

New Features of ALISA 4.0

For fast and improved alignment accuracy and efficiency

Alisa is the automated alignment system (software and hardware) developed for alignment and autoreflexion using a digital camera that replaces the eyepiece in an alignment telescope.

The advantages of such a system are enormous: fast, accurate alignment without operator fatigue.

Using the specially designed alignment software, you can typically get a centering accuracy on the target of 2 microns. Please see our web-site www.spot-optics.com for more details on how Alisa can be used. If you have any special need, please get in touch with us.

In the new release Alisa 4.0 we introduce a digital camera for the acquisition and analysis of the images of targets to be aligned. We give a brief list of the advantages offered with the new release, because of the camera and additional important improvements to the software.

In the new version of the software, you can now use pinholes for the alignment, along with the standard targets (circles or squares) inscribed on the front-glass.

| Feature Explanation | Explanation |
|---|---|
| Camera control from laptop computer: makes it easy to operate even in difficult workshop conditions | The camera is connected to the PC through a Firewire connection (IEEE 1394). It can be controlled both from a desktop PC through a PCI card and from laptop PC through a PCMCIA card. |
| Long cable lengths | Using repeaters, the cable connecting the camera to the PC can be as long as 70 meters (216 ft). |
| Quick alignment by a single operator: save time and money | The long length of the cable, plus the fact that it can be controlled from a laptop allows the operator to mount the camera on the alignment telescope, and move the laptop to the alignment target. Thus a single operator can do the alignment quickly. |
| Alignment of targets up to 70 meters (216 ft) away | We are in the final test phase for a new optical adapter that will extend the limit of the alignment telescope from 30m to 60m. |
| Good results even in the presence of air turbulence | It is possible to average several images of the same target before analyzing them. This improves the centering accuracy, even in typical conditions found in workshops. |
| Real-time alignment | Acquisition and display of images can be as fast as 15 frames per second at full resolution. This feature, along with the possibility of drawing a crosshair to indicate the center of the reference target image, enormously accelerates the phase of the first alignment of the targets. Once this is done, then you proceed to get more accurate measurements through the software analysis. |

| Feature | Explanation |
|--|--|
| Reference center always visible on the monitor | The center of the reference target (software cross) can be superposed on the image of the target to be aligned. The cross hair can also be positioned arbitrarily, e.g. corresponding to the center of the screen. |
| Sub-frame mode acquisition | Using the mouse, a limited zone of the image (subframe) can be used for faster acquisition and analysis. |
| Real-time zooming | A zoomed image can be acquired and displayed on the screen with the magnification chosen by the user. |
| Extreme precision in alignment | The small pixel dimensions for the camera (7.5 microns) imply an improvement in the accuracy of the results of the alignment analysis. On the other side, the large dimension of the chip allows the coverage of a larger field. |
| For all Windows system | The software package Alisa is now available for all Windows 98SE/ME/NT/2000/XP. |

ALISA 4.0: Technical Specifications

The only automated alignment and autoreflection measurement system that can be run from a laptop, with a cable length of up to 70m (200 feet)

The Alisa system is designed for alignment telescopes with built-in autocollimator (like the Taylor-Hobson). It has a dual function:

For alignment: The eyepiece is replaced with a digital camera, and the image of the target is displayed on the PC or laptop monitor. Initial alignment is done using the displayed target image, and the final refined alignment is done using software.

For autoreflection: The reflected image of the target on the cover glass is captured by the digital camera is stored and.

Extensive graphs guide you through the alignment process. The graphs and tables can be printed, and also imported into other programs like Microsoft Word to prepare reports.

| Alignment | |
|---|--|
| Standard operating range | 0m (cover glass) to 30m. Telescope dependent. |
| Extended operating range with accessory | Up to 60m |
| Repeatability | Better than 2 microns. |
| Accuracy of determination of centering(1) | Better than 5 microns. |
| Autoreflection | |
| Accuracy of determination of centering(2) | 5 microns up to 1m, less at larger distances. |
| Accuracy of measurement of tilt | 1" at a distance of 1m, less at larger distances |

Notes:

- (1) The centering accuracy refers to the image of the target. This value is projected onto the target as a function of the distance (this is a property of the alignment telescope):
it is $5\mu\text{m}$ over 3m and increases proportionally with distance: about 50microns over 30m. Using the extended range accessory, it is possible to obtain the accuracy of 50microns at a distance of 60m.
- (2) The centering accuracy will depend on the distance to the reflecting target.

SPAL001: The basic kit for alignment consisting of:

- High-resolution digital camera, which can be run from a laptop or a PC.
- 2m cable (*)
- Adapter for attaching camera to alignment telescope (**).
- Basic software for image acquisition and visual alignment using only the images of the targets (for details see software specifications).

The kit for precise alignment analysis consisting of:

- SPAL001. All the items in the basic kit.
- SPAL002. Software for precise alignment using image analysis for Windows98SE/ME/NT/2000/XP (for details see software specifications).

The kit for precise autoreflection analysis consisting of:

- SPAL001. All the items in the basic kit.
- SPAL004. Software for precise autoreflection using image analysis for Windows 98SE/ME/NT/2000/XP (for details see software specifications).

- (*) Longer cables up to 70m can be used with repeaters.
- (**) Adapters for both the Taylor-Hobson MAT and the Brunson telescopes are available. Special adapters made to order for other telescopes.

ALISA 4.0: Software Specifications

SPAL001 : Basic software for image acquisition and visual alignment and autoreflexion using only the images of the targets

High resolution digital camera characteristics: 1280x1024 pixels.
15 fps at maximum resolution

Real-time continuous acquisition and display software with possibility of online modification of the exposure time to get the best contrast.

Can be used from laptop.

Real-time sub-frame acquisition and display.

Possibility of displaying a selected zone of the image with user-selected magnification in real-time.

Possibility of drawing a cross hair defining the center of the reference target image superposed on the image of the current target.

Images can be saved in tiff format and reloaded from the file, printed out and imported in any kind of document like Word, Publisher etc. through a simple Cut&Paste operation.

SPAL002 : Software for precise alignment using image analysis

Any two targets can be used for defining the line-of-sight

Definition of line of sight for targets, diameter and distance for each of the targets from the reference target inside the alignment telescope. These data are used during the analysis.

Definition of ambient temperature during measurements that will be printed out as annotation in tables and graphs.

Details of the operator who is making the measurements, date of measurements and date of analysis that will be printed out as annotation in tables and graphics.

A project is created at the beginning of the measurements and all subsequent measurements and output results will be automatically saved in the same project.

Images of the different targets are automatically saved in tiff format for future analysis if required.

The analysis procedure gives results with a precision of less than 2 microns.

Analysis of the target images gives the following table and graphs output:

Tables with (x,y) centers and their estimated errors from analysis, also stored in a file with suffix table.

Graphs of (x,y) position of the centers of the targets with respect to the line of sight

Graphs of (dx,dy) displacements of the centers of the targets with respect to the line of sight

Graphs with indication of movements to be applied for any pair of targets to get aligned. Direction of movement is also specified.

Outline of each target for checking quality of the image (e.g. due to air turbulence in the workshop).

Any graph can be imported in any kind of document like Word, Publisher etc. through a simple Cut&Paste operation. Graphs and the output tables can also be printed out on any printer attached to the PC.

SPAL004 : Software for precise autoreflexion/autocollimation using image analysis

Definition of diameter and distance for Image and Reference target. These data are used in the analysis.

Definition of ambient temperature during measurements that will be printed out as annotation in tables and graphics

Details of the operator who is making the measurements, date of measurements and date of analysis that will be printed out as annotation in tables and graphics.

A project is created at the beginning of the measurements. Reference and Image. images and output results will be automatically saved in the same project.

Images of the targets are automatically saved in tiff format for future analysis if required.

The analysis procedure gives results with a precision of less than 5 microns.

Analysis of the target images gives the following table and graphs output:

Tables with (x,y) centers and their estimated errors from analysis, also stored in a file with suffix .table.

Graphs of (x,y) position of the centers of the 2 targets.

Graphs of (dx,dy) displacements of the centers of the 2 targets.

Graphs with indication of tilt to be applied to the image target to get aligned with respect to the reference target. Direction of tilt is also specified.

Outline of Image and Reference targets, for checking quality of the image (e.g. due to air turbulence in the workshop).

Any graph can be imported in any kind of document like Word, Publisher etc. through a simple Cut&Paste operation. Graphs and the output tables can also be printed out on any printer attached to the PC.

SpotOptics

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