



VITO Vehicular Radar Evaluation Kit



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Table of Contents

1. Introduction	4
2. Release Information Note	4
3. Glossary.....	4
4. System Architecture.....	5
5. Hardware	6
6. Software.....	7
7. Required Items.....	7
8. Mounting the Unit	8
9. The Graphical User Interface (GUI).....	9
REGULATORY STATEMENTS.....	12

1. Introduction

This guide provides brief information on the installation and operation of the **Vayyar VITO Evaluation Kit**. The sensor is a three-dimensional vehicular-radar system operating at 77-81GHz, which can be installed and mounted outside or inside a vehicle, and detect objects in a defined arena and display a real-time image of their positions within the arena.

VITO is described as model VCTA1_42LS under FCC-ID: 2AHIS-V80G.

2. Release Information Note

This document describes in short operation options for the evaluation-kit of Vayyar 3D vehicular-radar. For more detailed data-sheets and user manual – please contact Vayyar.

Note that both algorithmic capabilities and features are under continuous development and improvement.

3. Glossary

Term	Definition
API	Application Programming Interface
DC	Direct Current
DLL	Dynamic Link Library
EVK	Evaluation Kit
GUI	Graphical User Interface
IP	Internet Protocol. An IP address is a numerical identifier assigned to a computing device or node in a TCP/IP network. The address is used to locate and identify the node in communications with other nodes on the network.
MCU	Micro-Controller Unit
PCB	Printed Circuit Board
RF	Radio Frequency
RADAR	Radio Detection and Ranging
SoC	System-on-chip

4. System Architecture

The VITO system architecture and connectivity scheme is illustrated in the figure below.

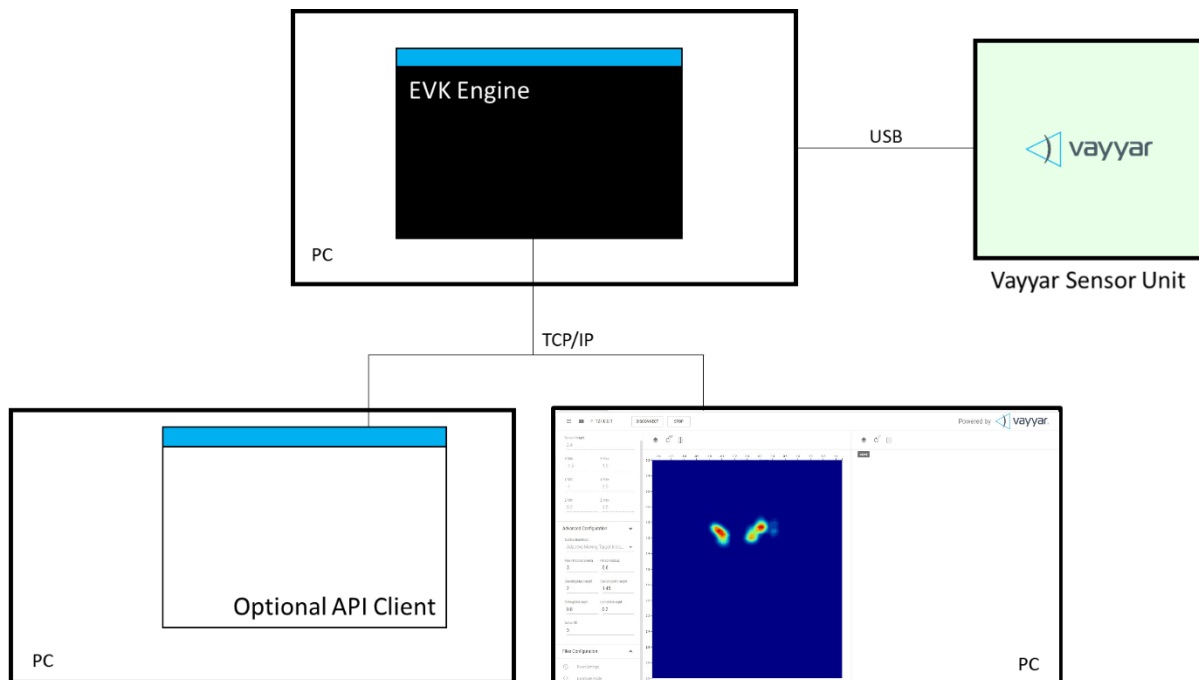


Figure 1: VITO System Architecture

The VITO system is comprised of the following components:

- **VITO Automotive-radar evaluation kit.**
- **The EVK Engine.** Host software that performs signal processing functions. The software runs in a command window in a PC, which is connected to the VITO radar via a USB cable.
- **Web GUI.** User-interface client software that communicates with the EVK Engine via a TCP/IP connection. The Web GUI client is supported by the following browsers:
 - Google Chrome
 - Mozilla Firefox
- **API Client.** Optional, customer-developed software that communicates with the EVK Engine via a TCP/IP connection.

5. Hardware

The figure below presents a high-level block diagram of the PCB that houses the EVK radar-unit:

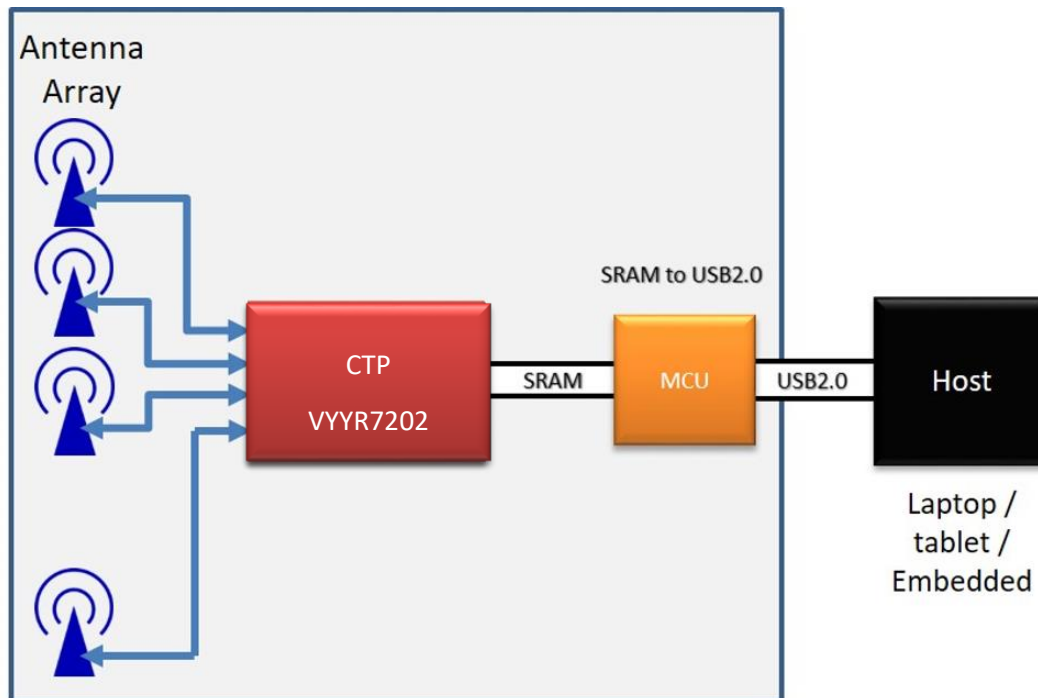


Figure 2: High-Level Block Diagram

The following components are embedded in the radar-unit PCB:

- Vayyar VYR7202-A1 system-on-chip (SoC).
- 40 embedded Tx/Rx linear polarized PCB embedded, wide-band antennas.
- A digital interface that communicates with a host PC via a USB-2.0 connection. The interface is implemented using on-board Cypress micro-controller unit (MCU).
- A Crystal used as a clocking source for the Cypress MCU.
A TCXO (Temperature Compensated Crystal Oscillator) used as a clocking source for the VYR7202-A1 SoC.
- Power supply system supporting 3.3V, 2.5V, 1.27V and 1.2V DC/DC converters.
- Non Volatile Memory (NVM) used to store inventory and calibration information.

6. Software

VITO 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:

1. The software contains a driver through which the application software communicates with VITO device.
2. Moreover, the driver is in charge of enforcing certain regulatory restrictions.
3. The user is required to communicate with the VITO device only through the driver using the provided API or web GUI.

7. Required Items

Make sure you have the following items at hand when installing the system:

- Vayyar VITO radar, and the USB cable provided with the EVK:
 - USB 2.0 A to micro-USB-B cable
- PC installed with the following software:
 - Windows 10 64-bit Operating System
 - A web browser – either Chrome or Firefox

8. Mounting the Unit

The radar can be installed both inside and outside of a car.

For in-car installation, the radar-unit is placed relatively to the car's longitudinal axis (See figure below)

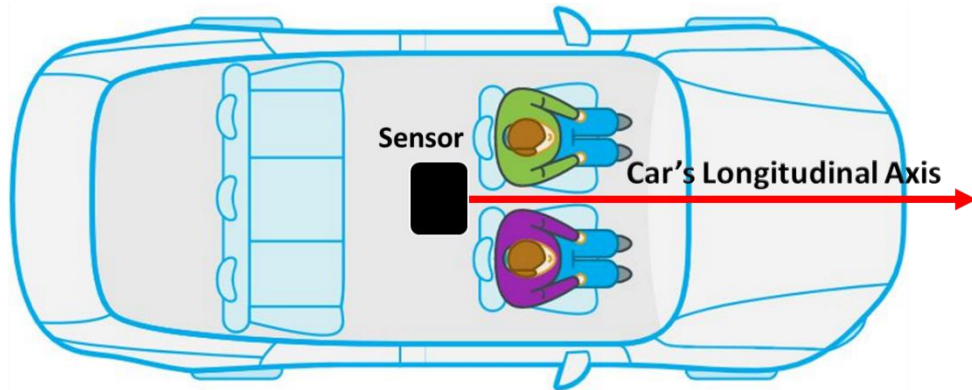


Figure 3: Radar Centralization

For out-of-car installation, the sensor is placed on the exterior structure of the vehicle in a vertical position, for example as in the figure below:



Figure 4: Example of Exterior Side Installation

9. The Graphical User Interface (GUI)

The layout of the Web GUI main page is depicted in the figure below.

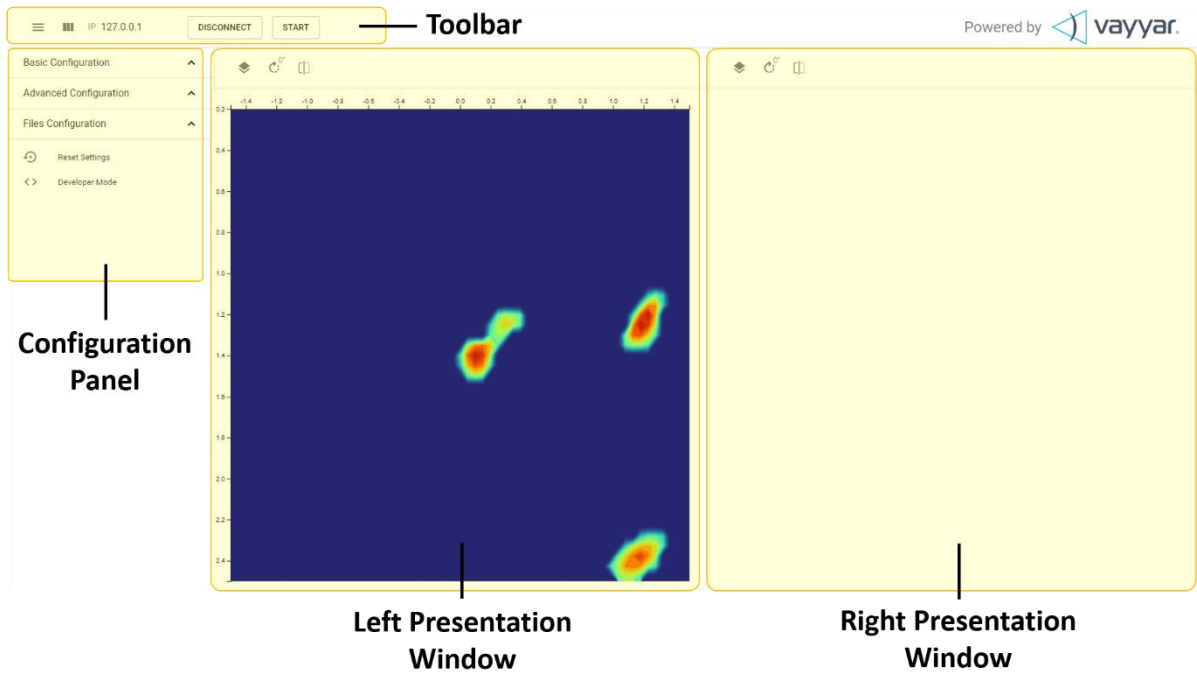


Figure 5: Web GUI Main Page Layout

Layers available for general EVK

PointCloud 3d

3D view of the energy received from the arena, represented as points that are filtered and clustered by targets. Each color represents a different target.

PointCloud 3d raw

3D view of the energy received from the arena, represented as points. The colors represent intensity – center of mass will be colored red for high intensity; Edges of the body will be colored blue for low intensity.

PointCloud 2d

2D view of the targets in the arena, represented as circles. Each color represents a different target. The trail of each target represents its history (locations in previous frames).

Heatmap

Smoothened 2D raw image view of the arena (top view).

Raw Heatmap

Raw, pixelated 2D image view of the arena (top view).

Tracker Targets

Indicates the tracked targets in the arena.

3D Heatmap

Raw image view of the arena as in 3D.

Tracker Postures

Indicates the tracked targets' postures: standing, sitting, walking or lying.

Breathing

A curve representing breathing data of the selected targets.

Layers available specifically for In-Car application

In-Car Occupancy

Illustration of the car and the passengers along with the "Lock Car" option.

➔ Lock Car

In this layer you can find the “**Lock Car**” option which enables an alarm when a child was left alone in a locked car. When the switch is on and the Radar identifies **one passenger** left in the car, an alarm will appear on the screen.

➔ Classification

The classification module differentiates between 2 kinds of occupants: an adult and a child in any type of child seat (excluding booster).

In-Car Breathing

Enables presenting breathing curves representing the breathing pattern of the selected passengers along with their RPM (the respiration rate per-minute).

In-Car Activity Level

Enables presenting curves representing the activity level pattern of the selected passengers. The curve is rising as much as passenger is moving his body and descending when he becomes calm.

Anti Car-theft Alarm

The radar presents a radar-image of the interior and the near exterior of the car, to detect a potential intrusion.

Regulatory Statements

The device is certified under FCC-ID : 2AHIS-V80G.

This V80G device 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.

To maintain compliance with FCC's RF Exposure guidelines, this equipment should be installed and operated with a minimum distance of 20cm between the radiator and a human body.

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

This V80G 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.

It is prohibited to operate the V80G device aboard aircraft in flight.

END OF DOCUMENT