

“Camadia” acquisition software how to (and first aid kit)

1. Overview of the system

On the Camadia control desk there are 2 monitors: 'Mac8' on the left, and 'Mac12' on the right (the big, fancy one!). Camadia is spread over these monitors. Let's have a look at the current organization:

--- **Mac8 (center)**: this can be considered as the 'main Mac', as it's from here that all the more important programs are run. The typical Mac8 screen is shown on the next page.

Actually, the Mac8 is just used to get access to other the **PC nika2-a** machine, through a remote connection (NOTE: if no programs are running, the screen will be basically completely black and empty)

PC nika2-a is the machine where (almost!) all the main programs are running: '**acqui**' is the core of the Camadia software and it is the one communicating with all the instruments, gathering data, and dispatching them to the other applications. '**controle**' gathers information from the telescope (eg, which type of scan is ongoing) and couples them to the rest of Camadia. '**lecture**' can basically be seen as a 'client' that listens to the data taken by acqui and creates the files that are then used by the pipeline.

All these programs run on nika2! In particular, acqui and controle must run **only** on nika2, whereas lecture can be run in 'mirror copies' on other machines.

Other Camdia-related programs running on nika2 are **antenna** and **elvin**, also playing a role in the communication between camadia and the telescope.

Apart from these programs, on nika2 a series of shells should be open to communicate with the electronics boards (“**NikelUSB**”), and with the “**mppsnc**” board (**only** if in polarization mode!).

Ok, a lot of information.. So see on the next page to have a feeling of what the system looks like!!

--- The Nika-2 desktop and what to check on it!

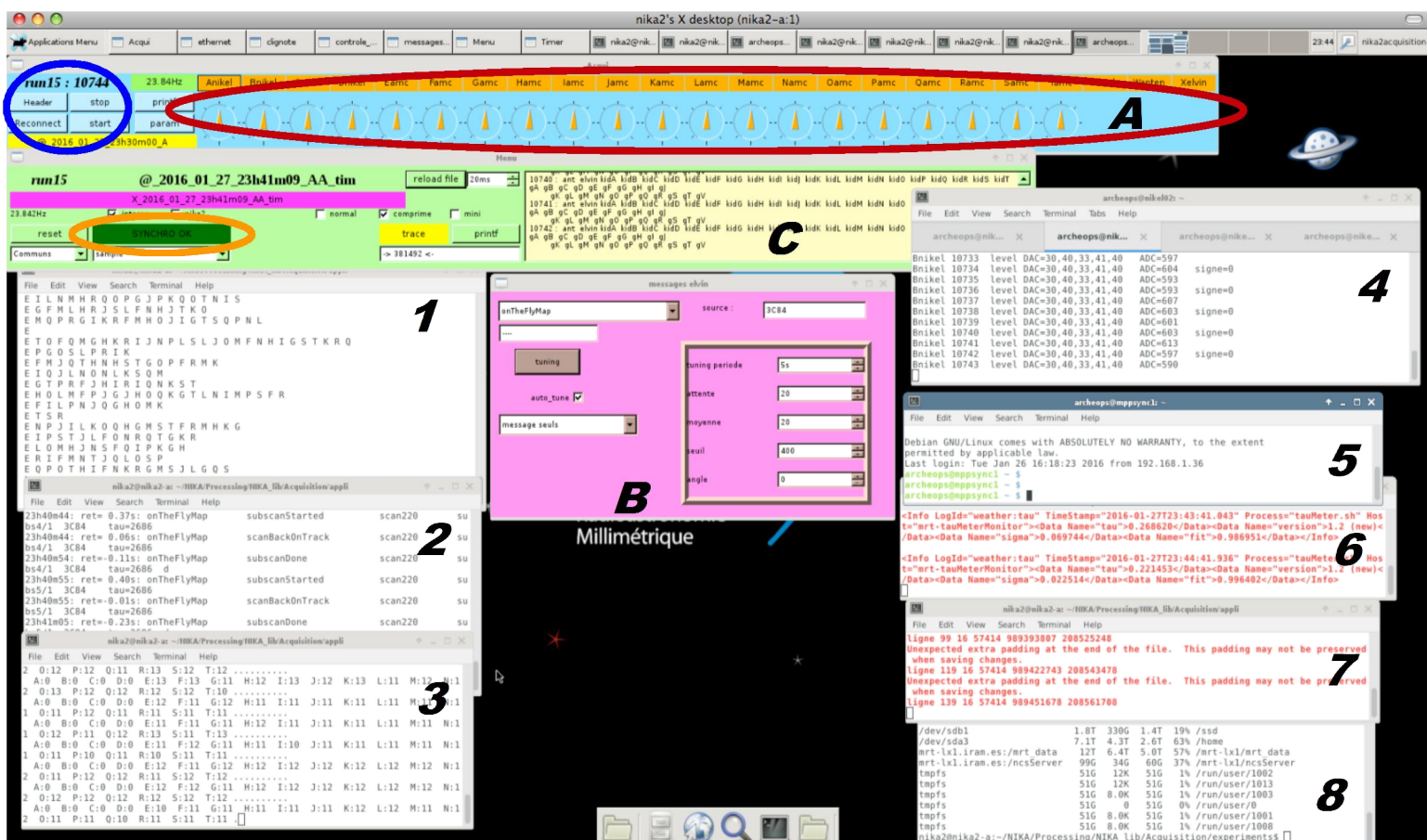


Fig. 1: Typical PC-Nika2 screen on Mac8.

PC nika2-a is, as you can see, pretty crowded.. Here we list all the windows that are present and what they should look like and be doing when the system is working fine.

Acqui : it is launched in shell '1' and opens the window 'A'. Note the 'header/start/stop' button indicated by the blue circle.

CHECK THAT:

- 1 – all the rectangles inside the red oval (Anikel etc..) are blinking
- 2 – in the shell 1, letters are scrolling by
- 3 – the arrows inside the red oval are all pointing more or less upwards and are all orange (green can be accepted from time to time..)

Controle : it is launched in shell '2' and opens the window 'B' but only after the header button in acqui has been clicked. Check that it shows info coming from the telescope.

Lecture : it is launched in shell '3' and opens the window 'C'.

CHECK THAT:

- 1 – the button in the orange oval is green and says **synchro ok**.
- 2 – numbers are increasing in the yellow part of window C

NikelUSB : they are launched in the 4 tabs of shell 4.

CHECK THAT:

- 1 – every few lines end saying **signe=0**
- 2 – lines are scrolling and numbers are increasing

.....CONTINUES ON NEXT PAGE!

Mppsync : it is launched in shell 5 if polarization measurements are ongoing. Otherwise, this shell might even not be there!

CHECK THAT:

1 – lines are scrolling..

Elvin and Antenna : they are launched in shells 6 and 7 respectively. Some red lines should be scrolling by.

Shell 8 is only for maintenance purposes! Not useful for camadia!

--- The Mac12 desktop and what to check on it!



Fig. 2 : The typical screen of Mac12. The resonances in this case are well tuned!

Mac12 (on the right of the table!): this is the second important machine. On this, we run a 'lecture' client (blue circle), to be able to listen to the data, plus the application '**monitor**' (red circle), which allows to get a rapid impression of the sanity of the system, as well as allowing the recovery of the resonances if they are lost. To launch this applications on Mac12 (if they are not there or needed a 'restart'), use the icons in the small green rectangle on the left: the green frog is lecture, the pink lion is monitor!

CHECK THAT:

- 1 – The 'lecture' window has numbers and letters scrolling by in its yellow part.
- 2 – The 'monitor' program shows a series of histograms
- 3 – The histograms are not frozen!
- 4 – The circles on the right (green rectangles in fig. 2) are all almost at the top of the slider.

NOTE: during long scans (eg, OTF geometries), the delta might actually shift and spread around a bit but should get recovered at the end of a scan.

2. Troubleshooting

--- Looking at the nika2 screen in Mac8 (see fig. 1) you don't see the window A / window A is completely frozen / no letters scrolling by on shell 1.

This means that **Acqui crashed!** —> See 'Relaunching a crashed acqui', chapter 3

--- Looking at the nika2 screen in Mac8 (see fig. 1) you don't see the window C / no numbers and letters scrolling by on shell 3.

This means that **Lecture crashed!** —> If acqui also crashed, go to chapter 3 'Relaunching a crashed acqui'. Otherwise, just try to relaunch lecture by clicking, in the shell 3, ctrl-c then './lecture'.

--- Looking at the nika2 screen in Mac8 (see fig. 1), in the window C it says 'mauvaise synchro' instead of 'synchro ok' (see fig. 7, orange arrow)

—> Try the following: click on the window A (acqui) the button stop. Wait 10s. Click start. Wait a few seconds and check that now you see 'synchro ok'. If this did not solve the issue, try clicking on the button itself. If still no improvements, try relaunching acqui following chapter 3 'Relaunching a crashed acqui'. If this, again, did not solve, then contact an expert!

--- Looking at the 'monitor' screen in Mac12 (as described in the previous page) you see that the histograms are completely frozen

Lecture must have lost its connection to acqui. Check that acqui is still running on pc-nika2 (in the Mac8 screen). If not, **Relaunch acqui** using the procedure of chapter 3. Once everything has been restarted, in the 'lecture' window of Mac12 click on 'reconnect'. You may need to click it twice. The numbers in the yellow part of the window should start to increase. Ok! It's good! But if you had to relaunch acqui then you also have to **Recover the resonances** (chapter 4).

--- Looking at the 'monitor' screen in Mac12 (as described in the previous page) you see that you lost many resonances, or all of them

This has become very rare (thanks Alain!). But if it happens, go to **Recovering the resonances** (chapter 4).

--- Looking at the nika2 screen in Mac8 (see fig. 1), one of the amc boards is not responding: its 'yellow rectangle' in the window A is not blinking, the resonances cannot be found with the standard 'recover resonances' procedure

This is very rare... But it can happen that, even after you have tried to restart acqui, all the yellow rectangles associated to an electronic card keeps NOT blinking. If this is the case, you have to deactivate and reactivate it. To do so, open a terminal on Mac 12 and connect to nika2-a as observer: ssh -X observer@192.168.1.36. Once connected type:

> crate

This is an alias to direct to Acquisition/Instrument/crate/. Now check which crate you have to reboot: its IP is

192.168.1.150 –> if the unresponsive board is between E and L

192.168.1.170 –> if the unresponsive board is between M and T

Now reboot the crate with the unresponsive card by typing:

> cratecoldreboot 192.168.1.xxx [xxx=150 or 170]

If it still does not work, contact someone: A. Monfardini, A. Benoit, M. Calvo, A. Catalano, O. Bourrion or J.F. Macias Perez should all be able to handle the situation.

--- Looking at the nika2 screen in Mac8 (see fig. 1), one of the Nikel boards is not responding: its 'yellow rectangle' in the window A is not blinking, and the resonances cannot be found with the standard 'recover resonances' procedure

Again, a very seldom issue. But this has happened before. This problem is typically due to the Nikel board corresponding to the array in question having had an error. So so the following:

1) on the Mac8 look at the shells of the Nikel boards. Note that they are 'grouped' together in a single window in PC nika2, the shell **4** of fig.1. Remember to check all the tabs!

2) Probably, on one of the shells (or more.. check them all!) you should notice that the numbers are not increasing and that there has been an error message. If so, make 'ctrl-c' to stop the Nikel program from running.

3) Relaunch the program by typing './startup'

4) You should see some output lines passing by until you get:

---- attente d'un block header ----

5) You can now relaunch the instruments following **Relaunch acqui** and **Recovering the resonances**.

Again, if it still does not work, contact someone in Grenoble: see list above!

--- VNC connection to nika2-a is lost (also very rare...)

If the screen that hosts nika2-a on the Mac8 is blocked and says 'Reconnexion', do the following:

1) Open a shell on Mac8

2) Type 'ssh nika2@192.168.1.36'. The password is the usual one.

3) Type 'cd NIKA/Processing/NIKA_lib/Acquisition/appli' (makes your life easier as when you open shells in the nika2-a window you'll be automatically in this dir which is the one where most of the programs must be launched from).

4) Type 'rm /tmp/.X11-unix/X1'. If it tells that the file is not there... Ok, no problem!

5) type 'rm /tmp/.X1-lock', answer 'yes' to the following question. If it tells that the file is not there... Ok, no problem!

6) type 'vncserver -geometry 1800x1000'

The connection might automatically get restored. If not, then open another shell on Mac8 and type 'open vnc://192.168.1.36'. The password is always the same. The window that opens allows you to control the PC nika2-a. Sadly, if this connection is lost, the 'acqui' program blocks, so you also have to relaunch everything: see **Launching the Camadia software from scratch** (chapter 5) and then **Recovering the resonances** (chapter 4)

3. Relaunching a crashed acqui program

In the following we make, as usual, reference to the letters/numbers marked in figure 1. So, if the acqui program crashed, you should already notice that the acqui window (**A**) has disappeared or is frozen, and that the shell **1** shows some error messages. In this case:

1 – If acqui is still there but is frozen, and not completely crashed, go to the shell **1** and click ctrl-c to definitively kill the program.

2 – You also need to kill the 'lecture' and 'controle' programs (if they didn't already crash on their own!). To do this: go to the shell **2** and click ctrl-c, this should kill controle (the controle window **B**, if it was still there, will disappear). Then go to shell **3** and click ctrl-c. This will kill lecture, and its corresponding window **C**. Note that lecture is sometimes hard to kill.. try ctrl-c multiple times and be patient!

3 – Now you can relaunch the acqui program: go to the acqui shell **1** and type './acqui' then enter.

4 – Wait something like 15s. During this time a lot of lines will pass on shell **1** then everything will become kind of static.

5 – Now on the acqui window **A** that opens click the stop button (red circle in figure 3). Wait 10s. Click the start button.

6 – If all the rectangles of the electronic boards are blinking (outlined by the red and blue rectangles in fig.3), then ok, go on. Otherwise wait again 10s, click stop, 10s, click start. Now all the boards should be blinking. If so, skip to point 9.

7 – If no boards are blinking, call an expert!

8 – If only one, of few, of the electronic boards are not blinking, then: if one of the cards NikelUSB (cards A to D, red rectangle) is not blinking see . If one of the amc (cards E to T, blue rectangle) is not blinking, see .

9 – If 1 minute has passed since when you did point 2, then on the shell **2** of controle type './controle' then enter. If 1 minute has not passed, wait until 1 minute has passed then go type './controle'

10 – On the acqui window **A** click on 'header'. The pink window **B** of controle will open. If not, go back to shell **2**, type ctrl-c, wait one minute, then re-try step 9. When the pink window is there proceed to step 11.

11 – ok, everything is ready: go on to **recover the resonance** following the procedure of chapter 4.



Fig. 3: the acqui program window (to be found on Mac8). In the red circle, the header/stop/start button. The resonances in this image are not well tuned! → need to recover resonances as per chapter 4!

4. Recovering the resonances

--- Step 0: reconnect lecture if needed

Often you'll need to recover the resonances as a consequence of a crash of the acqui program. If this is the case, on the 'lecture' window **A** of Mac12 (see fig. 2) click on 'reconnect' and check that lines and numbers start scrolling in the yellow area of the window

--- Step 1: stop the 'autotuning' (if it's running)

If the 'autotuning' box is checked in the 'monitoring' window (fig. 4, green circle), uncheck it. Furthermore, if 'decalage continu' is written in red (fig 4, green circle), click once on 'decalage seuil' (just on the left!). 'decalage continu' should turn to black. Ok, go on to step 2!

--- Step 2: find the resonances from the default parameters

- 1) On the Mac12, check that 'lecture' is well connected (numbers passing by in the yellow part of the window). If you just relaunched acqui, you might need to click on reconnect. You might actually need to click it twice. If it still doesn't work, see the instructions for Mac12 on 'Launching lecture' in section 2.
- 2) Go to the 'monitor' pink window. Click on 'Recover lost pixels': a screen similar to the one of fig4 on the left will appear (without histograms for the time being, most likely!)
- 3) Click 'load param'. Wait a moment. The mouse pointer will probably become a colored circle then back to normal. If this doesn't happen, once 30 seconds have passed since when you clicked on 'load param' you can in any case proceed to step 4.
- 4) Click on 'measure'. Wait until the button goes back to white (it is red during the measurement).
- 5) When it has finished, it will plot a sort of peaked curve and tell you the frequency shift to apply for each feedline. The values will be automatically read by the program.
- 6) Now click 'apply shift'
- 7) Click on 'tuning setup'. The tab shown on the right of fig. 4 will appear. Where it says 'attente' write 20 (40 if working at 47Hz). Do the same for 'moyenne' (20, or 40 if 47Hz acquisition). For 'periode tuning' set 5s.

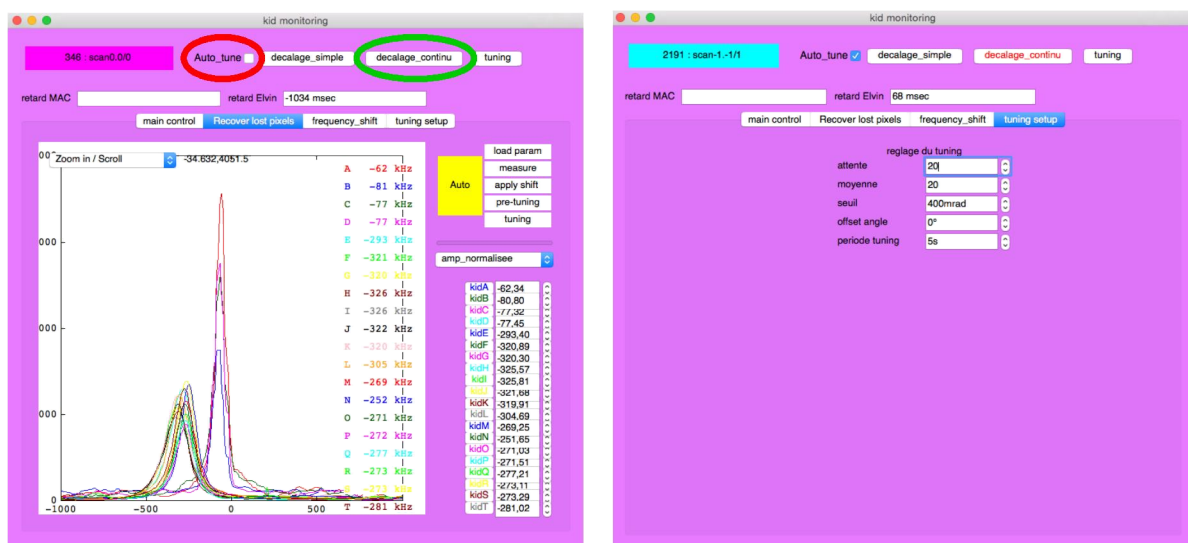


Fig. 4: the monitoring window: on the left the screen of the 'recover lost pixels' tab, on the right the one of the 'tuning setup' tab, with standard config for 23Hz acquisition.

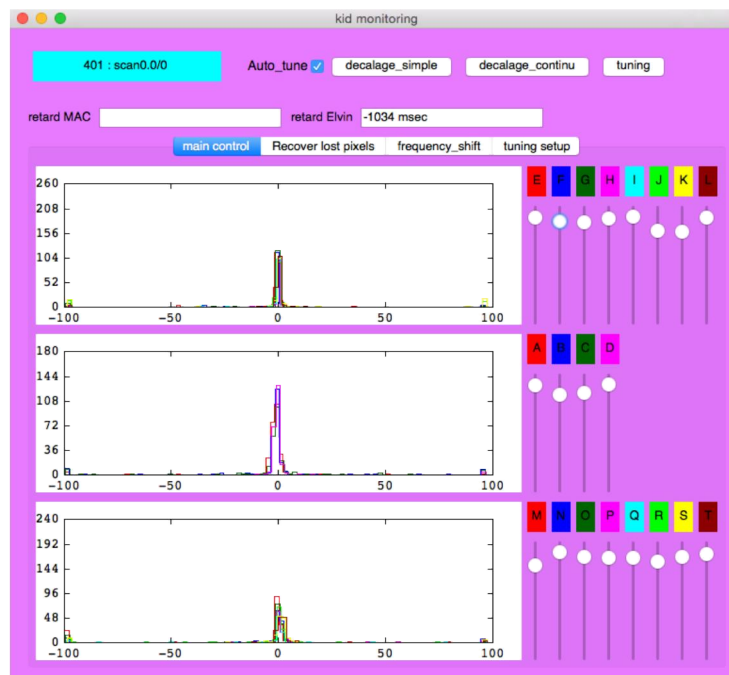


Fig. 5: the monitor screen on its 'main control' tab with the resonances well tuned. This tab is the standard tab that must be kept open during normal operation, to check that the histograms are more or less centered and the circles on the right are all almost to the top of their slider, as is the case in this particular image.

- 8) Click on 'main control'. The window will look like the one shown in fig.5, but with the histograms not so nice (or rather, completely scattered around!). No problem, go on!
- 9) Click once on 'decalage seule'. Wait like 15s. Click once more on 'decalage seule'.
- 10) on the Mac8, check that all the arrows of the acqui window are more or less pointing upwards and are orange (if a few of them are green, it's still ok!). If not, continue clicking on 'decalage seule' until the arrows are more or less ok
- 11) Now click on 'tuning'. Wait like 15s. Click it again. Ok, the resonances should now be ok: looking at the 'main control' of the monitor window (fig. 5) **the histograms are almost 'deltas' and the circles on the left are almost all at the top of their slider. Great!** If not, continue clicking on tuning until it's ok.
- 12) As a cross-check, once it looks fine on the 'monitor' window, check that in the 'acqui' window A of Mac12 all the arrows are pointing upwards, as shown in figure 6.
- 13) Ok, now check the 'autotuning' box. You can start observing! Yeyyy!!
- 14) Note that in the phases between scans (telescope inactive) the circles can be put all to 0 by the program: it's completely normal, no panic! They'll go back up once a scan is started.
- 15) To relax and be sure that there are no problems during this phases with no observations, in the Mac8 screen you can check that all the triangular arrows of the 'acqui' window are still yellow and point upwards, as shown in fig 6. If so, it means everything is fine



Fig. 6: the 'acqui' window on Mac8 when the resonances are all well tuned (all arrows are orange and point upwards).

5. Launching the whole Camadia system from scratch [in general not necessary!]

Let's imagine that no programs are running and you have to start observing. Here is what to do (which, as you will see, is actually very similar to the 'emergency solution' to apply when there are major problems..!). Note that I am assuming that the electronics boards are running fine: it should be the case, they don't give problems very often. To be sure, check in the 6 shells of the PC sami connected to the Nikel boards (numbered 1-6 in Fig. 1) that the numbers keep increasing. If they are not, see in section 5 what to do if the Nikel are not responding, then proceed. Otherwise, go on now!

NOTE: if there are still some programs running on some of the Mac, and especially on the nika2 window in Mac8, and this is complicating your life when starting your session, do not hesitate and kill all the running programs (find all the different shells/terminals and click 'ctrl-c' in them to terminate the program that was launched from it). Then, proceed as follow.

--- Launching acqui

On the nika2-a window:

1) Open a series of shells (7 in total are necessary. Ideally, follow the placement shown in figure 1 for the ones that will come and use the system after you!)

2) In the first one (shell 7 in figure 1), type:

“cd /home/nika2/NIKA/Processing/NIKA_lib/Acquisition/appli” then “./antenna.sh”. Check, when the program starts, that it is listening on port 63405 (it will print it on the shell). If not, stop it by “ctrl-c”, wait a while (the port might be still occupied due to a previously running version of the program), then try relaunching it until you get the right port. Typically, waiting 10/15 seconds is ok.

3) In the second shell (shell 6 in figure 1) do:

“cd /home/nika2/NIKA/Processing/NIKA_lib/Acquisition/appli” then “./elvin.sh”

4) In the third (shell 1 in figure 1) :

“cd /home/nika2/NIKA/Processing/NIKA_lib/Acquisition/appli” then run “./acqui”.

A blue rectangular window will open. This is what I'll call the '**acqui window**'. It will look something like this:

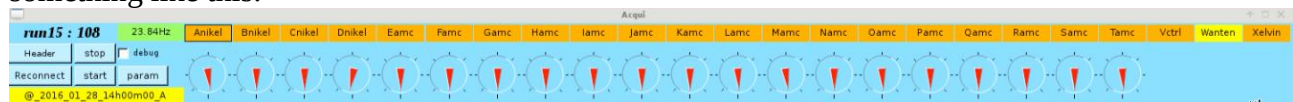


Fig. 7: the 'acqui' window. On the left the 'header/start/stop' buttons, on the right the arrows (giving an idea of the quality of the tuning) and the rectangles that blink when the connection to the different electronic cards is ok.

4) In the shell dedicated to the 'controle' program (shell 2 in figure 1) do:

“cd /home/archeops/NIKA/Processing/NIKA_lib/Acquisition/appli” then “./controle”. It should say something like 'en attente de block sur le port 55560 bla bla bla'. Ok!

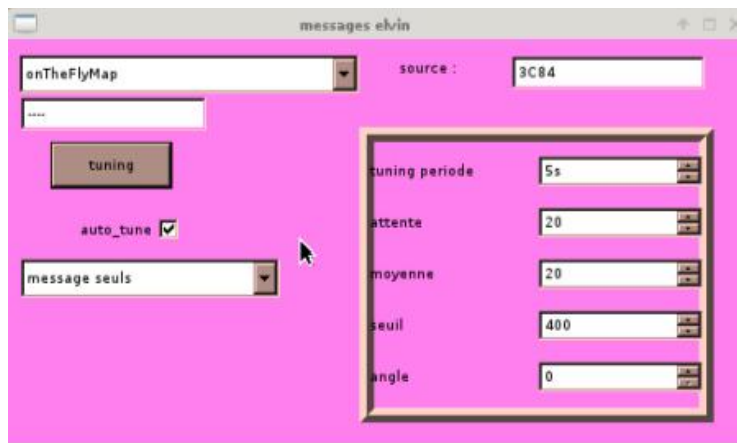


Fig. 8: Pink window of the 'controle' program running, with already the parameters configured for tuning periode (5s), attente (20) and moyenne (20). This are the good ones when making acquisitions at 23Hz.

Now:

- 5) On the blue 'acqui window' (letter **A** in fig. 1), click on the 'header' button. 'Controle' will open a pink window (see fig. 8, or letter **B** in fig. 1). If it does not, you'll have to repeat the following steps:
- 6) On the controle shell kill the controle program with ctrl-c.
- 7) **Wait one minute!** Really, it's in your interest! Then, relaunch with ./controle
- 8) Reclick on the 'header' button in the 'acqui' window. Check that the pink window opens this time. This must be repeated until the pink window is there!

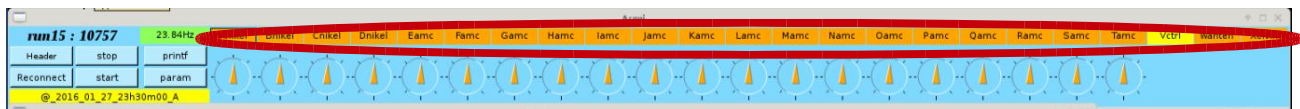


Fig. 9: details of the acqui window. Note that after a startup 'from scratch' the arrows will not be placed like this, they will be scattered a bit in all directions. Only after you have gone through the 'recover resonances' procedures, the arrows will be all orange and pointing upwards!

We're almost there! Now:

- 8) On the acqui blue window (letter **A** in fig. 1), click on 'stop'. Wait about 10 seconds. Click on 'start'. Then again, wait 10 seconds, click stop, 10 seconds, start. Now all the indicators of the electronic boards ('nikel' and 'amc', red circle in the image below) should start to blink synchronously. If not, repeat another time the stop/start cycle. If the 'Anikel, Bnikel, Cnikel, Dnikel' don't blink, see below 'launching the NIKEL_USB cards' then make twice more the 'stop start' cycle. Now they should really blink! If not call an expert! The indicators of 'elvin', 'antenna' and 'controle' (just on the right of such circles) should also be blinking, but on a more irregular basis. If so, then... **Great, acqui is running fine!**

--- Launching the NIKEL_USB cards

If the 'Anikel, Bnikel, Cnikel, Dnikel' rectangles keep not blinking, maybe the Nikel boards have not already been started. In this case, in the shell number **4** of fig.1, open 4 tabs. In each tab do the following:

- 1) ssh -l archeops 192.168.1.22x with x = 1/2/3/4 in the tabs 1/2/3/4!
- 2) when asked for the password, it is the usual 'Alain' one (crt....)
- 3) once connected on the remote machine, on each tab type ./startup
- 4) ok, wait until they say 'en attente d'un bloc header' then go back to the point 8) above in this page.

--- Launching lecture

On Mac8: in the fourth shell that you opened in the nika2-a window, (number 3), make:
“cd /home/nika2/NIKA/Processing/NIKA_lib/Acquisition/appli” then “./lecture”

A green rectangular window will open. This is the **lecture window** (letter C in fig. 1). NOTE: if the program is already running, it is safer to find the shell from which it was launched, kill it making 'ctrl-c', and relaunch it with “./lecture”.

The following options should have a tick: 'interne' (=save data on local HD) and 'comprime' (see the small circles in fig.10). On the yellow part of the window, you should see a series of numbered lines passing by. And, you should see a green rectangle telling 'SYNCHRO OK' (orange arrow in fig. 10). **Note:** the other instances of lecture running on other Mac depend on this one, so if this one gets blocked, also lecture on all other Mac gets blocked...

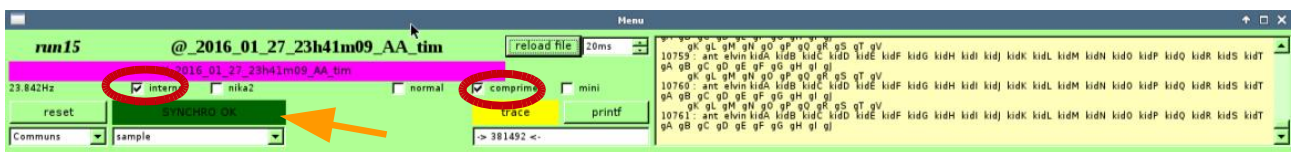


Fig. 10: the lecture window

On Mac12: if the lecture green window is already there (ie, the program is actually already running), just click 'reconnect' (might need to click it twice) to re-establish the connection of the lecture client to the acqui server. The numbers in the yellow part should re-start to increase. If they don't, then try restarting the program (the icon is a green frog on the left 'command bar' of the mac, see the green rectangle in figure 2). Lecture should start and connect correctly. **Note:** is it still doesn't, it's probably because the 'lecture' of Mac8, from which the othe ones depend, is not running; so go to Mac8, relaunch lecture there, and retry on the Mac12.

If, on the other hand, lecture is not yet running do the following:

1) Click on the green frog icon on the left bar of the mac (green rectangle in figure 2) and launch it! Ok, lecture is running. On the copy of lecture that run on Mac12, the options 'interne' (=save data on local HD) and 'comprime' should also be ticked.

--- Launching monitor

This program should run only on Mac12. So:

On Mac12:

- 1) Check that on Mac12 lecture is running and well connected.
- 2) Launch 'monitor' using the pink lion window on the left bar of the screen (green rectangle in figure 2) . A pink window will open (fig 11)

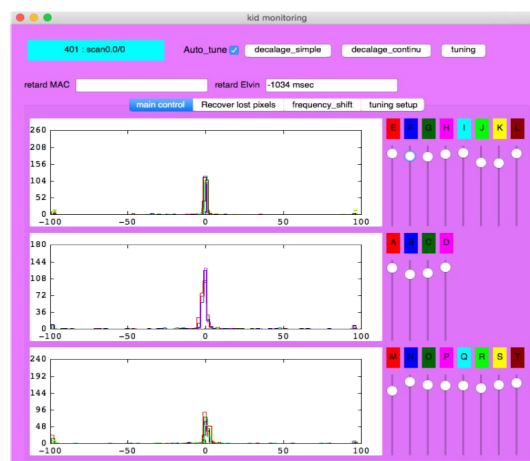


Fig. 8: the monitor window, with the resonances very well tuned. The sliders in the blue circles tell you how many resonances are well placed.

--- Launching trace

This program is typically run on Mac12 by 'expert users', it's not really fundamental for the data acquisition process. But if you need it for some reason, then:

On Mac12 :

1) Click on the yellow elephant icon on the left of the screen (green rectangle in figure 2). Done!

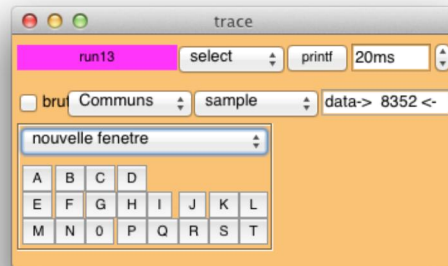


Fig. 9: the trace window form which one can launch all the sub-programs.

NOTE: if you want, clicking on 'nouvelle fenetre' (see figure above), then choosing 'trace tout' from the menu that opens, you can open a window on which you can plot the observed variables. The most common plot is obtained by letting the X axis as it is (it should be 'X communs' and on the menu below it should say 'sample'), while for the Y axis you can click where it says 'Y Communs', choose the feedline you want to look at (for example for the feedline B choose 'Bnikel'), then on the menu below it choose 'RFdIdQ'. You'll get a plot of the frequency shift of the kids of the line B as a function of sample number (i.e. of time, essentially!)

Ok, all the needed programs are now running!!!

6. What to do when you stop observing?

When not observing, you can leave everything running. But, to avoid filling up space with data of other instruments, **please remember to stop recording files!!!** To do this:

Deactivate the automatic file recording: just go on all the 'lecture' windows and make sure that both the 'nika2' and 'interne' options (red circle in fig.) are deactivated. **Remember to reactivate this option when you restart observing** or you will have no file!

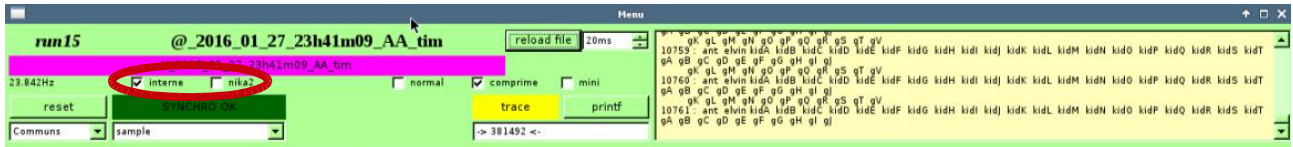


Fig. 10: to deactivate the recording of files, uncheck all the boxes that are outlined by the red circle, that is 'interne' and 'nika2'.