VMAKERPROUWB Environment Sensor – User manual

Covers models: VMPRO19CB4

Revision 1.1

Nov 2020

TABLE OF CONTENTS

1 Introduction

The VMAKERPROUWB module builds upon and expands the technology of vMaker line of products (FCC ID: 2AHIS-VMAKER), to utilize a broader set of antenna models, support an optional enhanced signaling technique.

The VMKAERPROUWB UWB module is used characterize the environment in the vicinity of the sensor by collecting and analyzing propagation information between the antennas, which is affected by the environment. The information is gathered by sequentially transmitting from the available antennas and collecting the received information at the rest of the antennas. The response information is then processed at the hosting device to obtain spatial information about the environment.

The acquisition is controlled by the hosting device. The hosting device may ask VMAKERPROUWB to acquire multiple snapshots, so as to integrate the data into information about larger spatial extent, or to detect changes in the environment.

2 Features

Three-dimensional radio-frequency based sensor, based on VYYR7201-B4 System-on-Chip for signal generation and recording. A MIMO array of slot embedded antennas is used to obtain high-resolution image.

The device is operated by a stand-alone host (PC, Smartphone, or other proprietary host), through a USB-2 interface or optional WiFi/BLE interface. The power is supplied either by the USB interface, a battery or by an external power supply.

2.1   VMAKERPROUWB model

See the table below for details on the model.

Capability \ Model	VMPRO19CB4
Number of antennas	19
Board size	71mm * 140 mm
External powering option	No
Antenna Type	Slot Embedded
Frequency ranges	6 -8.5GHz
Power supply	USB, 4.5-5.5V

Figure 1: VMAKERPROUWB module utilizing USB interface for communication with hosting device

2.2 Regulatory domains

VMAKERPROUWB models have been manufactured in accordance with the regulatory domains in which they are to be operated. Currently, single model is designed to support FCC (for operation in the US), ISED (for operation in the Canada), and CE (for operation in EU and other countries using CE certification). If in doubt, consult your local experts before ordering.

The VMPRO19CB4 model is restricted to 6 -8.5GHz band, supporting FCC, ISED, and CE permitted frequency bands.

3 Technology

The VMAKERPROUWB product are multi-antenna sensors that characterize the environment in the vicinity of the sensor. It is done by collecting and analyzing propagation information between the antennas, which is affected by the environment. The propagation response information is collected by VMAKERPROUWB and processed at the hosting device to obtain spatial information about the environment.
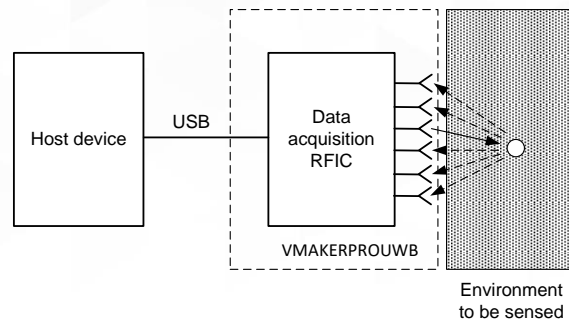
3.1 Block Diagram

The following figure presents a high-level block diagram of the VMAKERPROUWB platform.
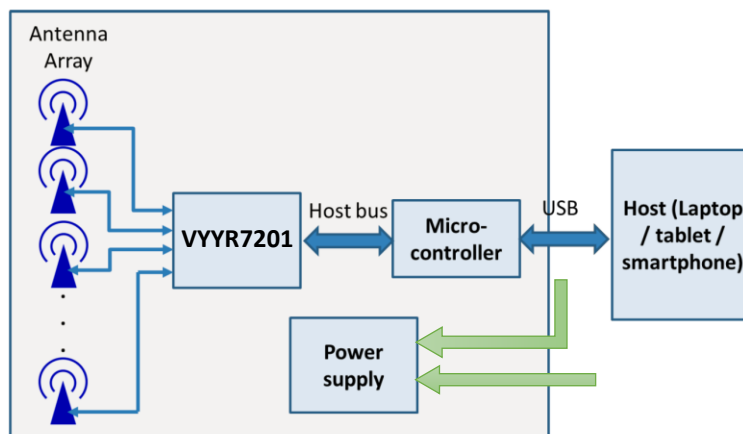
4 Interfaces

The module main interface is USB for communication configuration.

4.1 USB Interface and Powering Options

The board's main interfaces are USB 2.0 in high-speed mode (480Mbit) and power supply. Both can be provided by an onboard USB type-C connector.

Connector and powering options:

Capability \ Model	VMPRO19CB4
Connector types	USB type-C
Power Supply Connector	USB type-C
Voltage supply	5V +/-10%
Power Consumption	0.4-0.9A

5 Software Installation

VMAKERPROUWB is to be operated with dedicated SW per model, project, final product and the specific platform and OS (Windows, Android etc). The relevant SW and instructions will be given per device and project, separately from this manual.

General SW high-levels:
- The software contains a driver through which the application software communicates with VMAKERPROUWB device.
- The driver translates the commands into VMAKERPROUWB's actions.
- Moreover, the driver is in charge of enforcing certain regulatory restrictions.
- The user is required to communicate with the VMAKERPROUWB device only through the driver using the provided API.

6 Mechanical placement

The VMAKERPROUWB are provided as bare boards or with an optional mechanical housing and case. The mounting instructions shall be provided per specific product or module. In the case that a proprietary case is used, make sure that the front cover is nonmetallic (e.g. plastic) and preferably thin (not exceeding 2 mm).

7 Regulatory Information

7.1 Regulatory Conformance

The VMAKERPROUWB device has been designed to be in compliance with the FCC regulations governing UWB hand-held systems (Part 15.519) also known as "battery powered devices" or "mobile devices." This means that the device can be incorporated in a wide variety of products including educational robots, pipe locators, breathing monitors, etc. Note that there are other applications which are specifically forbidden, such as use of the devices in toys. See FCC Parts 15.519 and 15.521 for more details.

Certain models of the VMAKERPROUWB device have been designed and tested to be in compliance with CE requirements, and in particular to conform to ETSI standards EN 302 065-1, EN 301 489-33 and EN 301 489-1. In particular, the CE compliant devices are restricted to operation in the 6-8.5 GHz band. **Make sure that if you use the device outside US, that you order the appropriate model number.**

7.2 FCC regulatory statements

7.2.1 FCC Interference Statement (Part 15.105 (b))

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 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.

Cessation of operation is required until interference is resolved.

7.2.2 FCC Part 15 Clause 15.21

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

7.2.3 FCC Part 15.19(a) [interference compliance statement]

"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."

7.2.4 ISED RSS-Gen Notice

"This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

This device may not cause interference.

This device must accept any interference, including interference that may cause undesired operation of the device."

"L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

L'appareil ne doit pas produire de brouillage;

L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement."

7.2.5 ISED Canada ICES-003 Compliance Label (CAN BE PROVIDED ON LABEL OR in MANUAL):

"CAN ICES-3 (B)/NMB-3(B)"

7.3 Labels

In general the module will be operated by hosting device that will show the FCC ID and IC in the app. If for some reason e-label will not be used, the module will have a printed sticker or a silk screen printed FCC ID label on it, and the manual shall advise the users to affix a label saying "Contains FCC ID: 2AHIS-VMAKERPROUWB" if the VMAKERPROUWB is installed so that the on-board label is not visible.

7.3.1 FCC

FCC ID: 2AHIS-VMAKERPROUWB

7.3.2 IC regulatory Labeling

IC: 21498-VMAKERPROUWB

Figure 2: Per device, the FCC ID will either be e-labeled read by the hosting device or as a sticker as shown, or specified in the user-manual

For location, see section 7.3.1.

7.4 Instructions for the Integrator

The OEM integrator is responsible for ensuring that the end-user has no manual instruction to remove or install module.

OEM Integrators Notices

This device is intended only for OEM integrators under the following conditions:

The transmitter module may not be co-located with any other transmitter or antenna. As long as this condition above is met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

IMPORTANT NOTE: In the event that this condition cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC/ISED authorization is no longer considered valid and the FCC ID/IC number cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC/ISED authorization.

End Product Labeling

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the users manual of the end product which integrates this module. Visible area with the following: "Contains IC:21498-VMAKERPROUWB".

OEM Manual Information That Must be Included

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the users manual of the end product which integrate this module.

The users manual for OEM integrators must include the following information in a prominent location

IMPORTANT NOTE: To comply with FCC/ISED RF exposure requirements, this device and its antennas must not be co-located or used in conjunction with any other antenna or transmitter except under the conditions shown in the FCC filing and/or in accordance with FCC multi-transmitter product guidelines.