Continuous Solar Seeing Measurement System

CSSMS

Installation and user manual

Sept 1st, 2026

© ALCOR-SYSTEM

Table of Contents

1 CSSMS installation 3

1.1 Control Box installation 3

1.2 Sensor installation 8

2 Software 12

2.1 System requirement and operating system 12

2.2 Software User Interface 13

2.2.1 Recorded data 16

2.2.2 Weather and clouds effect on data 18

3 System maintenance 19

4 Troubleshooting 19

4.1 System does not deliver any measurements 19

4.2 System delivers noisy measurements 19

5 Product terms of use 19

1 CSSMS installation

The system is made of two parts, a control box and a sensor mounted to a ball support that allows any orientations. The sensor cannot be detached from the control box, and in located around 50 cm apart.

Fig. 1 Complete system without cables to computer and power supply, left main control box and right the sensor made of photodiode and green filter.

The system works outdoor, it is weather-tight and can withstand wind, rain and snow. it will prevent all intrusion of insects, even the smallest one. Nevertheless, the system is not submersible into water.

The base plate to attach the box and the sensor is not provided.

1.1 Control Box installation

The box has two fixing brackets on the side which allows to fix the system on a wall or other robust surface. It is also possible to fix it on a vertical surface, in that case have the 3 connectors downward. Bracket hole diameter is 6.5 x 5.5 mm. Attachment screws are not provided because their types are defined accordingly to the material where the box will be located and the country (metric / US).

Fig. 2 Control box

Fig. 3 Fixing brackets

Take care of the coaxial cable at the output of the box, it is short and fragile. Do not stretch it to the maximum length or/and avoid to twist it.

Connector keying and different number of pins are preventing connection errors. However, user must look at the number of connector pins at the end of the cord before connecting the camera, in order to avoid forcing the pins and damage the camera connector.

Fig. 4 Control box connectors side

Connector	Role	Gender
#1	Power connector	4 male pins M12 type
#2	Photodiode connector	1 pin, coaxial SMA type
#3	USB connector	12 female pins M12 type

Power connector (#1)

This is tied up to a 4 pins connector. This is 24V power supply and 20m cable. Metallic M12 type

SMA connector (#2)

This connects to the photodiode, located at around 50 cm. SMA type

USB connector (#3)

This is tied up to a 12 pins connector. The cable that goes to the PC is 20m length. Metallic M12 type

The waterproof connectors connect as follows:

- Identify the number of connector pins of the system, its type (male / female)
- Identify the number of pins of the connector cord and match.

- Identify the key pin inside the camera connector and the key at the connector cord side.
- Apply a rectilinear motion. **If insertion force strength persists, please repeat steps for locating the pin number and key. Excessive force applied to connector can cause the destruction of the connector or a bad connection can damage the system. In case of damage due to trials to attach cable to the wrong connector kind, warranty could be canceled.**

Turn the connector a little bit, when you fell the two parts of the connector are facing, then the connector can be pushed into its counterpart. **You should never force it; it should be gentle!**

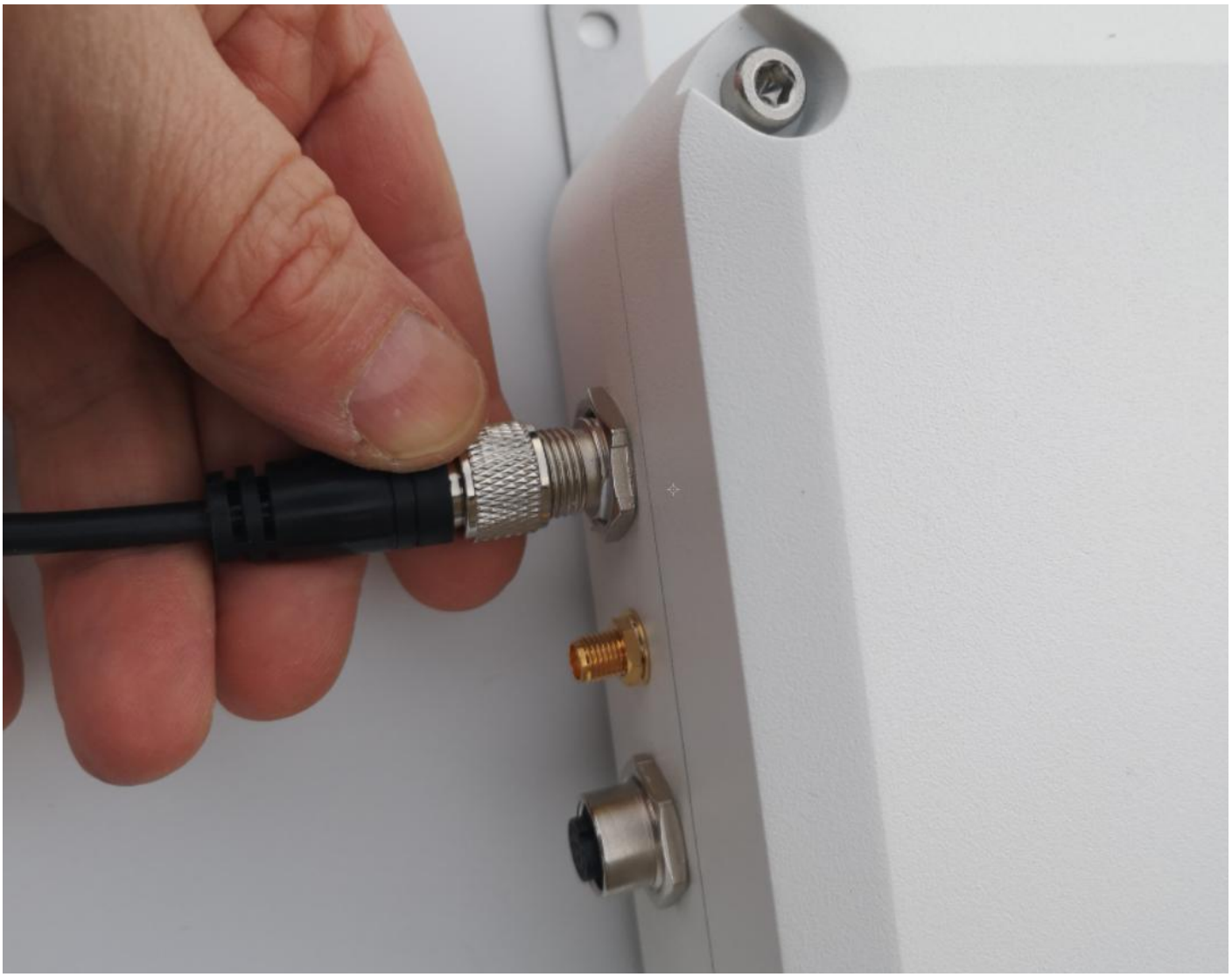

Fig. 5 Connector attachment
step #1: insert cable connector straight with proper key orientation
step #2: rotate clockwise to screw the connector nut into the connector box

Fig. 6 Connectors attachment

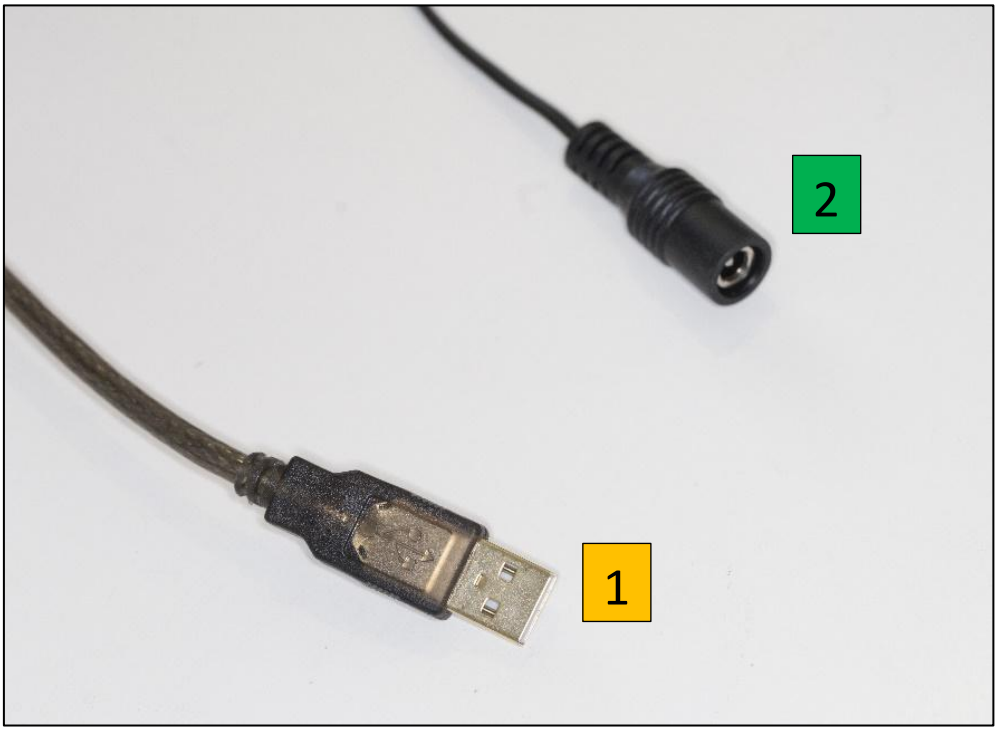

Fig. 7 Connectors opposite side from box

When the connector is correctly pushed you can turn the locking ring clockwise to attach it. On the other side connector #2 goes to the 24V/1.5A power supply, and connector #1 goes to any USB port of your PC. This is an USB 2.0 Link.

One of the cables is a 20m USB 2.0 with 2 active repeaters, those repeaters are sealed into molded plastic cast. It can withstand outdoor environment with rain, but it is preferable to install it in horizontal direction, like the picture below so that they can last more time.

Fig. 8 *USB active repeater (there are two of them in a 20m cable).*

1.2 Sensor installation

The probe comes with a protective cap. It must be removed to be able to use the product.

Fig. 9 Photodiode sensor comes with a protective cap

To remove the cap, grab it and pull it straight away, do not rotate the cap, there's no need to rotate it.

Fig. 10 Photodiode sensor comes with a protective cap

The sensor is a photodiode placed into a waterproof casing in the backside of a special green filter (see below filter transmission) it peaks at 550 nm.
The sensor is placed on a mount head ball that can allow any angle of sight. This angle of sight is set once for all, depending on the latitude of the place and north/south directions.

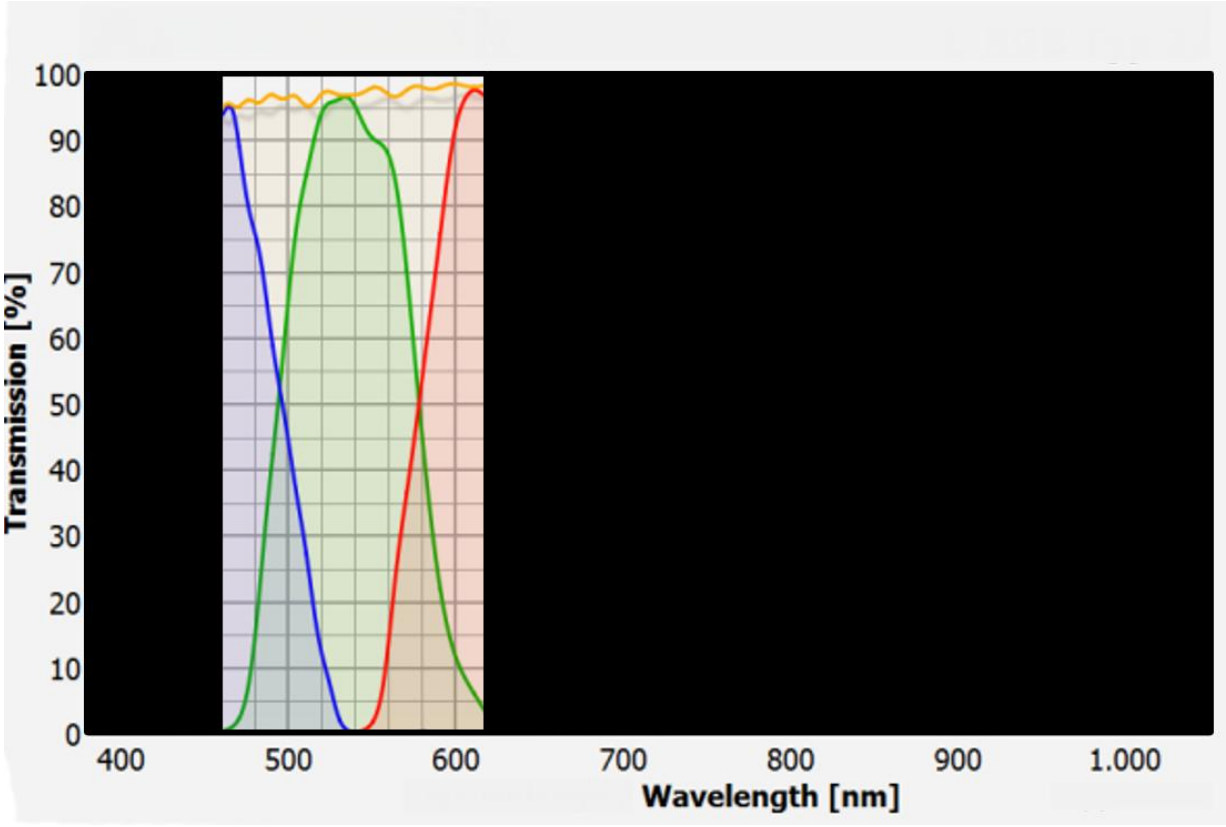

Fig. 11 Green filter transmission plot

It should face the SUN, more particularly the South (for northern hemisphere operation) or the North (for southern hemisphere operation) direction. The angle of the sensor with respect to horizontal plane is equal to 90° minus Latitude place angle.

For instance, if latitude is 30° North, it should be put aiming South in azimuth and at 60° angle of elevation from the horizontal plane.
Positioning accuracy is not critical, and +/- 5° error can be accepted.

Ensure that no building will hide the Sun during its path from sunrise to sunset. Also think, that over the course of the year the Sun position is changing, extreme values are from winter solstice to summer solstice.

The base of the ball support has a female thread 3/8'' 16 TPI UNC thread, allowing to attach it in a permanent position nearby the control box. Please, be sure both axis (azimuth and elevation) are tightened very firmly, so that it does not move over the course of the time because of the wind or the effect of the rain.

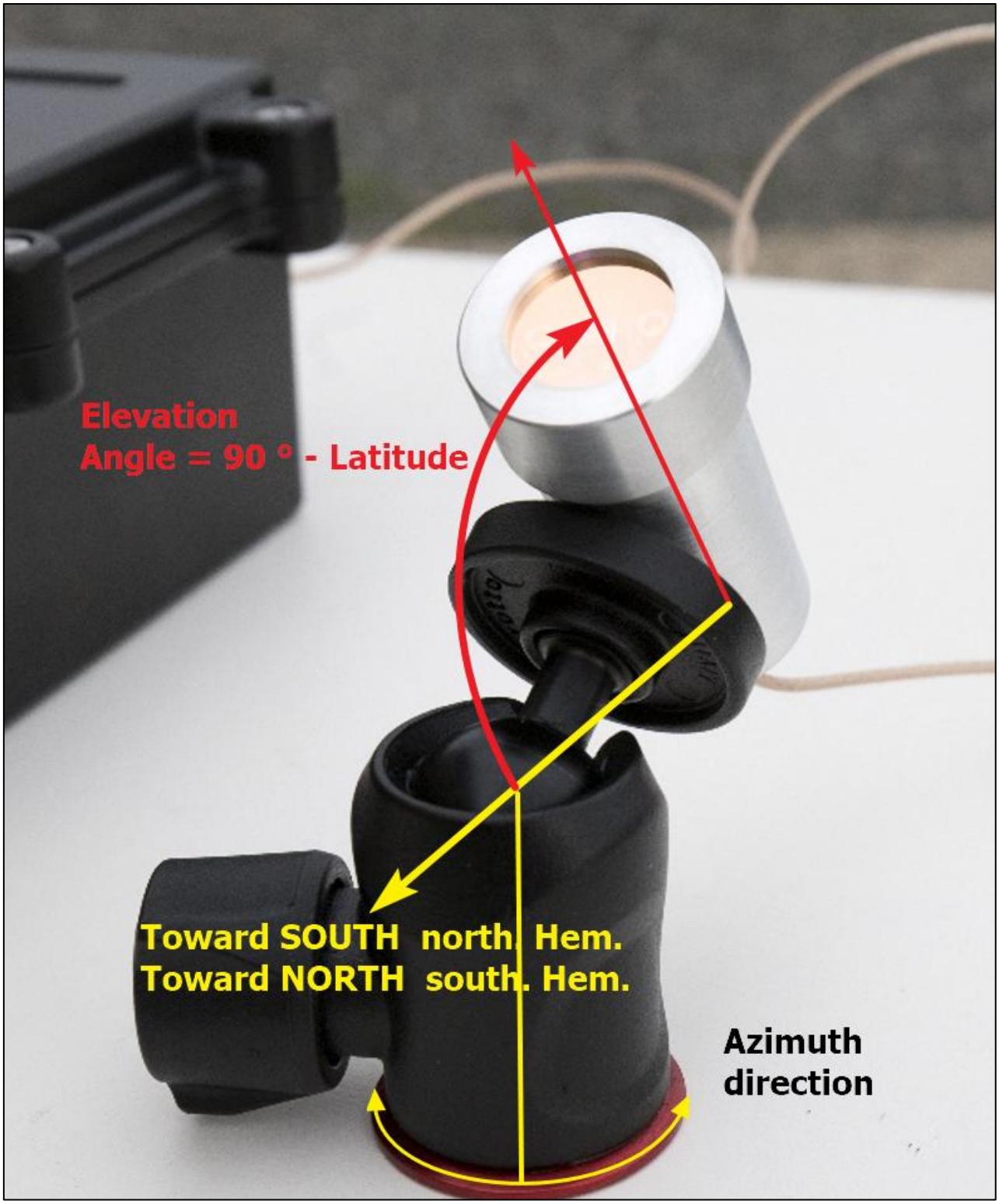

Fig. 12 Photodiode/sensor angle azimuth is set to north (or south) axis and elevation to 90° - latitude of the observing place.

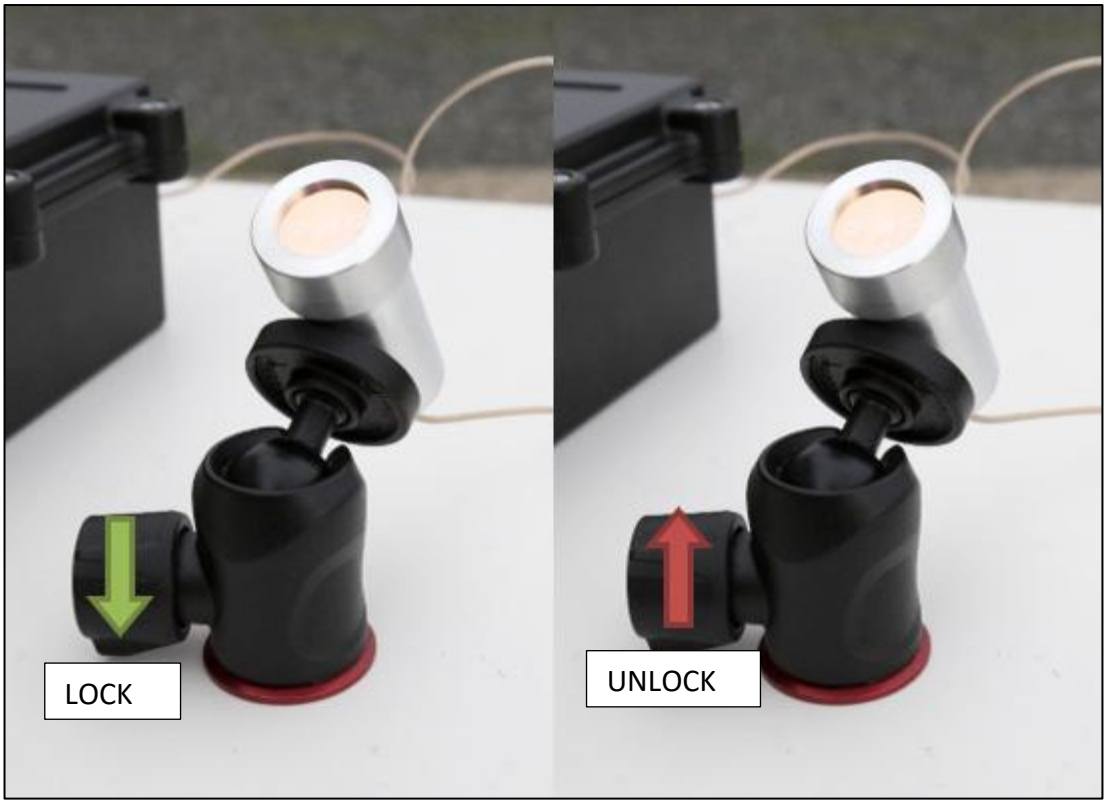

Fig. 13 Locking / Unlocking process of the elevation angle ball

System installation is complete and ready to go.

Important: the system works daytime, but does not provide any seeing data when Sun is hidden by clouds.

2 Software

Latest product software can be found in our web site:

http://www.alcor-system.com/common/CSSMS/software/CSSMS_Installer.exe

2.1 System requirement and operating system

Hardware requirement (Minimum) for CSSMS V1

- PC with AMD or Intel CPU, (with passmark index above 2000)
  - Intel Core i3-4012Y @ 1.50GHz (passmark index : 2000)

- 2 GB Memory
- 50 GB hard disk. Software requires 20 MB for installation, but storage must be granted for images.

Operating system requirement

- Windows 10 and 11 32- or 64-bits Operating System. May work with older operating system, but no support will be provided
- Under Linux works with a Python script that is provided with the installation files (*test_CSSMS_AllOS.py* file).

2.2 Software User Interface

This software has 5 panels :

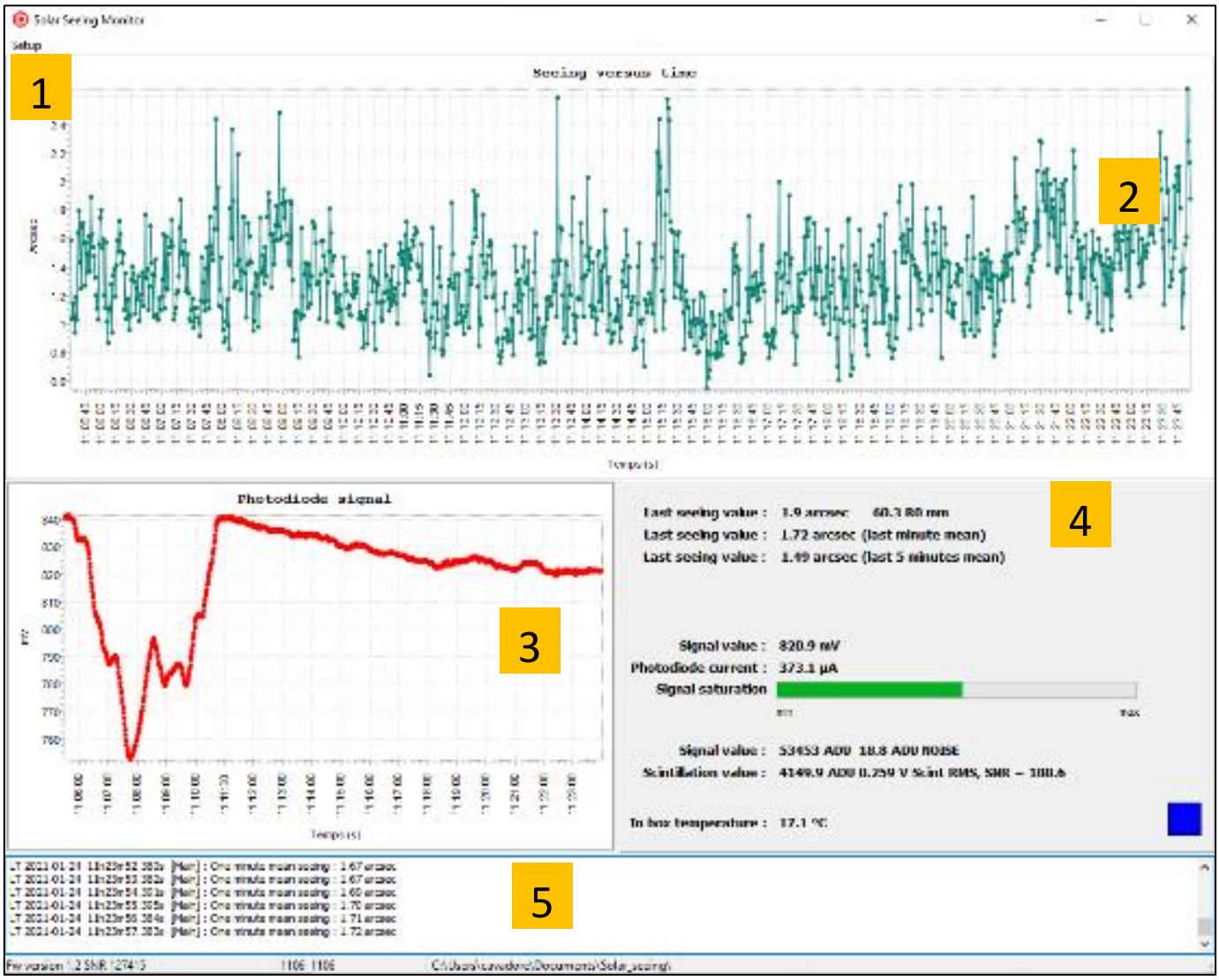

Fig. 14 Main program panel

Part #1	Setup Menu
Part #2	Seeing plot versus time
Part #3	Photodiode / SUN mean signal chart
Part #4	Seeing figure and other information
Part #5	Log output

➢ Part 1: Setup Menu

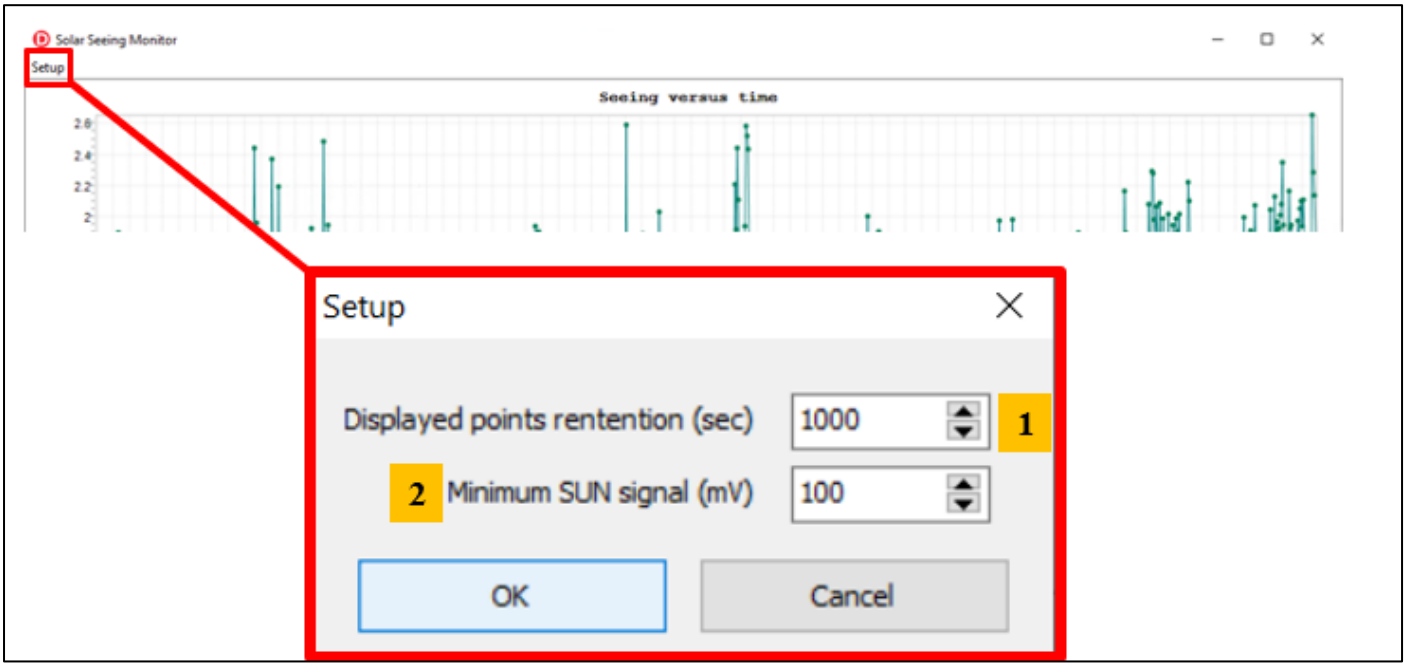

Fig. 15 Setup menu

1: Time span which can be plotted, before graphics will scroll horizontally.
2: Minimum of Sun signal to allow seeing data to be computed.
3: Geographic location (just used to compute Sun's Elevation)

➢ Part 2: Seeing plot versus time

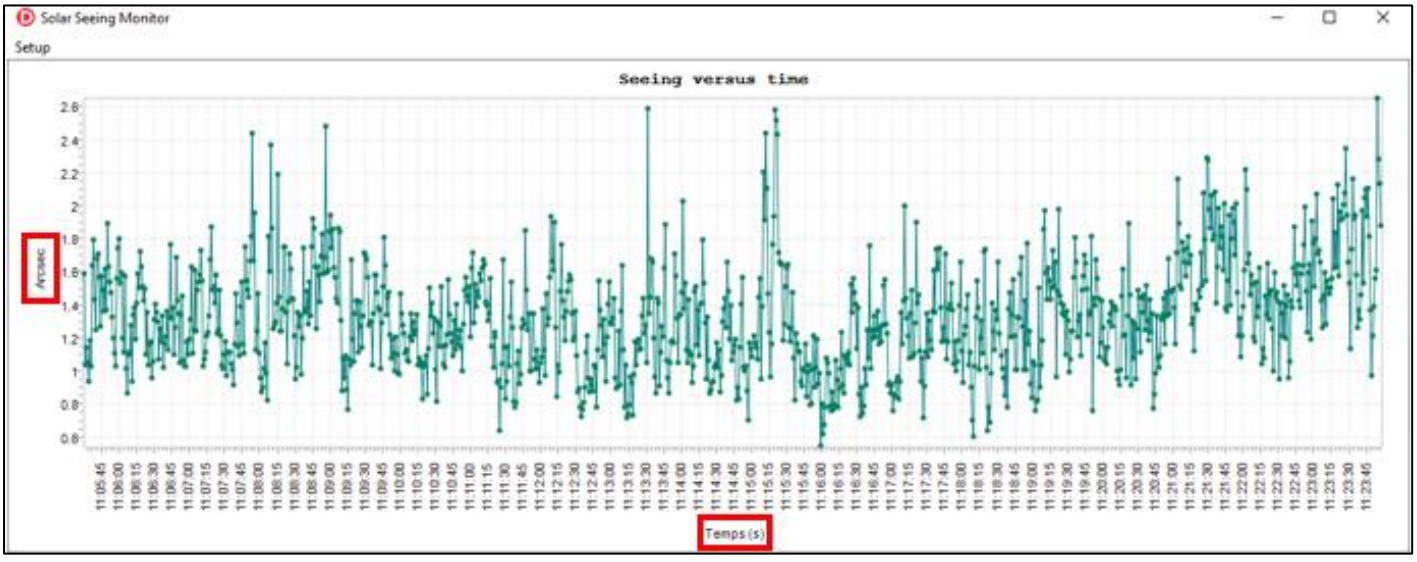

Fig. 16 Seeing versus time

This plot shows the seeing (expressed in arcsec) measured by the system over the time. One measurement point is added each second of time (based on 25 000 measurements per sec of SUN's scintillation).

A good “seeing” figure is below 2 arcsec. This is a seeing figure computed in compliance with the Fried’s theory definition of seeing.

NOTE : the seeing computed by this system, **is from the line of sight of the SUN and the photodiode**, this is not zenithal equivalent seeing.

- Part 3: Photodiode signal

This part shows the signal received by the photodiode versus time. Y axis shows the voltage of the photodiode in mV.
This mean SUN signal can change with atmosphere transparence, and especially with clouds presence. Also with SUN position, because the sensor does not track the SUN. Photodiode and SUN angle is changing with the course of the time. If thin clouds are present, level can be above threshold but seeing figure will be close to zero, and thus not valid also.
Under a given threshold, no seeing measurement are performed. This threshold can be set by the user.

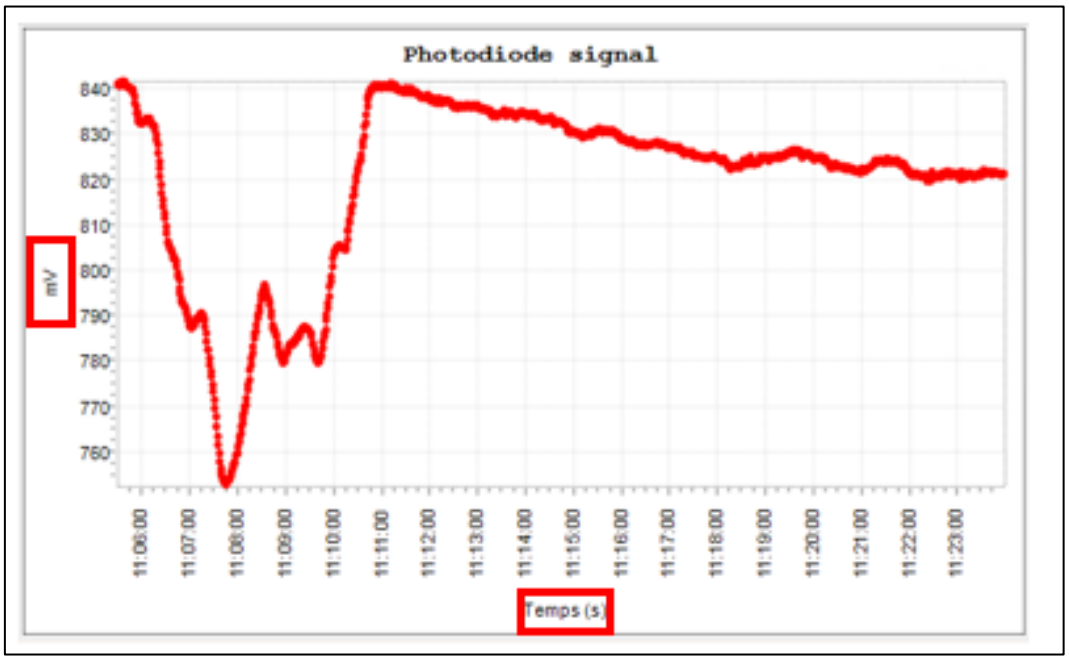

Fig. 17 Photodiode mean SUN signal

- Part 4: Information

This part shows the main information about the system.

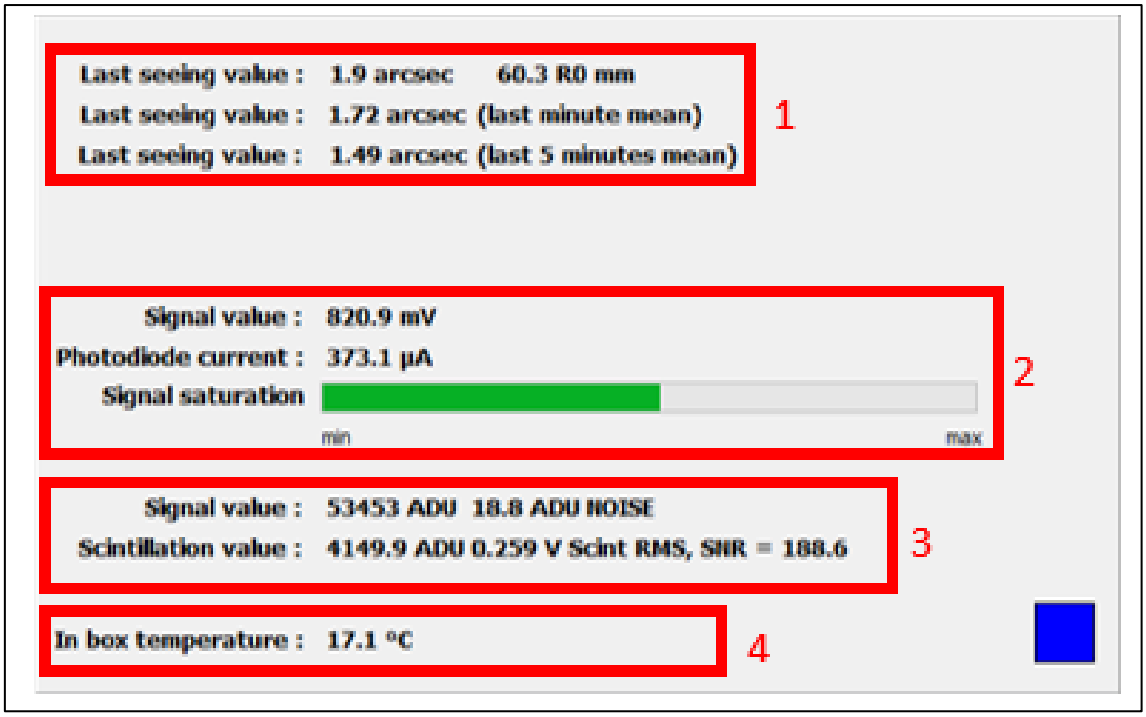

Fig. 18 system Information

Last Seeing figure measured, last minute mean and last 5 min mean (1).
Information about photodiode, reflecting mean SUN signal (2).
Advanced information, with noise levels, mostly used for debugging purposes (3).
Last measured temperature inside the box (4).

- Part 5: Log panel

The log panel writes information that the software can display. This is for debugging purposes.

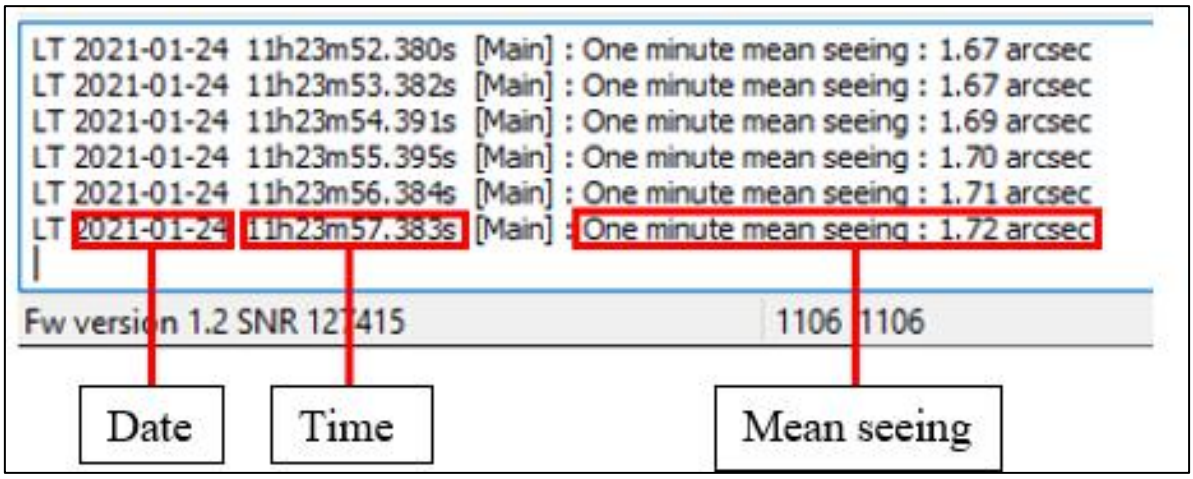

Fig. 19 Log

The measurements will start, typically, when Sun's Elevation is higher than ~ 10° with a minimum signal set to 200 mV.

2.2.1 Recorded data

The software records all the seeing data into a text file and appends new data to this file. This is the folder where the measurements are stored

C:\Users\[Logged user name]\Documents\Solar_seeing

This is a simple ASCII text file and can be opened with any software such as notepad++, excel, or other software called "***YYYY_MM_DD_result.txt***". The filename is set so that one file is produced per day.

Where YYYY is the current year i.e. 2021 … MM is the month of the year from 01 to 12, and DD is from 01 to 31 (depending on the month).

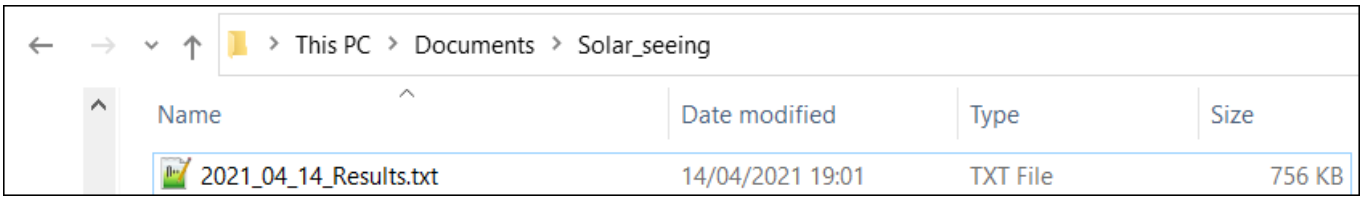

Fig. 20 Output file location

Here is the ascii data, edited with notepad++ each line is a measurement (once a second).

The first line will provide information of each column and is self-explanatory.

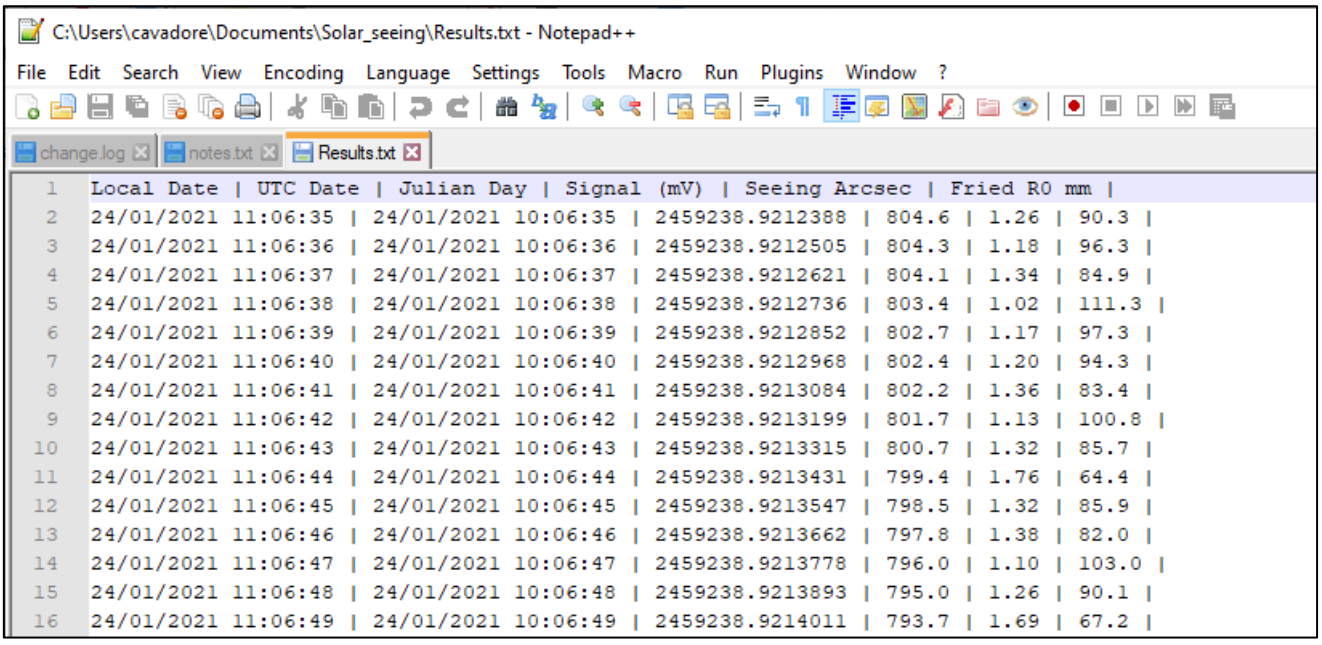

Fig. 21 Data saved into the file

On request, ALCOR-SYSTEM can provide a PYTHON script to read the data from the device and provide the same data already computed. It can also work on LINUX operating systems.

2.2.2 Weather and clouds effect on data

Measurements are valid when the sky is totally “blue” and free from clouds (picture below).

Fig. 22 Good condition for measurements

If thin clouds and high elevation are present in front of the Sun, the measurements based on scintillation will be lowered and might be false. Thin clouds tends to average scintillation to the photodiode.

Fig. 23 Bad conditions, seeing can be lower than actual figure.

3 System maintenance

It is advisable to clean from time to time (say three time a year), the top of the SUN sensor, to avoid accumulation of unwanted dusts or atmospheric contaminants that will dim the signal. Use alcohol, and clean and soft tissue. The input window is quite resilient to scratches (hard coating).

Fig. 24 SUN sensor

4 Troubleshooting

This section aims at providing hints to solve issues.

4.1 System does not deliver any measurements

The USB port driver might be non-connected or outdated, please update USB port driver. Also change USB port on your PC, sometime some USB are slightly damaged (ESD) with the course of the time.

If the issue persists, please contact us, the long 20 m USB extender cable might be also damaged, check that no damage has occurred on this cable (no small animal has started to eat the USB cable for instance).

4.2 System delivers noisy measurements

The SUN sensor is installed into a moving support (wind) or support that has vibrations. Install the Sun sensor into a very stable/stiff support.

5 Product terms of use

The use of this product is solely for getting seeing figure in the line of sight of the SUN, entertaining, educational or scientific purposes.

Use of this product involving people's lives is the responsibility of the user and in no way ALCOR SYSTEM will be held liable for injuries to persons or property theft as the use of this system described in this manual.

---0O0---