integration verification, they must be restricted to authorized personnel and not accessible to end users.