

gnavigator quick reference guide

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2024-12-02, version 1

gnavigator

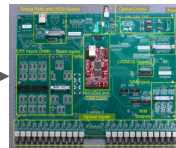
Frontend to **control** the **periscope and laser**, guiding the beam through the **Field Cage** while **avoiding sensitive areas**:

- Uses directly the existing CAD drawings;
 - Based on OpenCascade (CE) libraries;
- Able to identify the part being hit and determine the reflected beam direction.
- Offsets can be corrected based on reference shots (e.g. PIN diodes)
- All actions (e.g. periscopes status, periscope movements) are made through the CIB.

Control Frontend
(w/ CAD support)



Calibration Interface
Board (CIB)



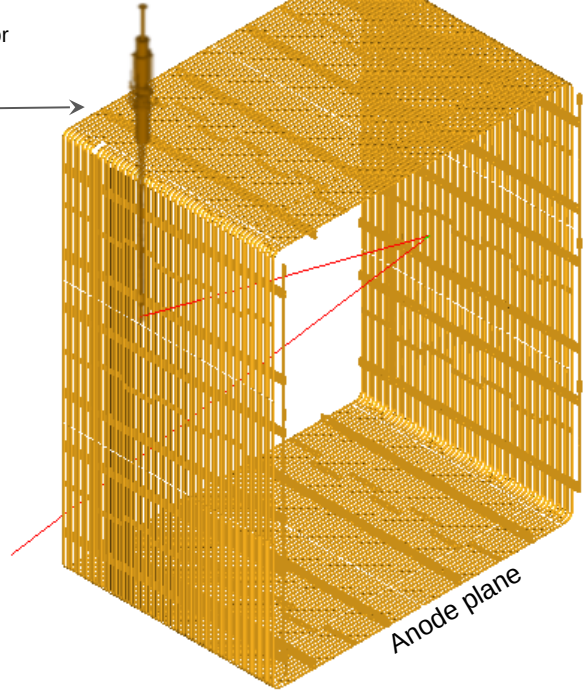
AZD-CD
Controller+driver



AZM911AC motor



Periscope (2)



(screenshot from the control frontend)

gnavigator: at CERN np04-iols-srv-01 (1)

gnavigator is installed on **np04-iols-srv-01**, to run it follow the steps:

- 1) If connecting to **np04-iols-srv-01** via SSH, include the `-X` flag to enable X11 forwarding:
`ssh -X user@np04-iols-srv-01`
- 2) From either the remote or local terminal console, if it doesn't already exist, create a working directory (e.g., `mkdir laser`).
- 3) Inside your working directory:
 - A) Execute `gnavigator-P1` to launch **gnavigator** configured for the P1 laser periscope;
 - B) Execute `gnavigator-P2` to launch **gnavigator** configured for the P2 laser periscope;
- 4) the `gnavigator-[P1|P2]` command creates a default configuration file (`config_per[1|2].json`) inside the working directory and links the default `config.json` to `config_per[1|2].json`, respectively;
- 5) Subsequent calls to `gnavigator-[P1|P2]` inside the same working directory will not recreate the correspondent configuration files; Instead, they will just re-link `config.json` to `config_per[1|2].json`, as appropriated;
 - A) The `config_per[1|2].json` files can be modified locally to reflect each user's preferences. These configuration files are only created automatically if not existing).

gnavigator: at CERN np04-iols-srv-01 (2)

Alternatively, users can use a VNC session for better interaction with the GUI. Detailed instructions can be found here: <https://twiki.cern.ch/twiki/bin/view/Main/VNCCONNECTIONS>

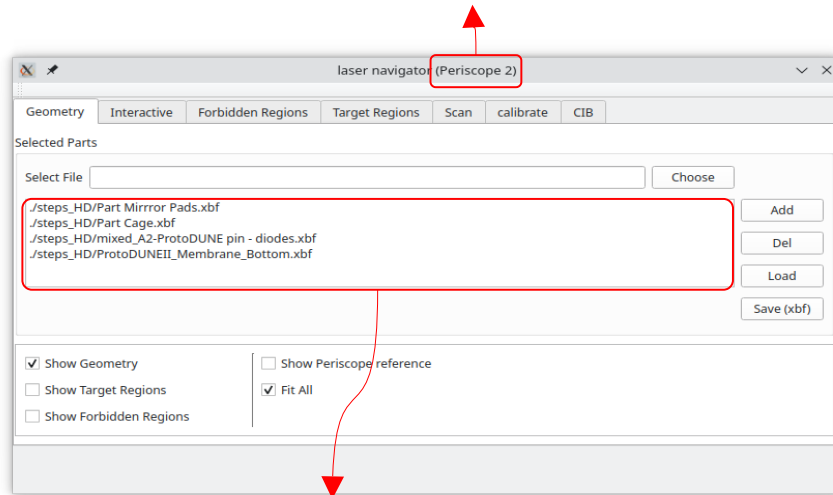
Yet another option is to take advantage of ssh tunneling to start VNC directly at **np04-iols-srv-01**:

- ssh into **np04-iols-srv-01** and use the above instruction to set a VNC password and start a VNC server inside a screen session: **vncserver :ff -localhost -name iols-Session [-autokill] -geometry 1920x1080** (ff is a number between 00 and 99 – see tunnel below)
- From you local machine open a ssh tunnel through lxplus:
 - **(auto)ssh -L9999:localhost:59ff -J user@lxplus.cern.ch user@np04-iols-srv-01**
- Use your VNC client to connect to **localhost:9999** from you local machine.
- User the instruction on the previous slide to start **gnavigator**.

The latest approach ensures that **gnavigator** continues to run even if the internet connection fails, and provides a smooth interaction with the GUI.

gnavigator: load geometry parts

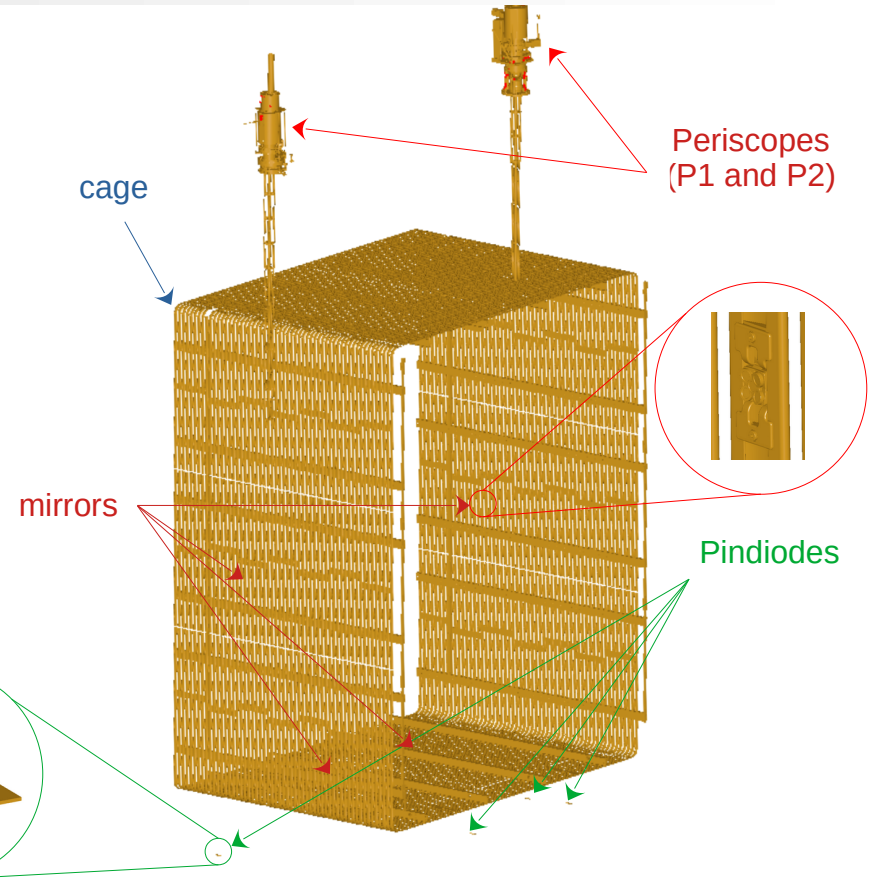
Indicates which periscope is under control



Part files:

- 1) Mirror Pads;
- 2) Field cage;
- 3) Pindiodes;
- 4) P1 and P2 periscopes;

(stp files are slower to load, but can be converted to xbf which load significantly faster)



gnavigator: Interacting with the geometry

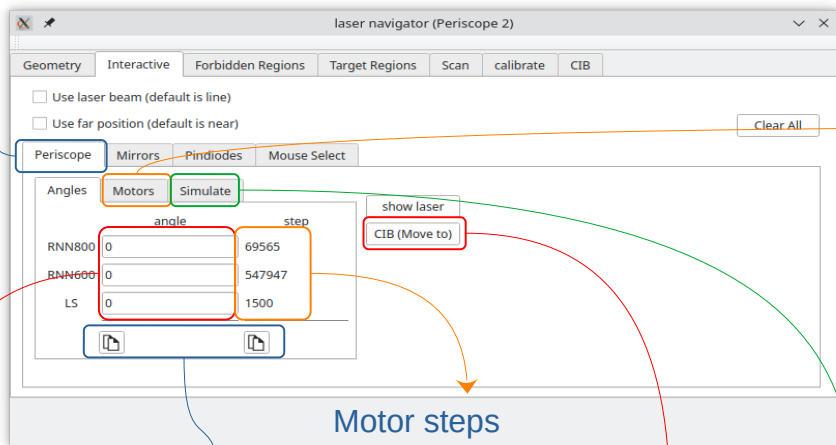
Use the mouse to interact with the loaded geometry:

- **Click and hold the middle mouse button** and move the mouse up|down|left|right to rotate the geometry;
- **Click the middle mouse button** to center that point on the drawing canvas;
- **Rotate the mouse wheel** to zoom in|out the geometry over the center point of the geometry;
- In the *Interactive* → *Mouse Select* tab **Ctrl + Click the right mouse button** to select the coordinates of the clicked point

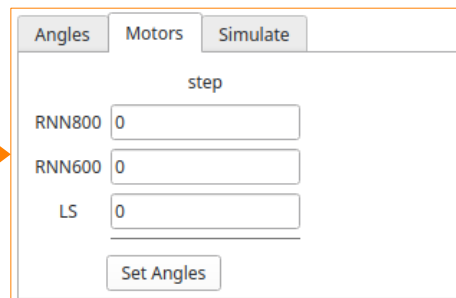
(Note: when the connection is remote using X11 forwarding, any change in the geometry display can take a few seconds to update/refresh)

gnavigator: Interactive targeting (1)

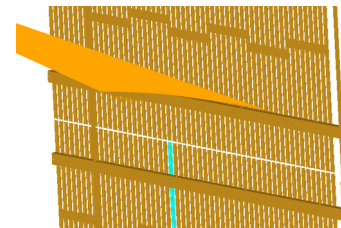
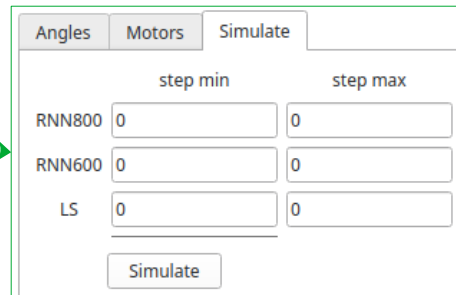
Periscope: allows to select directly the motor coordinates



Select directly motor coordinates



Quick simulation of laser movement
(Do not calculate reflections neither
check against forbidden regions)



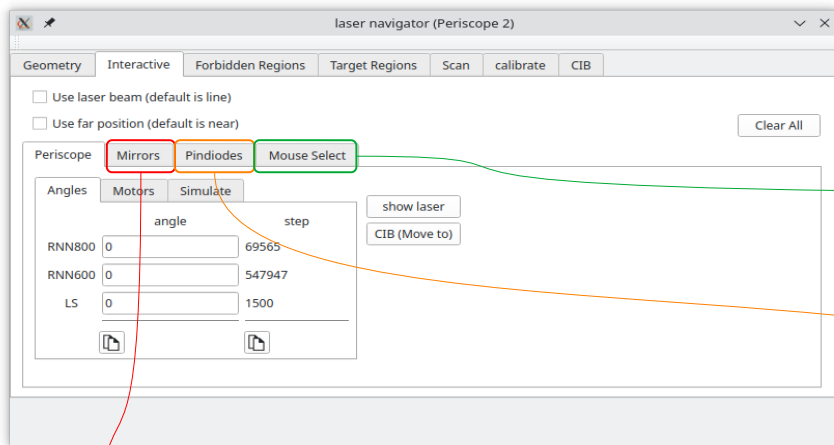
(RNN800 movement)

Copy angles/motor coordinates into clipboard

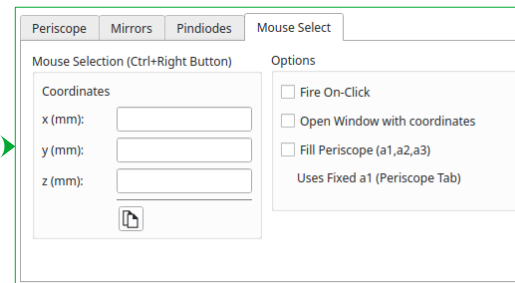
Set CIB "move to" motor (steps) coordinates,

- Select directly motor angle coordinates (degrees):
 - correspondent motor steps are only **updated** after clicking "show laser".

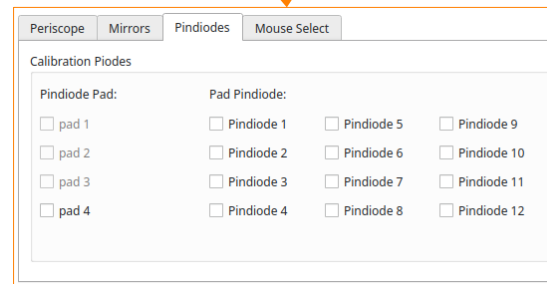
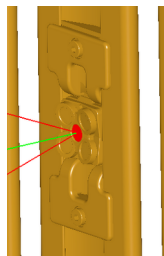
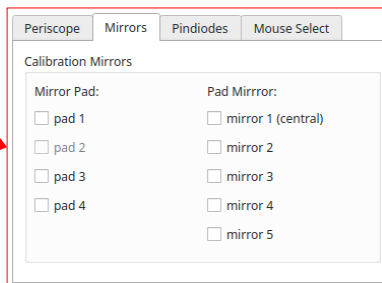
gnavigator: Interactive targeting (2)



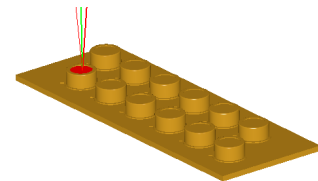
Select coordinates using mouse clicks



Select coordinates for 1 or more mirrors

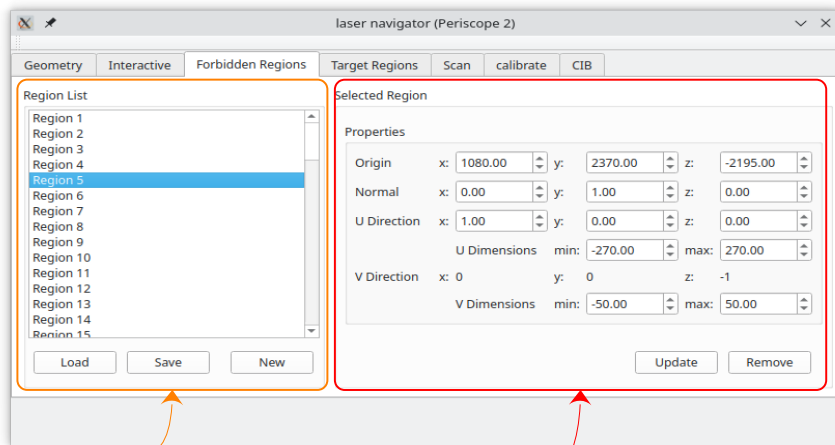


Select coordinates for 1 or more pindiodes



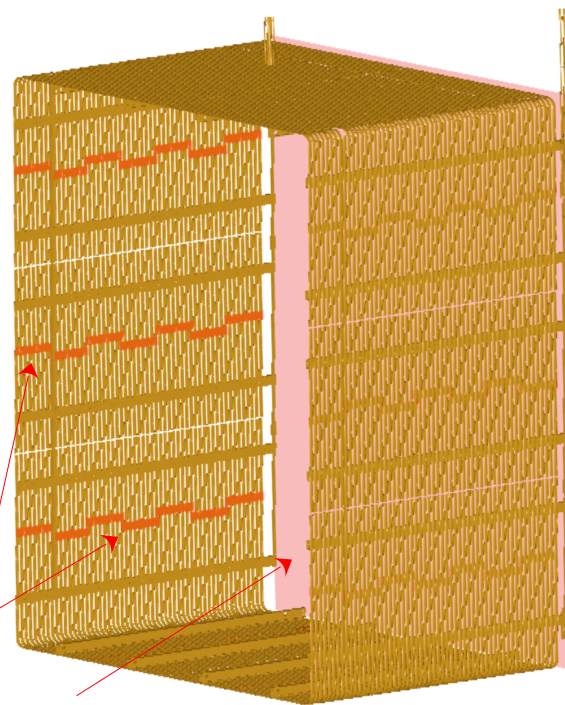
gnavigator: forbidden regions

Define regions we **forbid** the laser to hit either directly or after a reflection:



Region navigator

Single region configuration

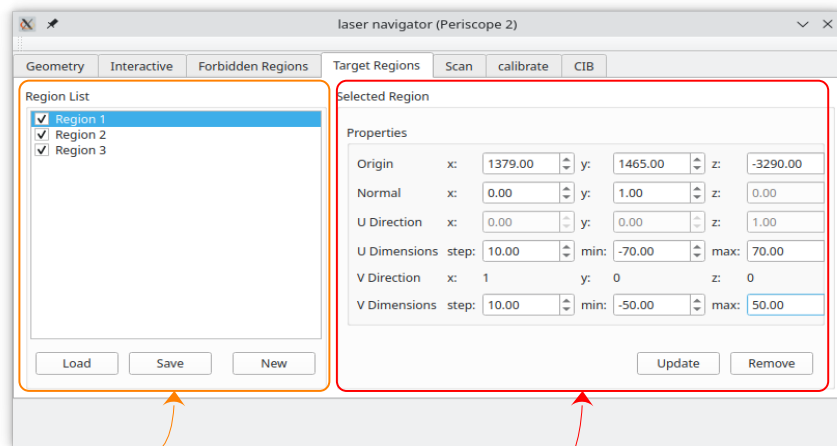


Voltage divider resistors

Anode Plane Assembly (APA)

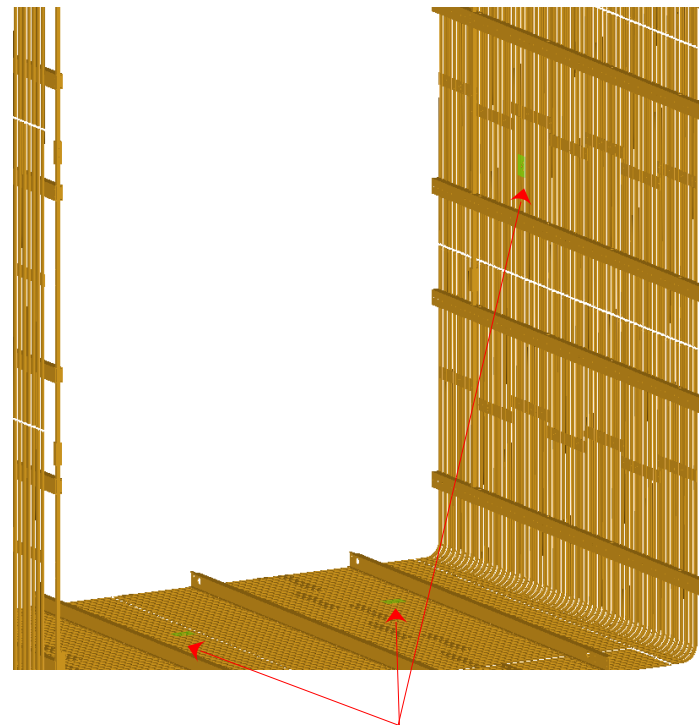
gnavigator: target regions

Define regions we want to target during a scan:



Region navigator

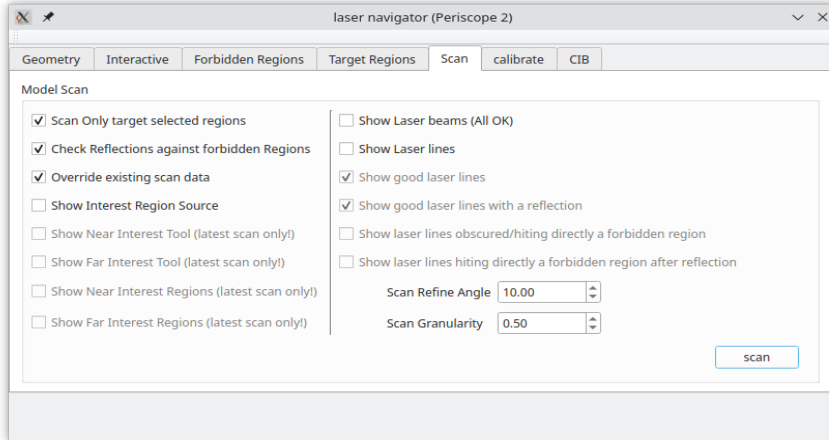
Single region configuration



Target scan regions for 3 mirror pads

gnavigator: scan and calibrate

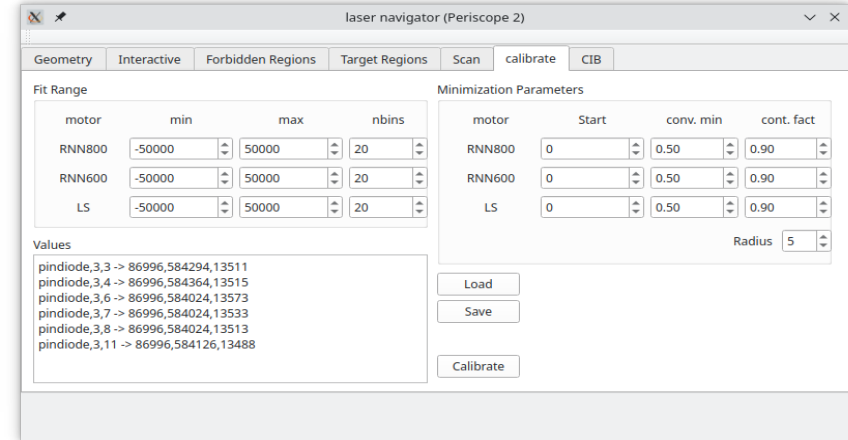
Perform a scan:



Calculate the motor coordinates (RNN800, RNN600 and LS) for the target points defined for each of the **target regions**:

- Considers the transversal profile of the laser beam;
- Find the coordinates with best clearance when going through the field cage;
- Avoids forbidden regions (direct and reflection hits);

Calibrate motor offsets:



Calculate the motor offsets (RNN800, RNN600 and LS) from a list of target coordinates:

- Supports (x,y,z) coordinates for the laser hit position;
- Supports naming (i.e. mirror, pindiode) of the laser hit;

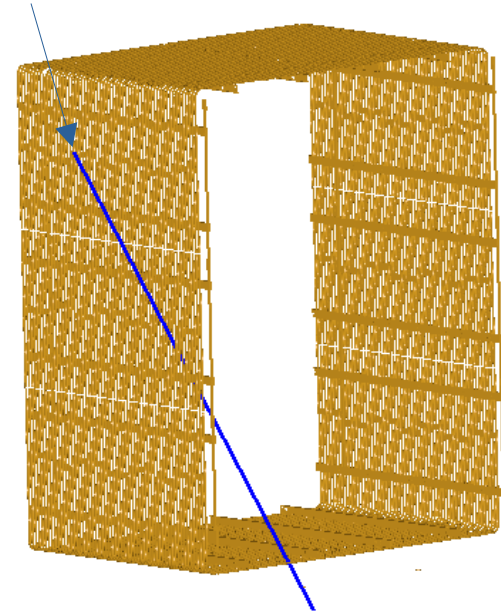
CIB (1): Monitoring

(dis)connect from/to CIB server
(different servers for P1,P2,...)

Property	Value
13 LS1.LSTAGE.current_position_mo...	16124
14 LS1.LSTAGE.state	offline
15 LS1.PM1.average_reading	9.6e-05
16 LS1.PM1.energy_reading	9.6e-05
17 LS1.PM1.state	offline
18 LS1.RNN600.current_position_cib	610041
19 LS1.RNN600.current_position_m...	610041
20 LS1.RNN600.state	offline

Log messages:
[2024-12-02 14:54:17] : Failed to connect to server: BadDisconnect
[2024-12-02 14:54:17] : Failed to connect to server.
[2024-12-02 14:54:17] : Fail to connect to CIB
[2024-12-02 14:54:51] : Successfully connected to server.
[2024-12-02 14:54:51] : Connected to server and started monitoring.

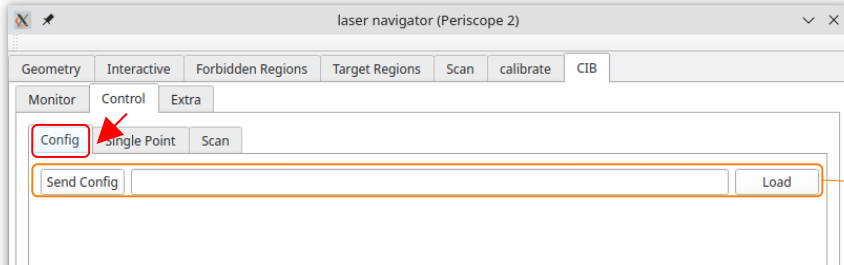
laser direction indicator: provides a visual indication of the direction the laser/periscope is pointing, independently of the actual laser status (e.g offline, warming)



- RNN800, RNN600, LS motor positions and status,
- Shutters status;
- DAC threshold;
- etc

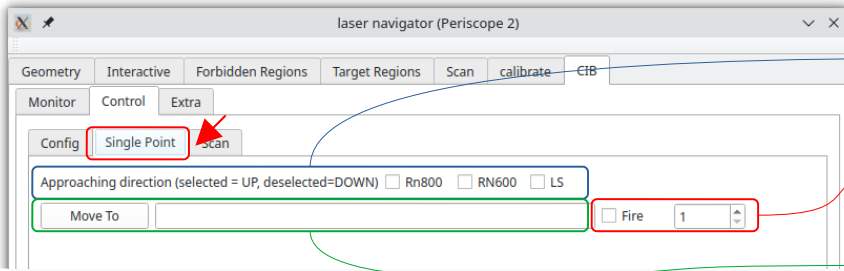
(values are updated every second)

CIB (2): Control



IMPORTANT: multiple clients can be connected simultaneously to the CIB server for monitoring and control. Make sure no one else is **controlling** the laser before sending **ANY** laser command from your navigator instance.

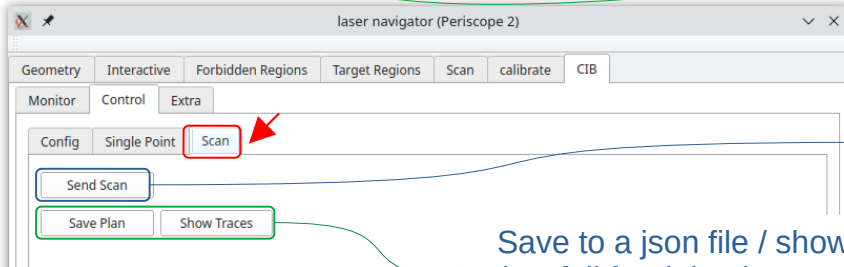
Loads and send a configuration file (json) to the CIB. Do **NOT** edit the config file without consulting a CIB expert!



Direction of approach to the new position (up/down)

If selected, fire the laser the chosen number of times at the new position. **Not checked against forbidden regions!**

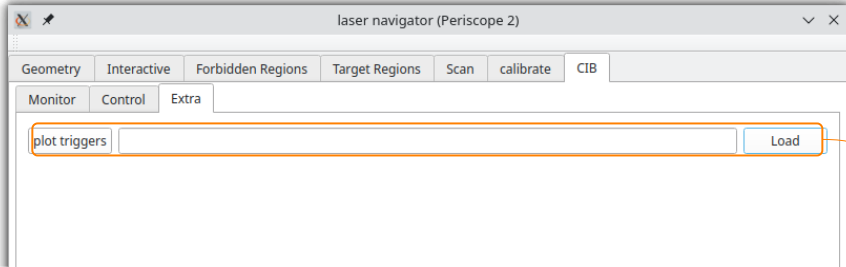
Move the periscope to a new position (motor coordinates). The position can be filled from the tab **Interactive > Periscope**



Send the scan loaded/available from the tab **target regions**. **The scan positions are checked against forbidden regions.**

Save to a json file / show at the CAD the scan traces as will be sent to the CIB (usefull for debug)

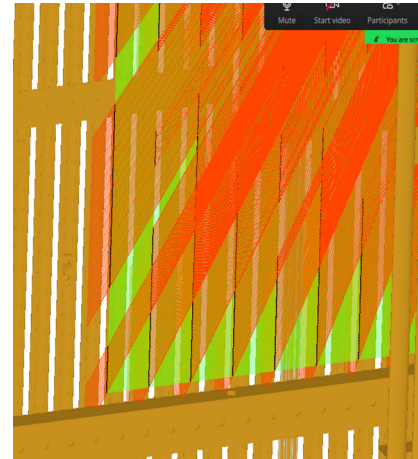
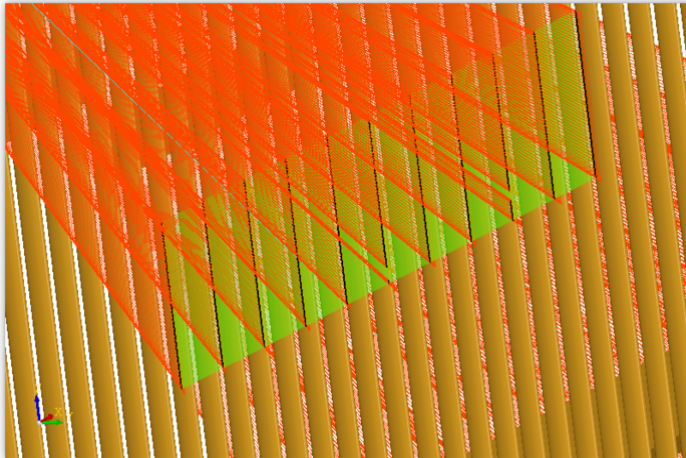
CIB (3): Extra



Loads a text file containing the actual trigger positions (motor coordinates) and show them at the CAD (see examples):

```
timestamp;rn800;rn600;LS
```

...



Send feedback on your user experience and report bugs/issues:

- slack: @Francisco Neves
- email: neves@lip.coimbra.pt