

SODIS

Stellar Occultation Data Input System

Quick Start Guide

for Observers



About this document

After two and a half years of [SODIS](#) we see a rapid development (more than 8000 reports reviewed). SODIS 2.0 with a more user-friendly report input page was released in the last few weeks. The current version of the [SODIS Observer Documentation](#) dated 21 March 2023 is very comprehensive and goes into many details, but is no longer up to date in parts (will be subject of an update).

In response to requests from individual observers, these brief instructions were therefore created to represent the current status. The document is primarily aimed at new or less experienced observers in the field of stellar occultations by minor bodies. It describes the minimum requirements for the preparation of SODIS reports.

As SODIS continues to evolve, things in this document may not reflect the status you find on the SODIS pages. According to the intention of the document it cannot deal with hardware issues or details of photometry and data-reduction software.

Change log

V 01-07-2025 First version

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1 SODIS overview

SODIS (Stellar Occultation Data Input System) is the IOTA/ES data collection system for observations of occultations by minor planets and other solar system bodies. SODIS relies on a database managed by IOTA/ES. Figure 1.1 shows the dataflow of the SODIS system. As a new observer, you only have to deal with the areas that are not greyed out.

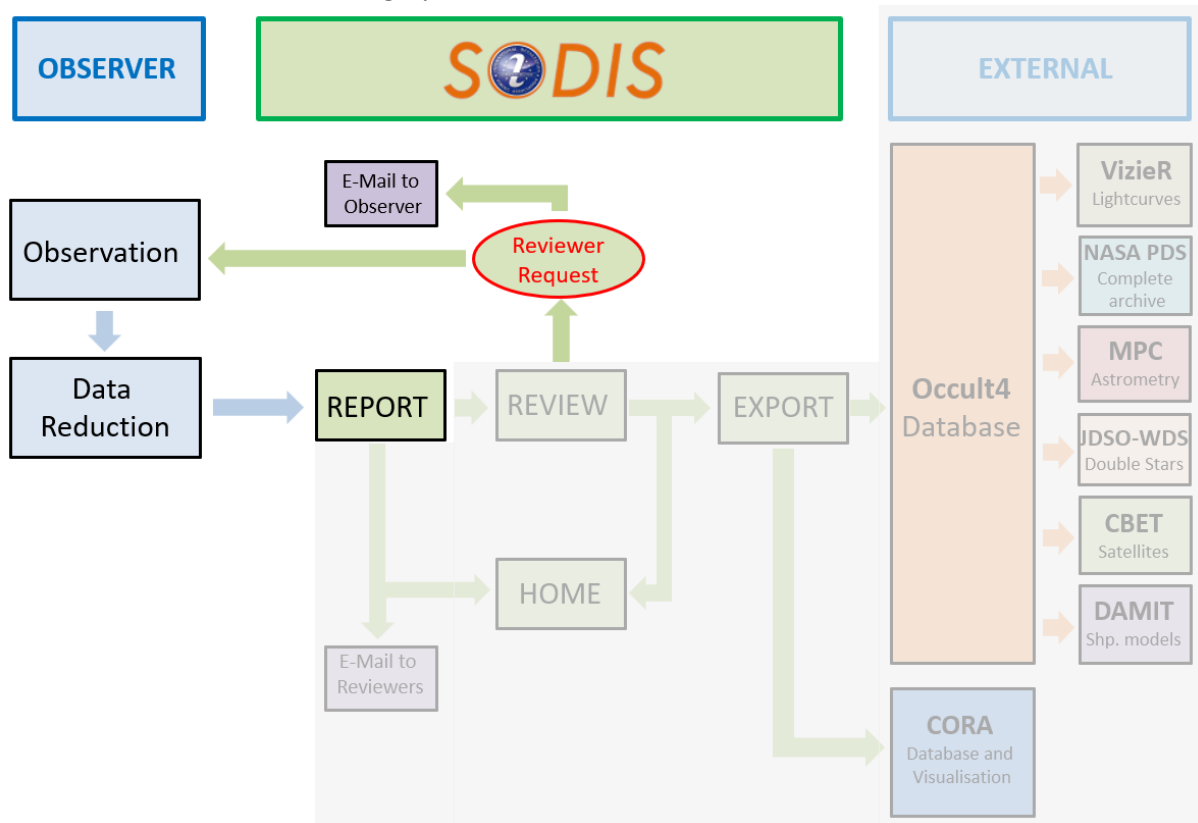


Figure 1.1 SODIS data flow (greyed out – not relevant for SODIS beginners)

2 Prerequisites

In order for your observation to be included in SODIS, it must fulfil certain requirements. Apart from the hardware, which is not covered here (must allow sufficient timing with a sufficient signal-to-noise ratio), you need above all some programmes that make the requirements for a SODIS report feasible. All programmes run on current MS Windows operating systems. Some of the programmes require a little more in-depth training - but perhaps you are already familiar with them.

2.1 OccultWatcher

OccultWatcher (current version 5.4.1) informs you about a possible occultation event that can be observed from a specific geographical position. It is also used to show the community your planned observation and then to report the results of your observation to the community again. To install, follow the instructions on the website. There are several add-ins, install at least:

- **'IOTA Reporting add-in'** (already included in the main installation, but must be configured)
- **'Occult Tools for OccultWatcher'** (must be configured)

The latter enables the display of the occultation map with all important data (Occult4 required), see an example in Figure 2.1. The **'IOTA Reporting add-in'** is the best way to report to SODIS, mainly

because it avoids input errors in the SODIS report mask as far as possible (see Chapter 3.2). There is also an online version of OccultWatcher, [OccultWatcherCloud](#).

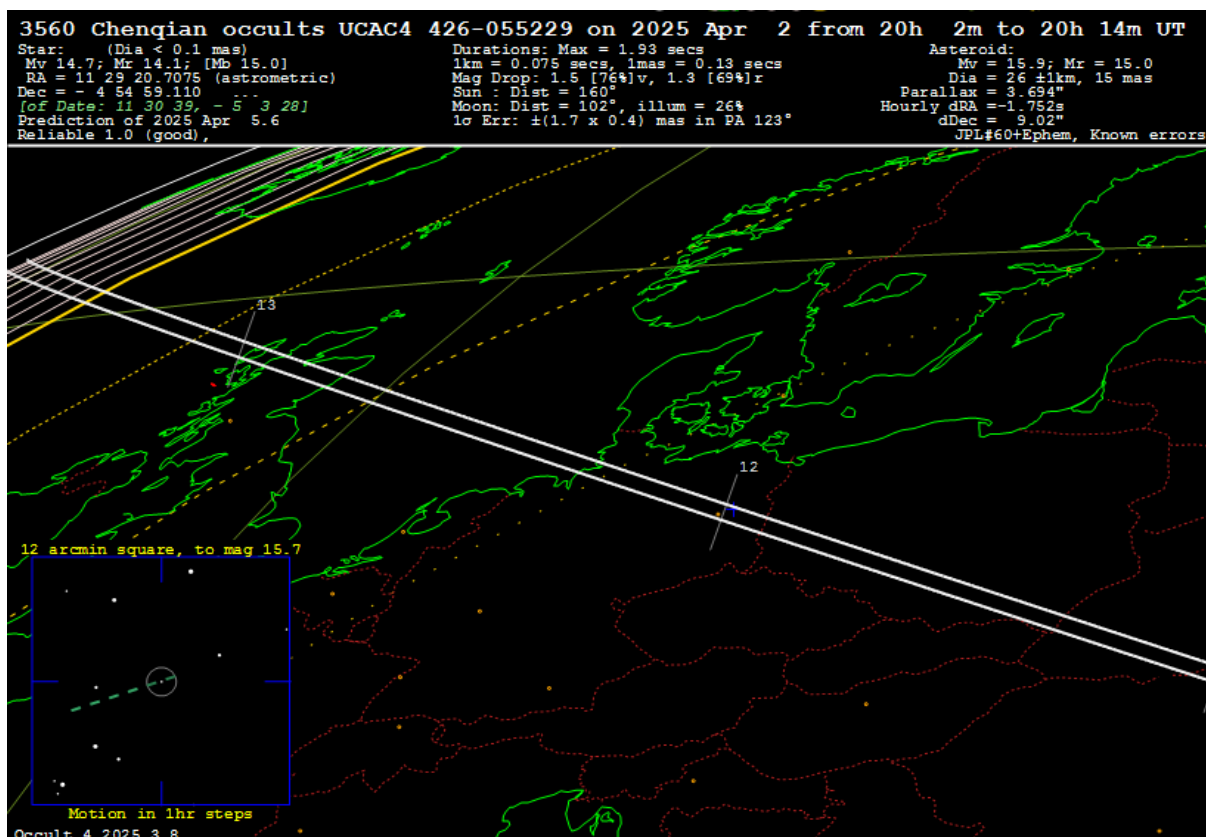


Figure 2.1 Occult4 occultation map, retrieved from OccultWatcher

2.2 Occult4 (including AOTA)

[Occult4](#) (current version 4.2025.6.22) is the very comprehensive and powerful basic programme for occultation work - only important functions are mentioned here. The installation is somewhat complex (programme folder of about 8 GB), follow the instructions on the website. In addition to the above-mentioned possibility of generating occultation maps directly from OccultWatcher, Occult4's '**AOTA**' subroutine, one of the recommended tools for extracting occultation data from a light curve, is particularly important for beginners.

The most common user errors when working with AOTA are described in Chapter 3.3.

2.3 Tangra

[Tangra](#) is the recommended photometry programme (current version 3.8.0) to produce lightcurves from your recordings. Don't forget to vary the photometric methods and parameters ('Data' > 'Quick Re-Process') to optimise the event (to get the best SNR).

2.4 PyMovie

[PyMovie](#) (current version 4.1.5) is another recommended photometry programme based on *Python*. For installation hints see Chapter 2.5.

2.5 PyOTE

[PyOTE](#) (current version 5.7.11) is the corresponding data reduction tool for PyMovie. PyMovie/PyOTE are corresponding with Tangra/AOTA. Both software packages are recommended, however, for a

beginner Tangra/AOTA will be sufficient. **Please avoid mixing up the two processing chains. In SODIS, it is usually enough to report the results from one of the two processing chains.** To install PyMovie/PyOTE strictly follow the [installation guide](#). Python 3.10.11 from the MS App Store was used successfully on a current W11 24H2 Home system (do not install any other Python version).

2.6 SODIS

[SODIS](#) does not require installation, but is an online system that can be accessed via a web browser. [Registration](#) is required for reporting to SODIS. After registering, you will receive an e-mail with your login details. After registration and log in you will find the account details via your avatar at the top right of the SODIS website.

3 Reporting to SODIS

3.1 SODIS data entry

Please report to SODIS at least *within 3 to 5 days after observation*. And also *update your OccultWatcher station with your result*. SODIS collects both negative and positive observations, which must be entered in the SODIS [report mask](#) (Figures 3.1, 3.2).

All times are entered in UTC.

1 Read Form 1 Datei auswählen Keine ausgewählt 1 READ

Occultation Positive 2 Date Observation tt-mm-jjjj 3 Predicttime --:--:-- Predicted event time for observer position

Additional Obs 4 Enter only one additional observer 5 More Obs

Star UCAC 6 Asteroid 7 No 8

Located near 9 Enter the nearest town marked on a commercial map Station Name 10

Country Code of the observation country position AD (Principality of Andorra) 11

Latitude DEG 12 MM 12 SS.s Longitude DEG 12 MM 12 SS.s

Altitude 13 m Datum Type WGS84

Telescope Unstated Aperture cm Effective Focal Length 14 cm

Obs Method unspecified Exp Time s.sss

Start Obs HH MM SS.ss End Obs HH MM SS.ss

D Main Star 15 D Time HH MM SS.sss Acc_D 16 S.sss

Duration NaN s.s

R Main Star 15 R Time HH MM SS.sss Acc_R 16 S.sss

Time Source unspecified Camera Signal/Noise 17

Observation conditions

Wind Temp °C Transparency Clear Seeing unstated

Figure 3.1 Upper part of the SODIS data entry page (for the blue numbers see text). The duration is calculated automatically

The input mask is designed to be largely self-explanatory. The fields outlined in red are mandatory, but all other fields should also be filled in. Many fields offer a selection or indicate how to fill in. Please note following frequent incorrect entries relating to the blue numbers in Figure 3.1:

- 1 Fields for the (very recommended) data entry using a report form (see Chapter 3.2)
- 2 The actual date on which the *observation was made* (not the date on which the prediction was made)
- 3 The predicted event time for the observer's geographical position (coming e.g. from Occult Watcher)
- 4 Additional observer, *one only*. Note: *your name as observer is automatically filled in*, no entry in the report mask
- 5 Check if more than one additional observer
- 6 Occulted star designation according to prediction
- 7 Asteroid name, note the usual space between the two parts of the name (e.g. 2003 SH308)
- 8 Asteroid number
- 9 Enter the nearest village or town marked on a map like Google Maps. This information is used to detect any incorrect geographical position entries. For example, you should not enter a large city that is 50 km away, but something close to the observation position
- 10 Name of your choice for your observation station, e.g. a MPC observatory code. This is optional and will not appear in the Occult4 database later on
- 11 Country code of the *country from which you have observed*
- 12 Latitude and longitude of your observation location. Be very precise here
- 13 Height of the observation site above sea level, accurate to the nearest metre. Can be found in Google Earth
- 14 Effective focal length used (includes e.g. focal reducers)
- 15 The selection depends on the type of event. For example, a second report with 'Second Star' is required to report the second component of a double star
- 16 Error bars of D and R time, given by the data reduction tools
- 17 Signal-to-noise, given by the reduction tools AOTA: see AOTA report, PyOTE: DNR from PyOTE log file

The lower part of the SODIS report page is mainly used to upload required files, see Figure 3.2.

Drag & Drop your files or [Browse](#)

Powered by PQ/INA

Please provide following files:

- 1 In case of a negative occultation:
 - Occultation Map
 - Image of light curve with object and referenz star (Tangra or PyMovie)
 - Light Curve CSV Export
- 2 In case of a positive occultation:
 - Occultation Map
 - Image of light curve with object and referenz star (Tangra or PyMovie)
 - Light Curve CSV Export
 - AOTA evaluation: Tab5 screenshot; PyOTE evaluation: screenshot of PyOTE light curve window
 - AOTA result file or PyOTE log file
 - voluntary, not obligatory: DAT file of the light curve

Comment

3

4 UPLOAD

5 DELETE

Figure 3.2 Lower part of the SODIS data entry page (for the blue numbers see text)

Note required files to upload with your report and some other hints relating to the blue numbers in Figure 3.2:

- Files to upload with a **negative report** (no occultation recorded), see Figure 3.3

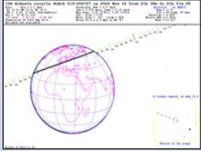
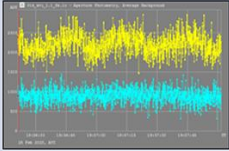
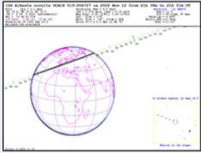
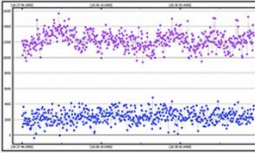
Pipeline	Event	Overview	csv File
Tangra, AOTA	 PNG-Image from Occult-Watcher: „Open Event in Occult“	 PNG-Image from Tangra: „Export lc / Save as Image File“ Include at least one comparison star	csv file from Tangra: „Export lc / Save as csv File“
Py-Movie, PyOTE	 PNG-Image from Occult-Watcher: „Open Event in Occult“	 PNG-Image from PyMovie: „Plot“ („Composite Lightcurve Plot“) Include at least one comparison star	PyMovie csv file (Result of PyMovie photometry)

Figure 3.3 Files to upload with a negative report

Note: A negative observation must also be reliable, i.e. with both sufficient time resolution and signal-to noise ratio, depending on the prediction data.

- Files to upload with a **positive report** (occultation recorded), see Figure 3.4

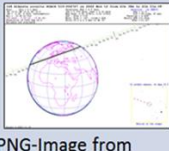
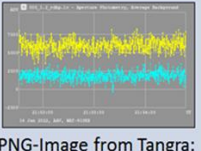
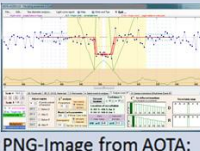
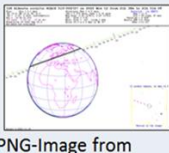
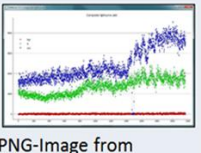
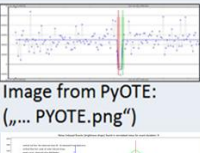
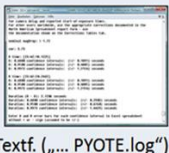
Pipeline	Event	Overview	Reduction	Log	csv File
Tangra, AOTA	 PNG-Image from Occult-Watcher: „Open Event in Occult“	 PNG-Image from Tangra: „Export lc / Save as Image File“ Include at least one comparison star	 PNG-Image from AOTA: „tab 5“	 Textfile („... AOTA_Report.txt“) from AOTA „tab 6“: „Save Report“	csv file from Tangra: „Export lc / Save as csv File“
Py-Movie, PyOTE	 PNG-Image from Occult-Watcher: „Open Event in Occult“	 PNG-Image from PyMovie: „Plot“ („Composite Lightcurve Plot“) Include at least one comparison star	 Image from PyOTE: („... PYOTE.png“) („... noise_induce_event_pyote.png“) "NIE-Test"	 Textf. („... PYOTE.log“) from PyOTE	PyMovie csv file (Result of PyMovie photometry)

Figure 3.4 Files to upload with a positive report

- Field for observer **comments**, primarily for the reviewer. The reviewer will decide whether comments remain for export to the Occult4 database. Please enter only really necessary comments. Note: Dave Herald wrote: *‘There are some limitations non characters. They must all be ASCII - the ASCII values must be between 32 and 127. Also ASCII 124 {the pipe character | } is replaced with an underscore, if present. Not that this means carriage returns and line feeds are excluded.’*

- 4 To upload your report. To enter one time after all entries are made and all the required files are dropped
- 5 To delete (and not to upload) your report

If you are unsure about making entries in SODIS - you can find plenty of example reports on the SODIS pages.

3.2 Working with a report template

As already mentioned, to avoid entry failures it is strongly recommended to use a [report template](#) which is widely automatically filled in by OccultWatcher. The procedure is detailed described in the [SODIS Observer Documentation](#), see Chapter 1.4.

3.3 The most common observer errors when using AOTA

Unfortunately, when using AOTA, there are 'standard mistakes' that are made again and again by users (and sometimes also by reviewers), despite repeated warnings. There are detailed descriptions of these in the [SODIS observer documentation](#), here are just a few brief notes.

AOTA as part of Occult4 is still the standard evaluation programme in Europe. One of its advantages is that, together with Tangra, it accurately handles the time delays of a wide range of cameras. A very detailed guide is part of the Occult4 help system. AOTA is logically structured; the problems occur mainly with its '**tab5**' - '**Analyse event**'.

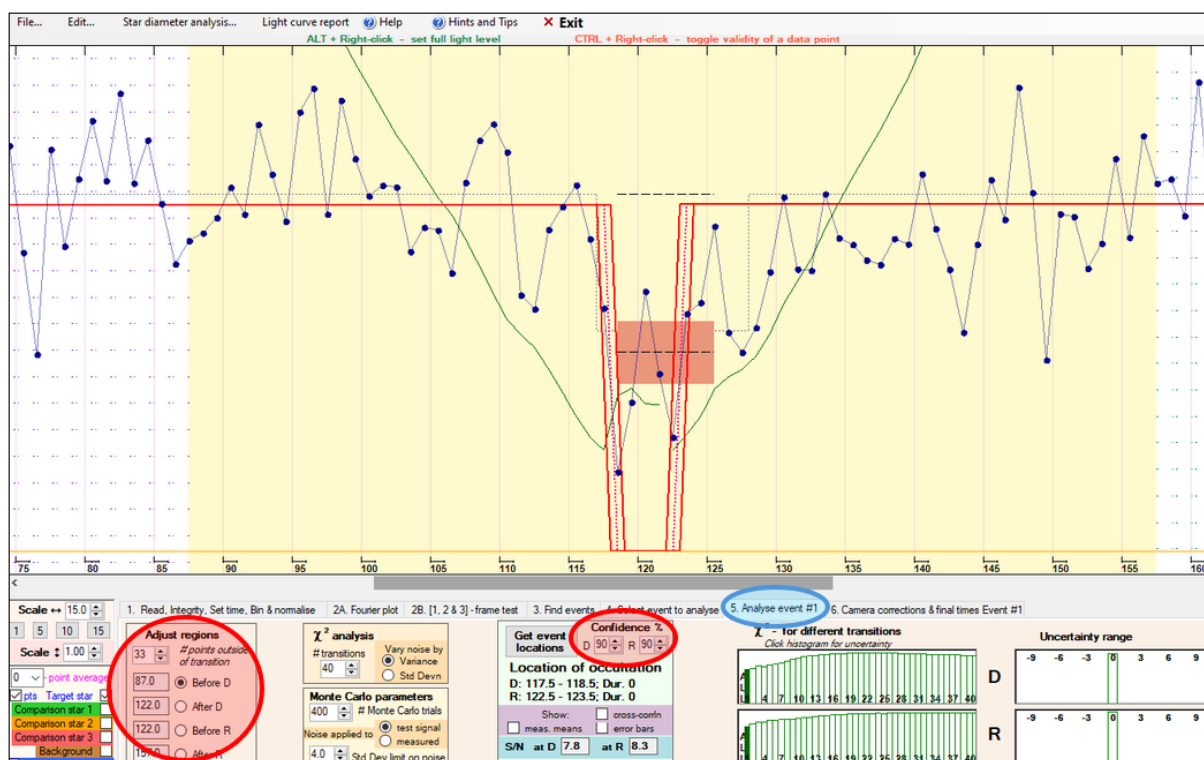


Figure 3.5 AOTA tab5 example sent to SODIS with an observer report. '**Confidence %**' must be set to 95% and '**Adjust regions**' was not done or was done incorrectly

As can be seen in Figure 3.5, the confidence level was set incorrectly (90%); it must be 95 %. Since the regions were not set or were set incorrectly, the bottom of the occultation event does not represent the true light curve. There are many other negative implications of incorrectly set or unset regions, details can be found in the [SODIS observer documentation](#), Chapter 3.3.1. Figure 3.6 shows the results of tab5 after the regions and confidence have been set correctly.

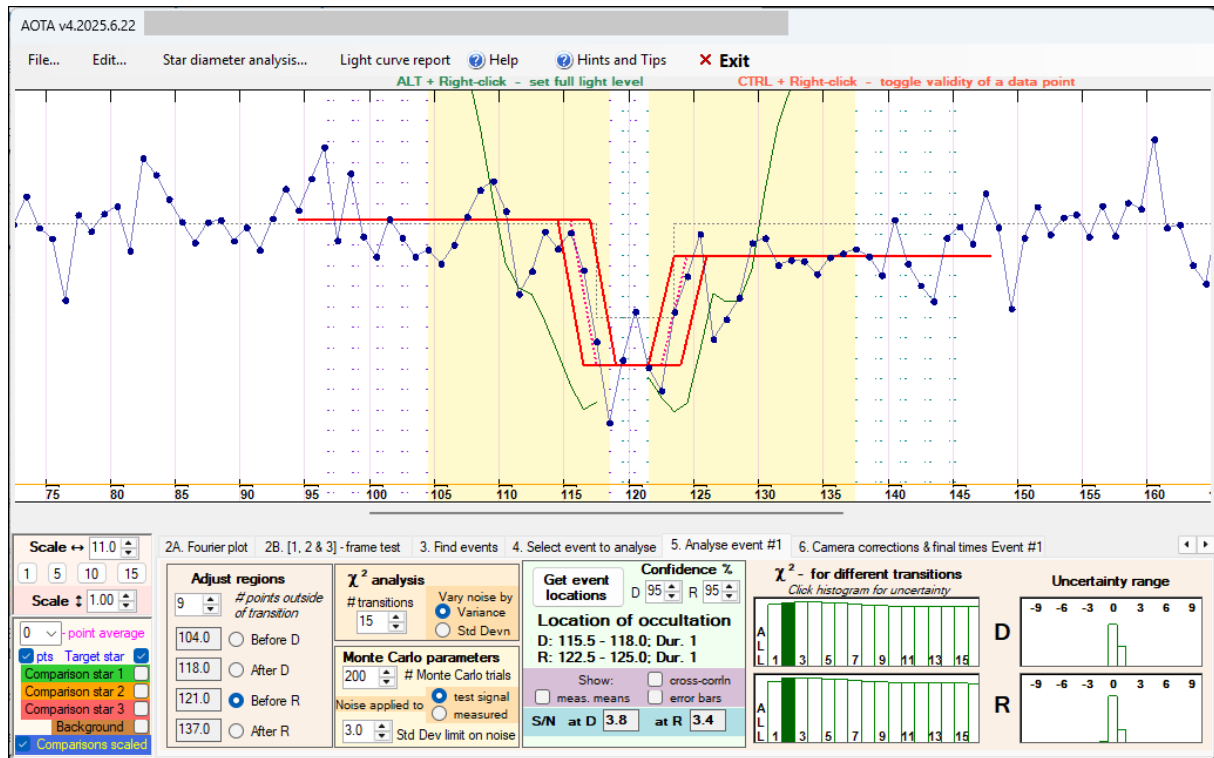


Figure 3.6 Example from Figure 3.5 with correct settings

With **tab2B** there is also a relatively new function in AOTA in relation to 1 - 3 frame events, called **'[1, 2 & 3] - frame test'**. It is used to evaluate events with only a few frames and is *mandatory*. Unfortunately, this test is often forgotten. The results should at least be added to the report as an observer comment, and a corresponding image can also be uploaded. If the test is not passed, a SODIS report is at least questionable. An example is shown in Figure 3.7. PyOTE has a corresponding test (Noise Induced Event test), see Figure 3.4.

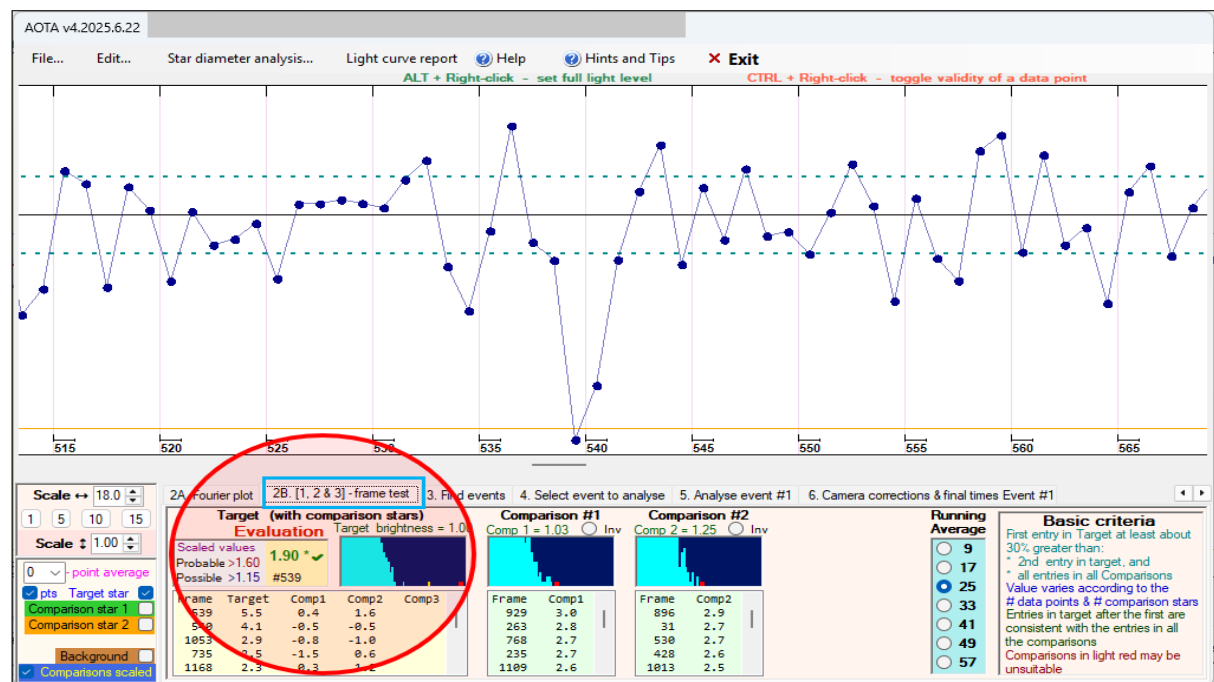
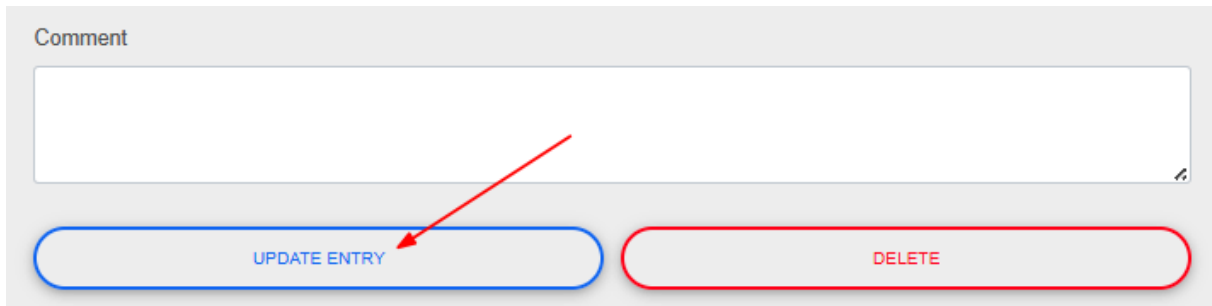


Figure 3.7 AOTA tab2B test for events with full data points

3.4 After the upload of your observation report

Please refer to the [SODIS Observer Documentation](#), chapter 1.6. After clicking on your avatar at the top right of the SODIS website please check your report for possible failures. You will be still able to make corrections which must be confirmed by clicking **'UPDATE ENTRY'** (Figure 3.8).



The image shows a user interface for editing an observation report. At the top, there is a text input field labeled 'Comment'. Below this field are two buttons: a blue button labeled 'UPDATE ENTRY' and a red button labeled 'DELETE'. A red arrow points from the top right corner of the 'Comment' field down to the 'UPDATE ENTRY' button, indicating that clicking this button confirms the changes made in the comment field.

Figure 3.8 UPDATE ENTRY button to confirm/upload changes

4 After reporting

Your report is now in the SODIS database and a reviewer (SODIS currently has 36 reviewers) is going to check your observation for possible formal and content errors. If all is OK, the reviewer will finalize your report and you will find it on the **'HOME'** page of SODIS.

If the reviewer has found some problems, he will inform you in one of the following ways:

- You got an e-mail from the reviewer
- The reviewer made a comment with hints about the issues on your report page
- The reviewer made a SODIS Reviewer Request (see Figure 1.1 and Chapter 1.6 of the [SODIS Observer Documentation](#))

In all cases you should observe your report page frequently as long as your report is not finalised by the reviewer, react on your reviewer and make required changes as soon as possible. Sometimes you are also asked to provide additional files. All changes must be confirmed by clicking **'UPDATE ENTRY'** (Figure 3.8).

5 Trouble shooting

Read the documents first. In addition, many of the required tools have very detailed help within the programmes or on their websites. All our colleagues in the occultation community are also ready to help at any time. Specialised forums are [Planoccult](#) and [IOTAoccultations](#), both require registrations. SODIS also has a special [user forum](#), which is highly recommended (142 members with 1,478 posts; registration required). Questions directly concerning SODIS can be sent to the SODIS e-mail address sodis@iota-es.de.