

specMACS

GUI Manual

Overview

The screenshot displays the specMACS GUI interface, which is divided into several functional areas:

- VNIR Overview:** Located in the top-left, it shows a heatmap titled "preview of spectral channel 100" with a vertical axis for "spatial pixel number" (0 to 1200) and a horizontal axis for wavelength (0 to -300 nm).
- SWIR Overview:** Located in the top-right, it shows a similar heatmap titled "preview of spectral channel 100" with a vertical axis for "spatial pixel number" (0 to 300) and a horizontal axis for wavelength (0 to -300 nm).
- System Status:** Located in the middle-right, it displays a table of system resource usage:

name	usage
grabbers	
vnir	0 %
swir	0 %
blesshuhn	
disks	64 %
cpu	8 %
memory	20 %
- Manual Capture:** Located in the top-right corner, it contains controls for "start Capture" and "stop Capture", along with checkboxes for "spectral binning for VNIR", "only averages", and "auto-cycle files 4000". It also includes a dropdown for "intent" (set to "cloud sides") and a "comment" field with the text "partly cloudy, 38 deg".
- System Log:** Located at the bottom, it displays a log of system messages with columns for "type", "node", "source", and "message".
- User Comments:** Located in the bottom-right, it provides a text area for "write comments here" and a "save" button.

Blue arrows point from the text labels on the left and right to their corresponding GUI elements.

Spectrometer Overview

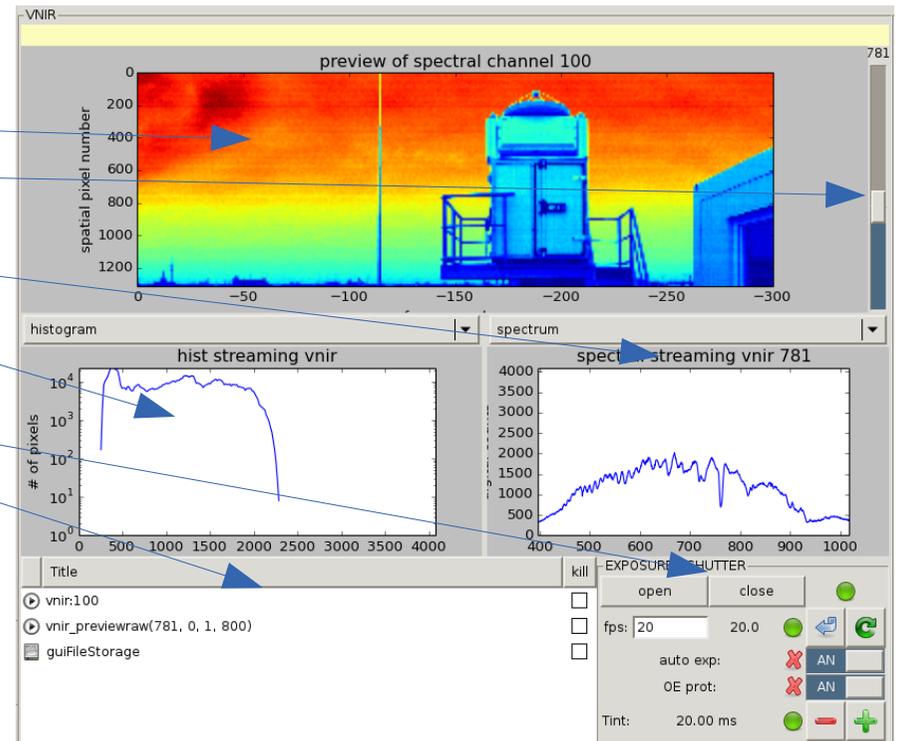
The spectrometer overview is available for each spectrometer separately and shows all important live measurement data. It consists of:

- image preview
- spatial selector
- 2 multipurpose data views (MPDV)
- extractor listing
- exposure and shutter controls

The **image preview** shows a picture of the last 300 frames of one selected spectral channel.

The two **MPDV** can show different data streams which can be selected from the drop down menu above them. The divider between both can be moved. Currently the following data streams are available:

- **histogram**: A histogram over the full sensor chip. It shows how many pixels are illuminated at a certain digital count value and allows the operator to decide immediately if the sensor is underexposed (peak on the left side) or overexposed (peak on the right side). Generally underexposure is preferred over overexposure, because clouds are typically the brightest objects. Thus the histogram in the screen shot shows an optimally or maybe slightly underexposed sensor.
- **min/max/avg**: Three lines are shown, which indicate the minimum, maximum and average digital count number of the sensor. This view is in principle suited for overexposure detection as well, but as a single pixel can already trigger the maximum, it is likely to give more false alarms.
- **spectrum**: The full spectrum (uncalibrated) of a single spatial pixel is shown. The pixel can be selected via the **spatial selector**.
- **spatial**: This is a plot of the 0th frame of the image preview.



The specMACS image acquisition system basically works by providing all frames from the spectrometers to so called “**extractors**“ which can work with these frames and generate various products. The system has some fixed extractors which are always active and not controllable by the user. An example would be the extractor which calculates histograms and averages. Other extractors can be created and removed by the user at any time. These dynamic extractors are shown in the **extractor listing**.

Usually one or more preview extractors will be shown (these are created by the preview windows and are symbolized by ) and during the capture, a **storage extractor must be shown** () , **otherwise no data will be stored!**

Each extractor can be terminated by clicking on the „kill“-Button. This will immediately stop the extractor (gracefully). This is usually only needed, if due to a crash, the extractor was not terminated the normal way. **Note: Killing the storage extractor will immediately stop writing data to the disks.**

The **EXPOSURE / SHUTTER** window allows to control the camera parameters and gives feedback to the user, mostly by the following three icons:

-  : yes / open / on / value is valid
-  : no / closed / off / value is invalid
-  : unknown / system did not respond during the last two seconds

The spectrometer shutter can be opened and closed. As there is no feedback switch which allows to read back the shutter state, the icon can only show the state in which the shutter controller believes the shutter to be. For a definitive state feedback, refer always to the live image or any other data feed.

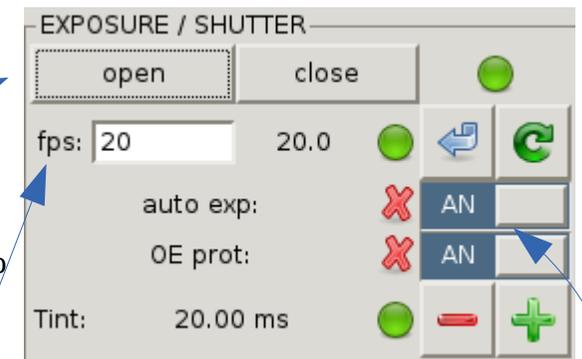
The frame rate (frames per second) can be set () by the user. It can be explicitly requested () and is also periodically reported by the respective control system. The frame rate is the only parameter which is not controlled by the auto exposure controller and must always be set by the user.

The auto exposure controller has a few different operating modes. It has a full auto exposure mode “**auto exp**“ which prevents from over exposure and from under exposure. This mode is the most fragile and must be activated with care. If the system tends to change the exposure time too often, this mode should be deactivated as the first counter measure.

The next mode is over exposure protection “**OE prot**“. This mode will reduce the exposure time, if too many pixels are over exposed. If only this mode is active, the user has to check the exposure time manually and increase it if necessary.

Both modes can be switched on and off using the switch. This switch might come out of sync, which is not problematic and can be solved by switching twice. The current state is always reflected by the indicator icon.

The last row displays and controls the integration time “**Tint**“. Note that the auto exposure system will work against you, if it is activated...



Manual Capture

Capture can be started (●) and stopped (■) manually. Using this control, it will always affect all connected spectrometers at the same time. If a single capture (= storage extractor) has to be stopped, please use the corresponding extractor kill switch.

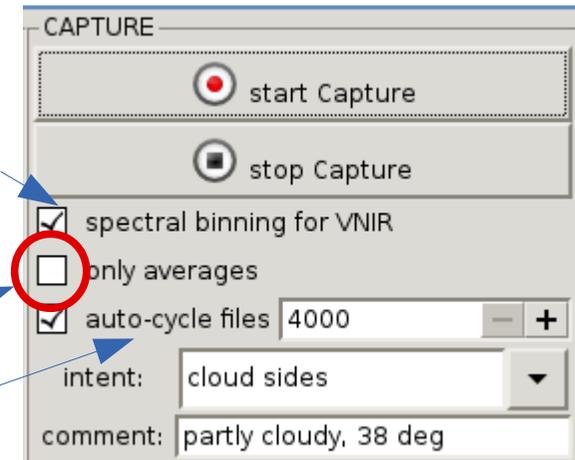
To reduce the amount of stored data, **use spectral binning for VNIR** during flight. Due to oversampling in the sensor, this will only minimally affect the data quality but nearly doubles the maximum recording time.

DO NOT USE only averages during flight. This will save only the average and the variance of all frames taken during the whole capture. It is intended only for calibration purposes.

For longer captures, **use auto-cycle files**. This will create new data files after the given number of frames. The system will ensure, that no frame will be lost while switching to a new file. 4000 frames are a reasonable amount, so you can use this setting.

The **intent** field contains some predefined categories and should be selected according to the intent of the capture. This will be used later, to facilitate the search through the image database.

Likewise, the **comment** field can be used to express the capture intent in your own words and will also be available in the image database later.

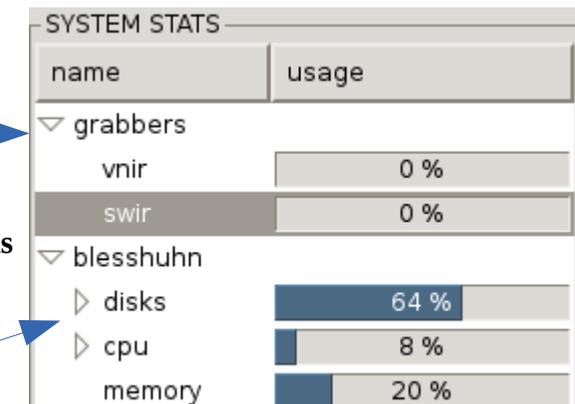


System Status

The system status panel shows live information about some general metrics of connected computers or processing components.

Entries under “**grabbers**” show how many frame cache buffers are used. These buffers hold newly captured images in RAM until they have been processed by extractors. They should be most of the time empty but can fill up quite fast (there are 256 buffers which fill in 10 seconds @ 25 fps). If you see them gradually filling up, there might be too many extractors or the frame rate is too high. **Please try to fix this immediately, because if they reach their maximum, the whole image acquisition will crash.**

Computers are listed by their host names and show some general system parameters. The most important parameter might be **disk usage**, so you can estimate how much capture time is left.



User Comments

If anything happens which should be remembered, it can be noted here. These notes enter the logging facility like any other log message, thus get synchronized and time-stamped. You should assign the comment a **severity tag**, which can later be used to filter more important comments from less important ones. Here “**debug**” means really verbose / the single message is not so important. And “**critical**” means the system crashed or nearly crashed / very important.

Now write your comment into the text field and save it with the lower button.

USER COMMENTS

info

write comments here

save

System Log

The System Log shows the last 1000 log messages from all system components. The severity is shown in the first column. If you see **anything other than debug or info**, please pay some **extra attention** and maybe ask via satcom chat.

```
info camserver camManager.vnir {
  "vnir_previewraw(7, 0, 1, 800)",
  [ 7, 0, 1, 800 ]
}
info camserver camManager.vnir removing zmqPub / vnir_previewraw(5, 0, 1, 800) extractor.
critical gui userComment Sau blöd, jetzt bin ich doch tatsächlich übers Kabel gestolpert, hoffentlich ist die Messung jetzt nicht ganz hinüber!!!
add Extractor: zmqPub (
[
  "swir_previewraw(5, 0, 1, 256)",
  [ 5, 0, 1, 256 ]
]
)
add Extractor: zmqPub (
[
  "vnir_previewraw(7, 0, 1, 800)"
]
```

Checklist Number Reference

The screenshot displays a software interface for processing VNIR and SWIR spectral data. The interface is divided into several sections:

- Preview Windows:** Two main preview windows at the top show "preview of spectral channel 100" for VNIR (left) and SWIR (right). Both windows have a black box with a white arrow pointing to the number "4".
- Histograms and Spectra:** Below the preview windows are four plots: "hist streaming vnir", "spectral streaming vnir 781", "st streaming sw", and "spectral streaming swir 5".
- Task List:** A central task list shows two tasks: "vnir:100" and "swir:100". Each task has a black box with a white arrow pointing to the number "5".
- Checklist:** On the right side, a checklist titled "CAPTURE" is visible. It includes options like "start Capture", "stop Capture", "spectral binning for VNIR", "only averages", and "auto-cycle files". A black box with a white arrow points to the number "6" next to the "stop Capture" option.
- System Stats:** Below the checklist, system statistics are shown for "grabbers", "blesshuhn", "disks", "cpu", and "memory".
- Log Messages:** At the bottom, a log window shows messages from "camserver camManager.vnir" and "gui". A red "critical" message is visible, followed by a "userComment" message: "Sau blöd, jetzt bin ich doch tatsächlich übers Kabel gestolpert, hoffentlich ist die Messung jetzt nicht ganz hinüber!!!".