

General Description

The TOF>cam 635 USB adapter together with its Graphical User Interface (GUI) is the easy tool to operate, demonstrate and test the TOF>cam 635 in combination with Windows or Mac computers. It helps to learn more about the performance and functionality of the camera. It demonstrates the camera's capabilities with wide and narrow field illumination as well as to operate also under full sunlight condition to show the outdoor capabilities. Although, it is a guidance for the user, to do the implementation of the TOF>cam 635 in his applications.

This document presents an overview of the operation and functionality of the TOF>cam 635 operated in combination with the TOF>cam 635 USB adapter. The adapter also contains the necessary accessories, cables and GUI to run the camera in combination with a computer with USB interface. In addition, the GUI software comes with the complete C source code to support customer's implementation.

Features

- A quick introduction to the TOF>cam 635
- The basic TOF>cam 635 operation modes can be evaluated
- Includes TOF>cam 635, USB adapter and cables to use the camera with a PC or Mac computer
- The user GUI software (PC/Mac) with visualization and features. It includes all the C source code libraries and drivers for development
- Supports ROS driver on Linux operating systems.

Applications

- Use the TOF>cam 635 with the TOF>cam 635 USB adapter
- Evaluation of the TOF>cam 635
- Application development support

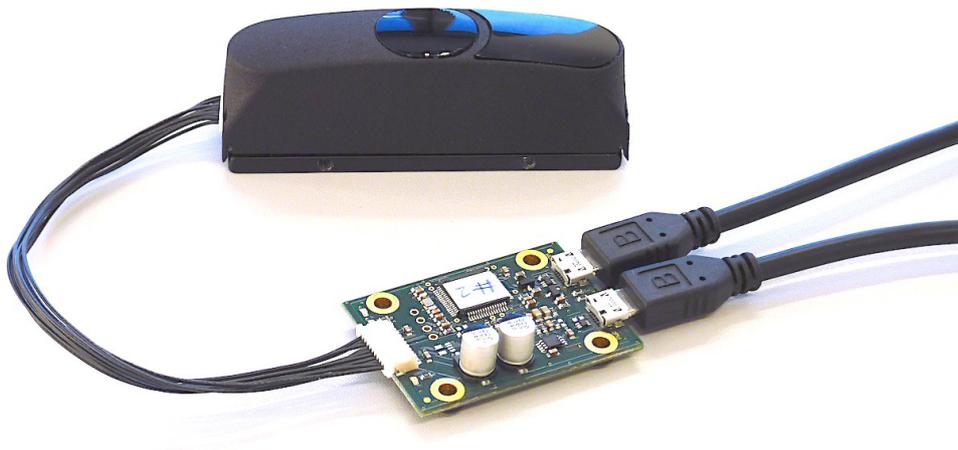


Figure 1: The TOF>cam 635 with USB adapter

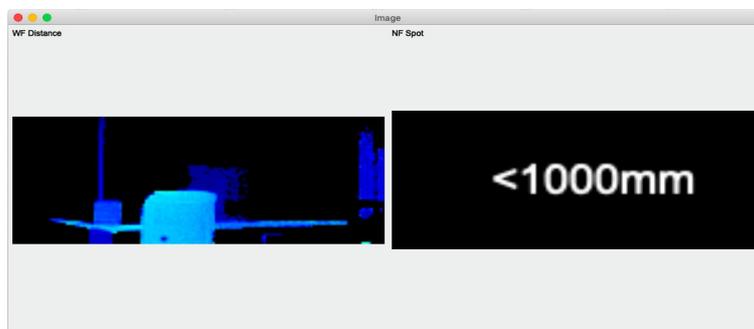


Figure 2: GUI screen with WFOV and and spot data

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1. Before you start

1.1. Precaution and Safety

| | |
|---|---|
|  | The TOF>cam 635 adapter is a non-housed electronic device. Handle it with the necessary ESD precaution. |
|  | Cable-tripping: Place or mount the system on solid ground or fix it correctly on a solid support. Place cables carefully. Falling devices can be damaged or harm persons. |
|  | It is the responsibility of the user to operate the system in compliance with the local EMC regulations. |
|  | This adapter is not a safety device. It may not be used in safety applications, explosive atmospheres or in radioactive environment, except the user implements the required safety measures, e.g. by redundancy. However, the sole responsibility for the safety of the application is by the user. |
|  | LIMITED WARRANTY - LOSS OF WARRANTY This adapter should only be installed and used by authorized persons. All instructions in this datasheet and in the related documents shall be followed and fully complied with. In addition, the installer and user is required to comply with all local laws and regulations. The installer and user is fully responsible for the safe use and operation of the system. It is the sole responsibility of the installer and the user to ensure that this product is used according to all applicable codes and standards, in order to ensure safe operation of the whole application. Any alteration to the devices by the buyer, installer or user may result in device damage or unsafe operating conditions. ESPROS Photonics AG is not responsible for any liability or warranty claim which results from such manipulation or disregarding of given operating instructions. |
|  | ESPROS Photonics AG is an ISO 9001: 2015 certified company |
|  | This product is according to European Union standards and free of hazardous substances. |

1.2. Updates

ESPROS Photonics is constantly striving to provide comprehensive and correct product information. Therefore, please check ESPROS' website regularly for updated versions of datasheets and documentations: www.espros.com

| | |
|---|--|
|  | Download the latest Flyer TOF>cam 635 |
|  | Download the latest "Installation and Operation Manual TOF>cam 635" and "Manual TOF>cam 635 USB adapter" |
|  | Download and use the latest "ESPROS_TOFCAM635_GUI", "ESPROS_TOFCAM635_ROS_driver" and TOF>cam 635 firmware TOFCOS. If there are any questions, please contact the ESPROS sales office or send an email to sales@espros.com |

1.3. Important Notes

Notes on PRELIMINARY versions:
THIS DATASHEET IS UNDER CONSTRUCTION. IMPORTANT PARTS MAY BE MISSING

Colored marking in text means "under consideration" and refers to not yet applicable or verified information.
 Values and/or information are either estimates or show the applicable principle only.

2. The TOF>cam 635 USB adapter

2.1. Scope of delivery



Figure 3: Scope of delivery TOF>cam 635 USB adapter

| No | Pieces | Designation | Remarks |
|----|--------|---|------------------------------|
| ① | 1 | TOF>cam 635 USB Adapter | |
| ② | 2 | Micro USB cable | USB 2.0, A plug - micro plug |
| ③ | 1 | Cable 2x 10 Pin F JST 1.0 mm (approx. L = 150 mm) | P/N P300 471 |

Table 1: Bill of material

2.2. Ordering information

| Part Number | Part Name | Remarks |
|-------------|---|---|
| P100 531 | TOF>cam 635 | Not included in the TOF>cam 635 USB Adapter |
| P100 539 | TOF>cam 635 USB Adapter | To connect the TOF>cam 635 to a USB port. Includes USB adapter, 2 USB cables and 1 cable 2x 10 Pin F JST plug (part no. P300 471) |
| P300 471 | Cable 2x 10 Pin F JST 1.0 mm (approx. L = 150 mm) | Cable between USB adapter and camera |

Table 2: Ordering Information

3. Use TOF>cam 635 with TOF>cam 635 USB adapter

3.1. The TOF>cam 635 system

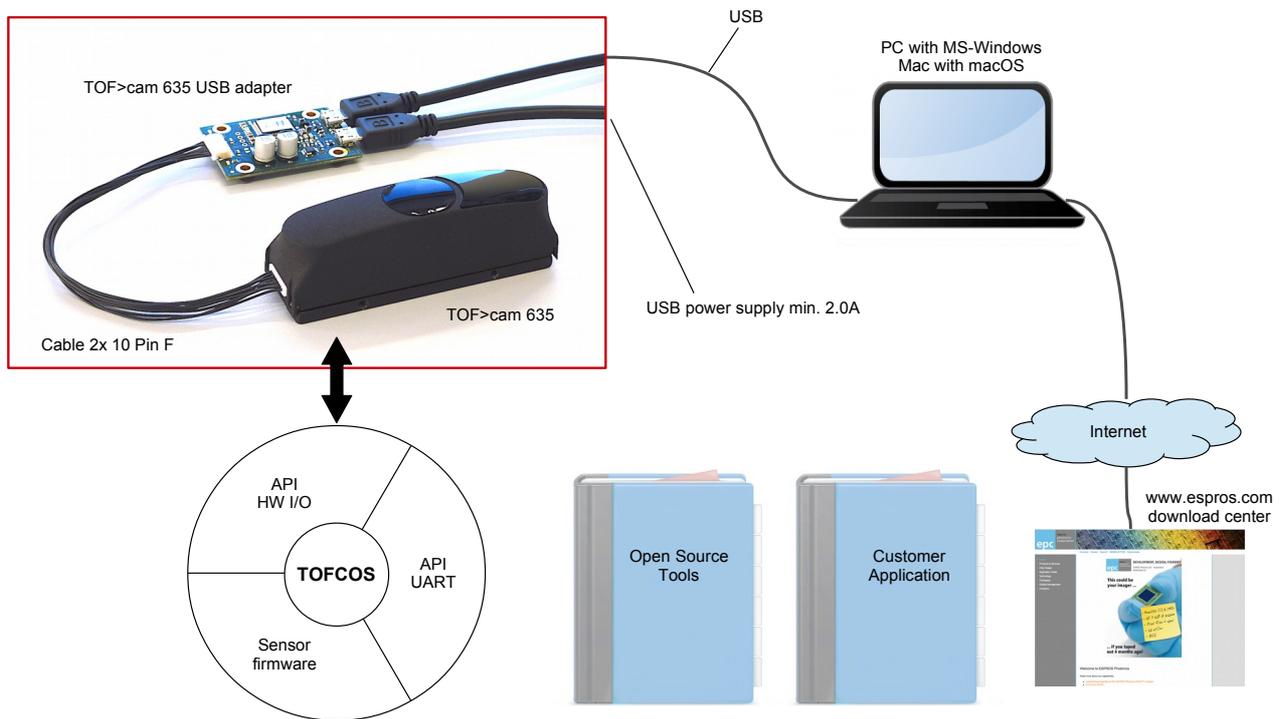


Figure 4: The TOF>cam 635 system setup

The system is based on the TOF>cam 635 camera.

- The multifunction camera is compact and lightweight.
- The camera, with their UART interface, communicates with the computer via USB-UART adapter, using a virtual "COM" port.
- The USB interface supplies the camera with power.
- The application firmware of the camera runs the TOFCOS kernel which manages the camera, including correction algorithms.
- For Linux computers are ROS device drivers available to support fast user application implementation.

3.2. GUI Software, ROS driver and application tools

ESPROS Photonics supports the user's development and integration to his application by having various support tools available e.g. GUI software including the C source code, ROS device drivers, etc.

They are all available by downloading the "ESPROS_TOFCAM635_SW_package". Updates of the camera's TOF>cam 635 firmware TOFCOS are also included in the package. After the download, first read the README and CHANGELOG files to get the latest operation and application information.

4. Install the adapter

4.1. System requirements

First, before installation of a new software release, read the README and CHANGELOG files of the download package to get latest product information.

- User interface GUI TOF>cam 635
No driver is needed for Windows 10 and Mac OS. The SW runs directly.
Install the appropriate driver on Windows 7 OS.
- ROS TOF>cam 635
Needs Linux and ROS operating system installed.

4.2. Software installation

The TOF>cam 635 USB adapter uses software which can be downloaded from the ESPROS homepage at www.espros.com. Click the link "Downloads" as shown below:



Figure 5: ESPROS homepage with the download link

You will see a folder structure. Go to the sub folder **02_Cameras_and_Modules**. Download the file "ESPROS_TOFCAM635_SW_package" for Windows (.exe) or Mac (.dmg). Unpack the file. You will get a folder structure as shown in Figure 6.

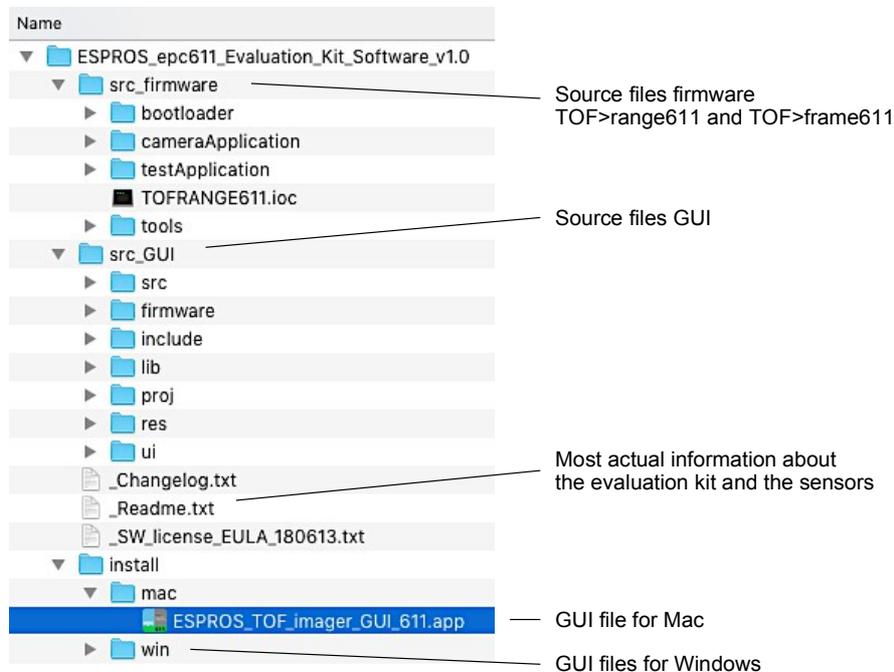


Figure 6: Folder structure after installation

4.3. System setup

1. Connect the TOF>cam 635 to plug J2 of the USB adapter (TOF>cam 635). Refer to Figure 1.
2. Connect a USB power supply (min. 2.0 A) to the plug J1 of the USB adapter (Power Supply +5V / 2.0A). Power consumption depends on the frame rate, so in most cases you can use also a 2nd powerful USB port from the computer (e.g. USB 3.0 high-power: >0.9A) or a battery bank with USB port.
3. Connect your host computer to the plug J3 of the USB adapter (Host communication USB 2.0).

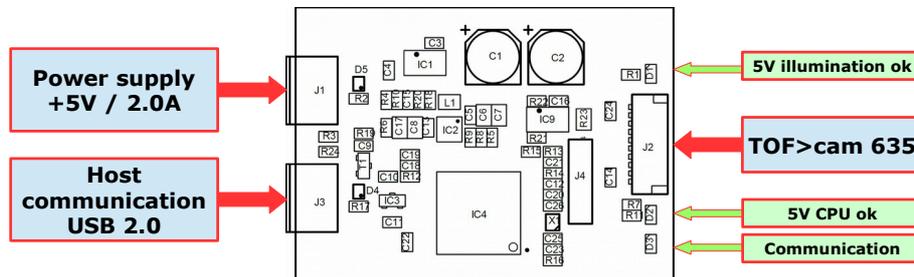


Figure 7: Cable connections (blue) and status LEDs (green)

4. Check if all 3 LEDs are on. Refer to Figure 1:
 - LED 5V illumination ok: ON when both USB ports are connected.
 - LED 5V CPU ok: ON when host communication USB is connected.
 - LED Communication: ON when host communication USB is connected and no communication, BLINKING when communication is in progress.
5. The device TOF>cam 635 is recognized on the host as “STMicroelectronics Virtual COM Port”, automatically.
6. The TOF>cam 635 is now ready to use.

4.4. Disconnect the system

1. Close the GUI or application software e.g. ROS application.
2. Disconnect the USB cable from the computer.
3. Disconnect the the USB power supply from the USB adapter to power-off the system.

5. Use the TOF>cam 635 system

The TOF>cam 635 can be used either with

- the user interface TOF>cam 635 GUI,
- the TOF>cam 635 ROS driver,
- by customer's application software.

The TOF>cam 635 USB adapter communicates transparently between the host and the TOF>cam 635.

5.1. Com port selection

- Use with the TOF>cam 635 GUI
The COM port is searched and selected automatically by the GUI.
- Use in customer application
Be sure to select each time of connection the correct COM port according the host's operating system device list. It can/will be different on every computer and/or can change when other devices are connected too or additionally.

5.2. Com port setting

The TOF>cam 635 runs at 10 Mbit/s on the UART interface. Means, the USB adapter has to run this baud rate also on his UART port to communicate with the camera. Thus, the TOF>cam 635 GUI sets automatically host's corresponding COM Port to 10 Mbit/s.

In case of a ROS operating system or any other customer application, the TOF>camera 635 USB adapter is setting the baud rate of his UART port the following way:

- 4Mbit/s or higher: The TOF>cam 635 USB adapter uses on his UART port all the time and fix 10Mbit/s.
- <4 Mbit/s: The TOF>cam 635 USB adapter uses on his UART port the same baud rate as set on the corresponding COM port of the host computer. Advise: The TOF>cam 635 cannot communicate with the host in this case (wrong baud rate).

5.3. Error handling

1. All LEDs are on, but the camera does not work:
 - a) The USB cables are the wrongly connected. Swap communication to power and vice-versa.
 - b) The host is using a wrong baud rate setting. Refer to section Com port selection and Com port setting.
2. LEDs 5V CPU ok and Communication are on only: No power on Power supply plug. Check power supply or USB port.
3. LEDs 5V illumination ok and 5V CPU ok are on only: TOF>cam 635 USB adapter is damaged.

6. GUI functionality

6.1. Start the GUI software

After starting the “[ESPROS_TOFCAM635_GUI](#)” application, the software connects automatically to the device. The corresponding control window of the GUI appears.

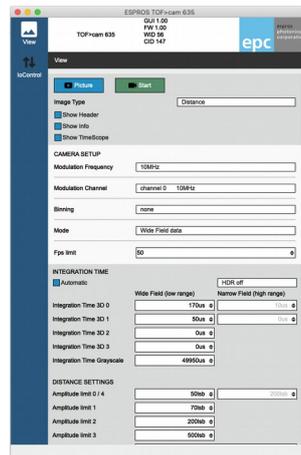


Figure 8: Control window after startup for TOF>cam 635

The GUI consists of three different windows: The control window on top, the corresponding display windows below and the dock for the apps on the left. The control window is used to set imaging parameters and image presentations.

Most of the functions are self-explanatory and are not described here. However, some tool tip windows support the usage. Refer to the “Installation and Operation Manual TOF>cam 635” for the detailed functionality of the TOF>cam 635 and the ROS driver.

6.2. Camera operation

Press the “Start” button. You get get the main data window:

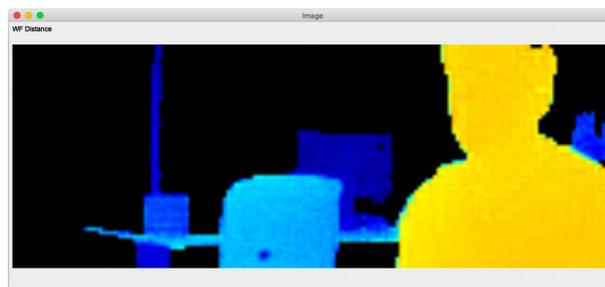


Figure 9: Main data window after start

6.3. Main data windows

Examples of the operation mode windows for distance data:

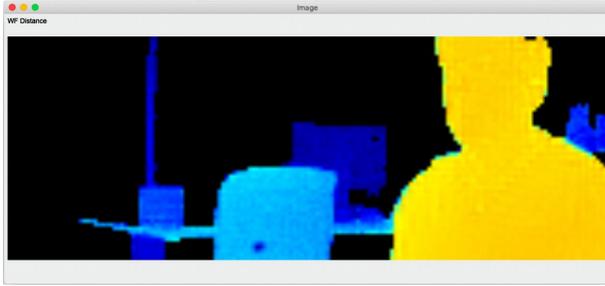


Figure 10: Wide field of view WFOV

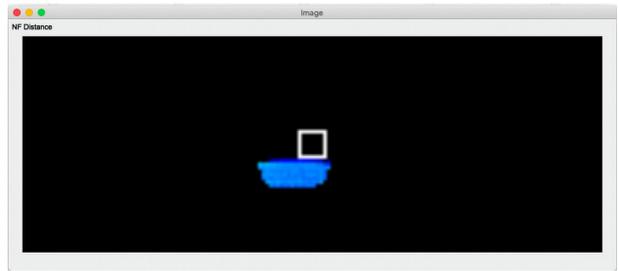


Figure 11: Narrow field of view NFOV

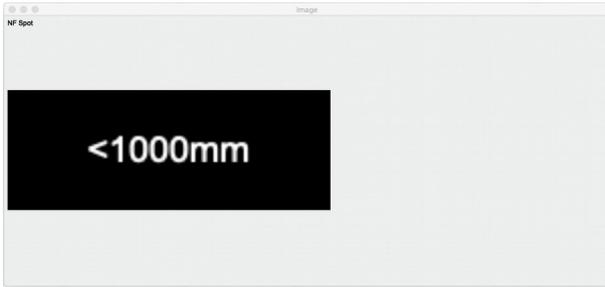


Figure 12: Spot data, obtained from the NFOV

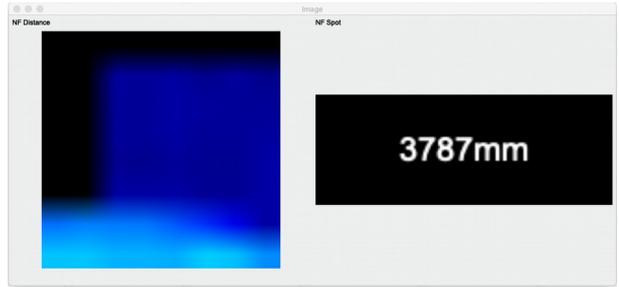


Figure 13: NFOV pixel and spot data

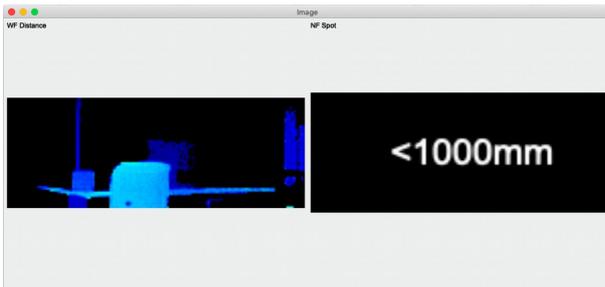


Figure 14: WFOV and spot data

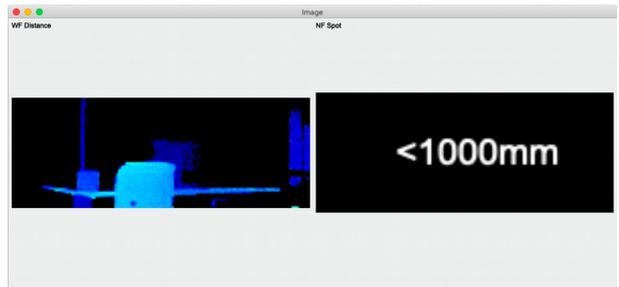


Figure 15: WFOV or spot data

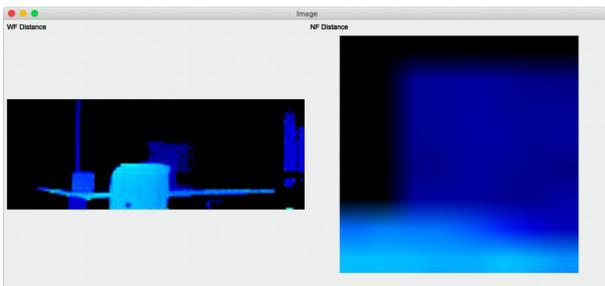


Figure 16: WFO and NFOV pixel data alternatively

Examples of the data representation windows:

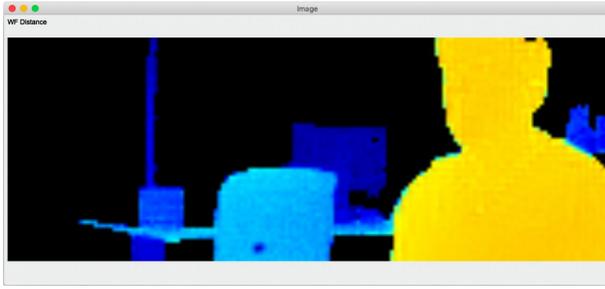


Figure 17: Distance

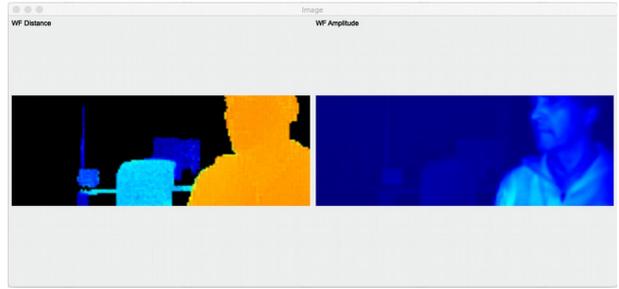


Figure 18: Distance and amplitude



Figure 19: Grayscale

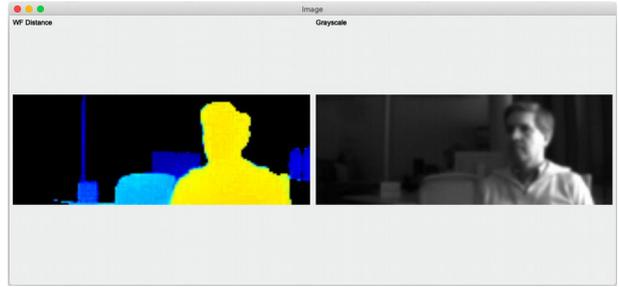


Figure 20: Distance and grayscale

6.4. Miscellaneous functions

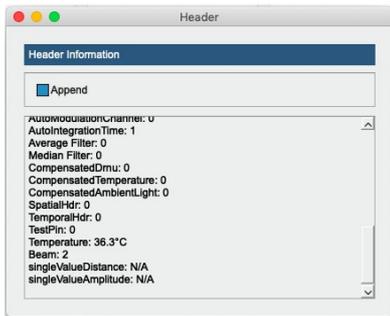


Figure 21: Header information of the image data stream

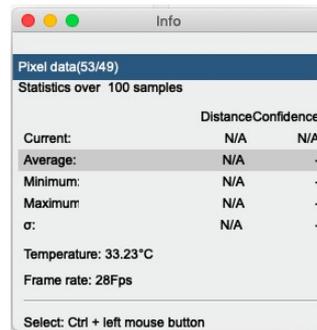


Figure 22: By pointing with the cursor into the image, pixel information will be displayed. In addition, the chip temperature and the frame rate are displayed.

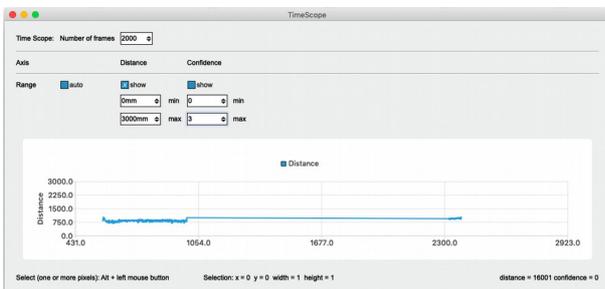


Figure 23: Time scope is a function which shows a time series of distance values of a selected pixel in the image.

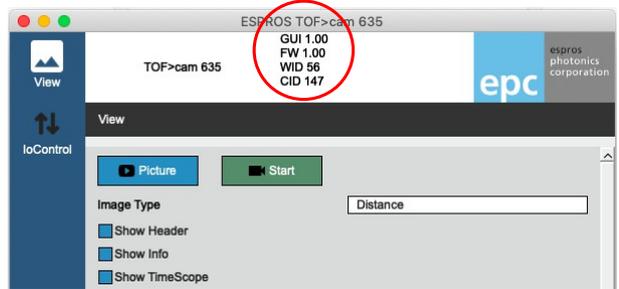


Figure 24: The top bar of the app presents the information about the running hard- and software. CID and WID numbers are manufacturing data of the imager chip.

7. Maintenance and disposal

7.1. Maintenance

The device does not need any maintenance.

7.2. Disposal

Disposal should be done using the most up-to-date recycling technologies for electronic components according to the local regulations and laws. The design and manufacture of the cameras and components are done in compliance with the RoHS legal regulations.

8. Ordering information

| Part number | Part name | Comments |
|-------------|--|--|
| P100 539 | TOF>cam 635 | |
| P100 539 | TOF>cam 635 USB Adapter | To connect the TOF>cam 635 to a USB port. Comes with two USB cables and a cable with a JST plug P100 516 |
| P100 516 | Cable 10 Pin JST SHR-10V-S(-B) in a length of approx. 75mm | |

Table 3: Ordering information

9. Addendum

9.1. Related documents

Installation and Operation Manual TOF>cam 635, ESPROS Photonics Corp.

Datasheet epc635, ESPROS Photonics Corp.

Book 3D-TOF, A guideline to 3D-TOF sensors that work by ESPROS Photonics Corp. (Author Beat Dede Coi et. al.)

9.2. Links

Refer to the "Installation and Operation Manual TOF>cam 635".

9.3. SW Licenses

We appreciate the use of the following open source or free software in our tools and respect the large amount of work the owners have done:

| Tool | Internet address | Licence holder |
|------|---|-----------------------------------|
| Qt-5 | https://www.qt.io | Copyright (C) 2018 The Qt Company |
| ROS | Refer to the "Installation and Operation Manual TOF>cam 635". | |

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