

*NIKA2 pools:
the work behind*

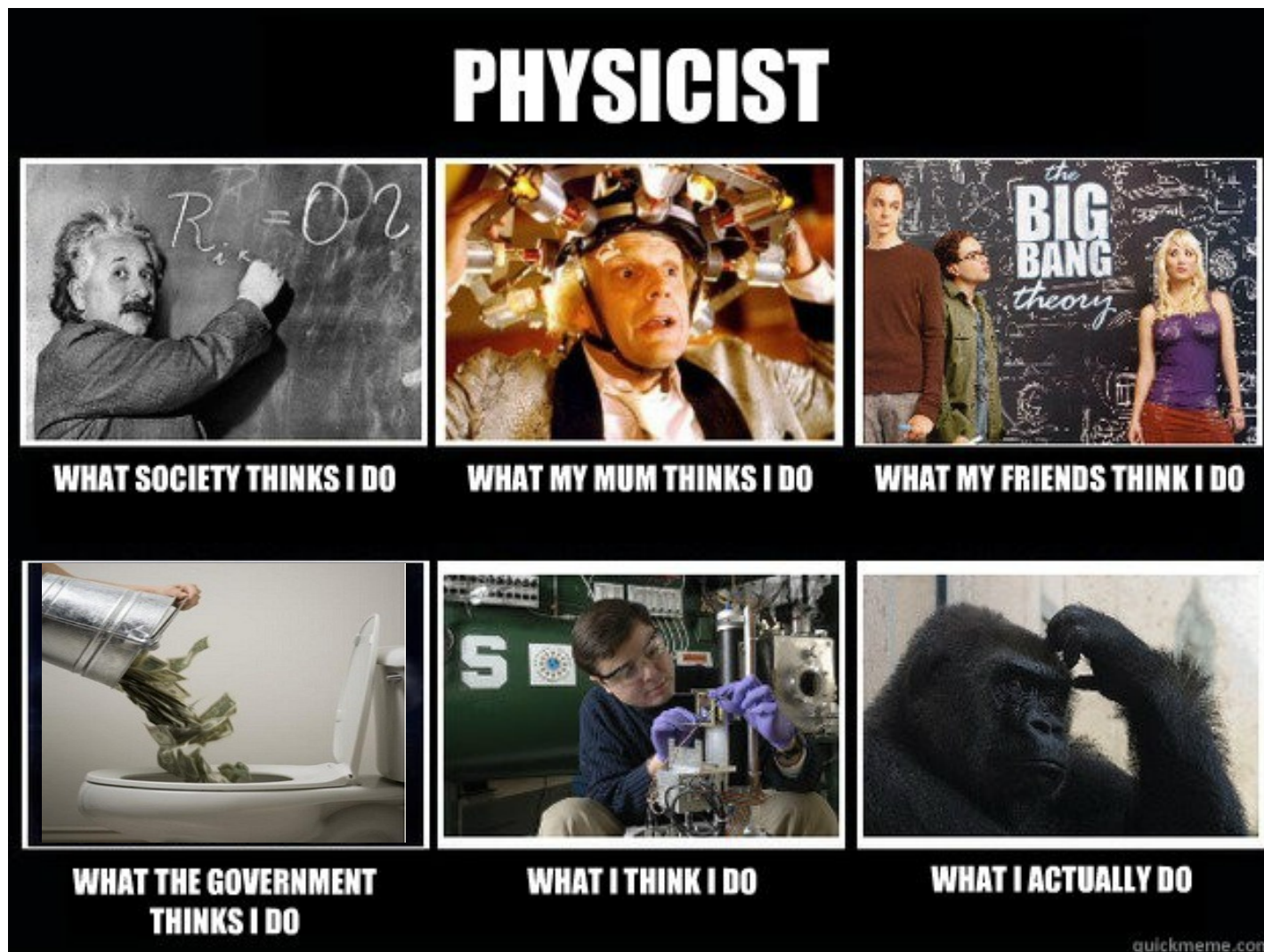
*Martino CALVO
on behalf of the NIKA2 collaboration*

Outline

- Introduction
- Setup of a pool: hardware
 - Standard case
 - Exceptional interventions
- Setup of a pool: software
 - Standard case
 - Exceptional interventions
- Handing over NIKA2 to IRAM

Why this talk?

- Fact vs perception memes



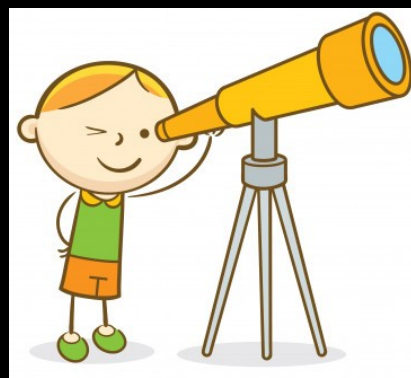
Why this talk?

- We can apply it to NIKA2

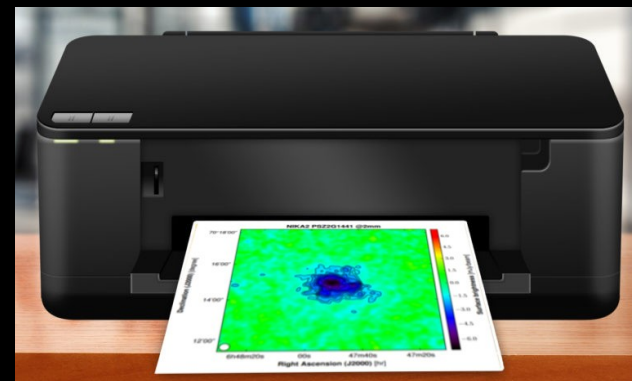
How NIKA2 works according to...



MY FRIENDS



MY MOTHER



A 'GUEST' ASTRONOMER



IRAM



ME



HOW IT REALLY WORKS

Why this talk?

- We can apply it to NIKA2

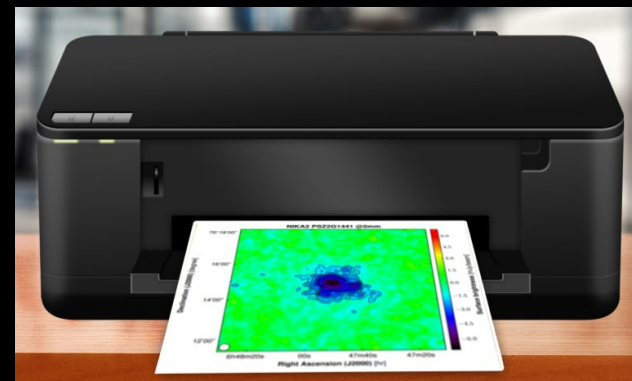
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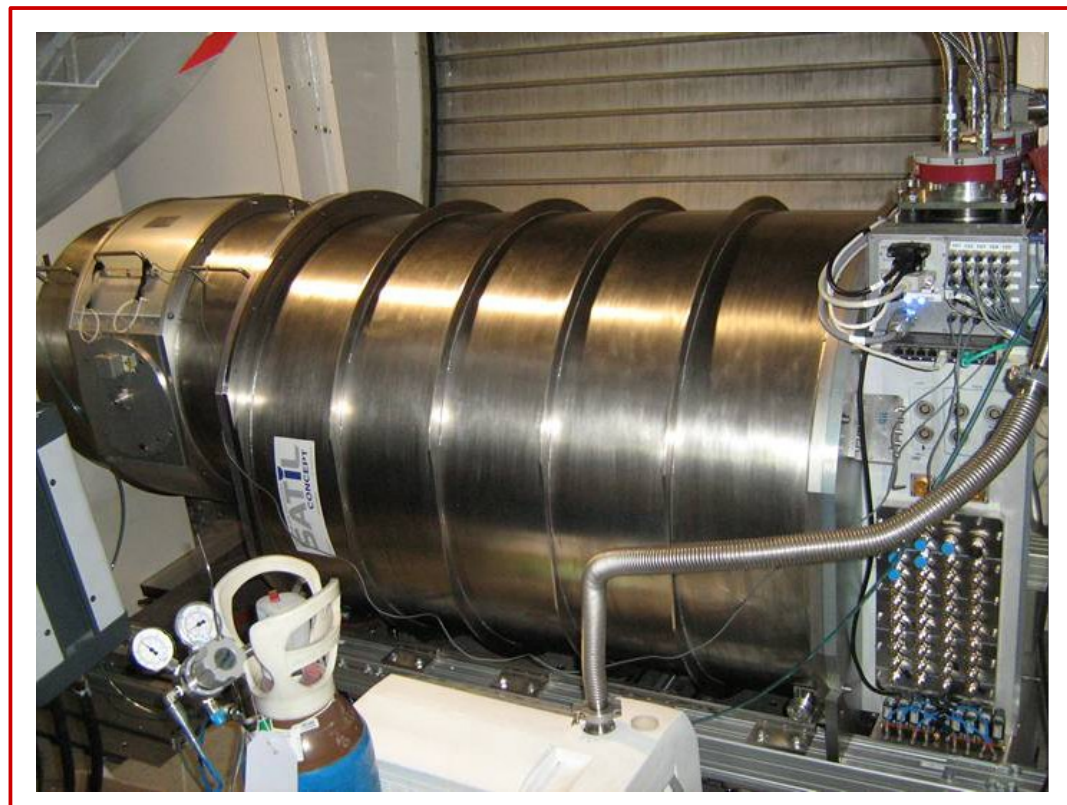


ME



HOW IT REALLY WORKS

Cooling down NIKA2



The cryostat :

- **1.3 ton**
- 2.3m length
- Full remote operation
- Cryogen free
- Base T < 200mK, **80kg!**

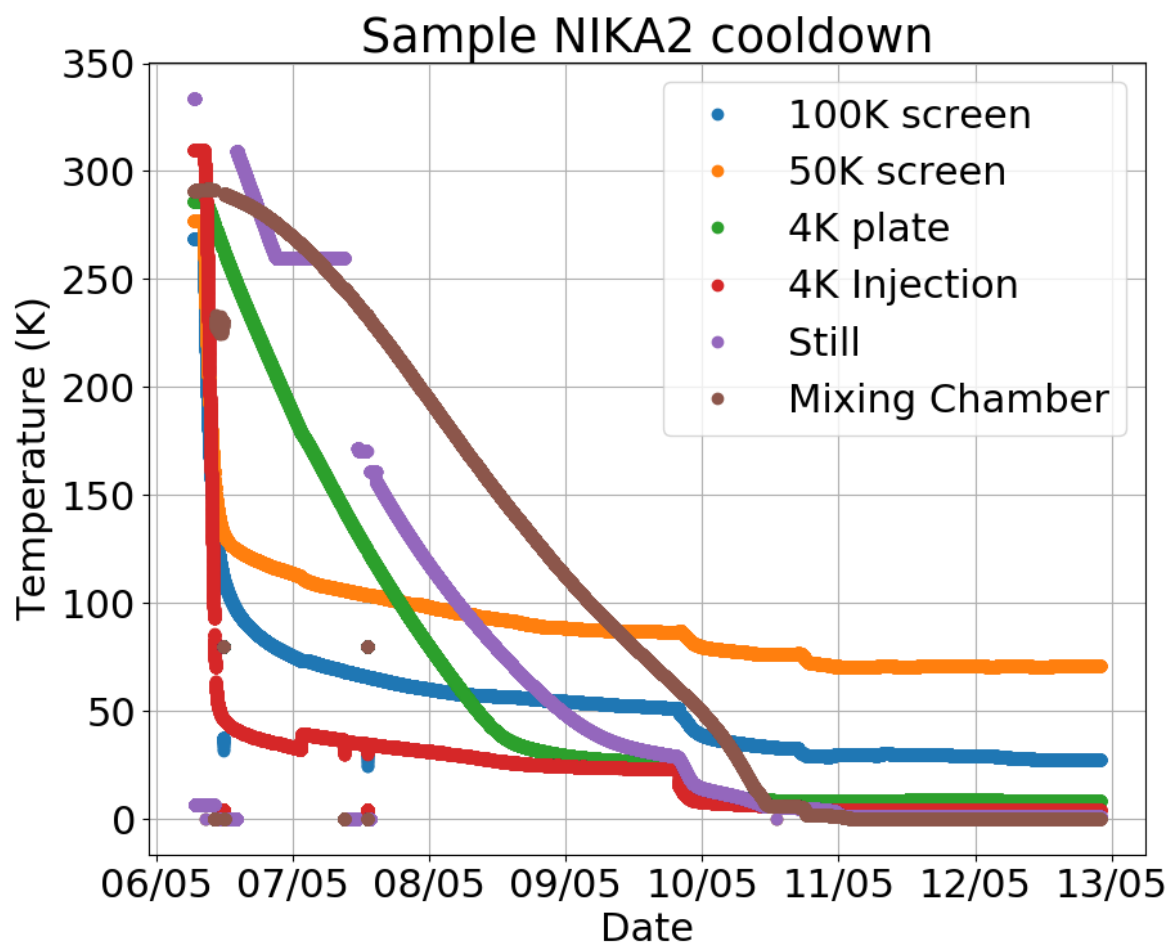
➡ The cooldown needs time!

A pool actually starts ~ 1 week before first observations!

Cooling down NIKA2

- Step 1: pre-cooling the cryostat

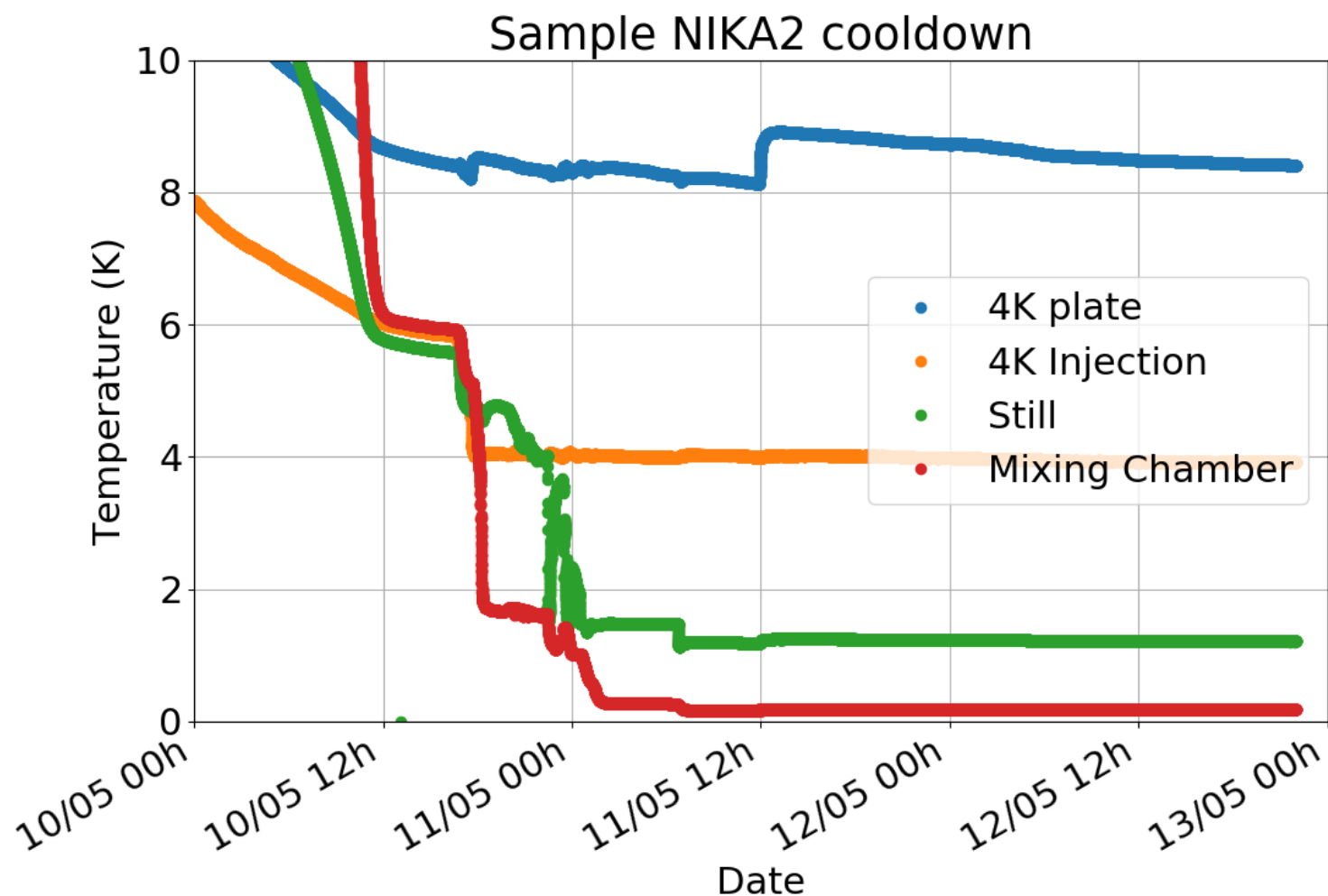
~4 days, reach 4K, based on PT cooler



Cooling down NIKA2

- Step 2: condensation/dilution mode

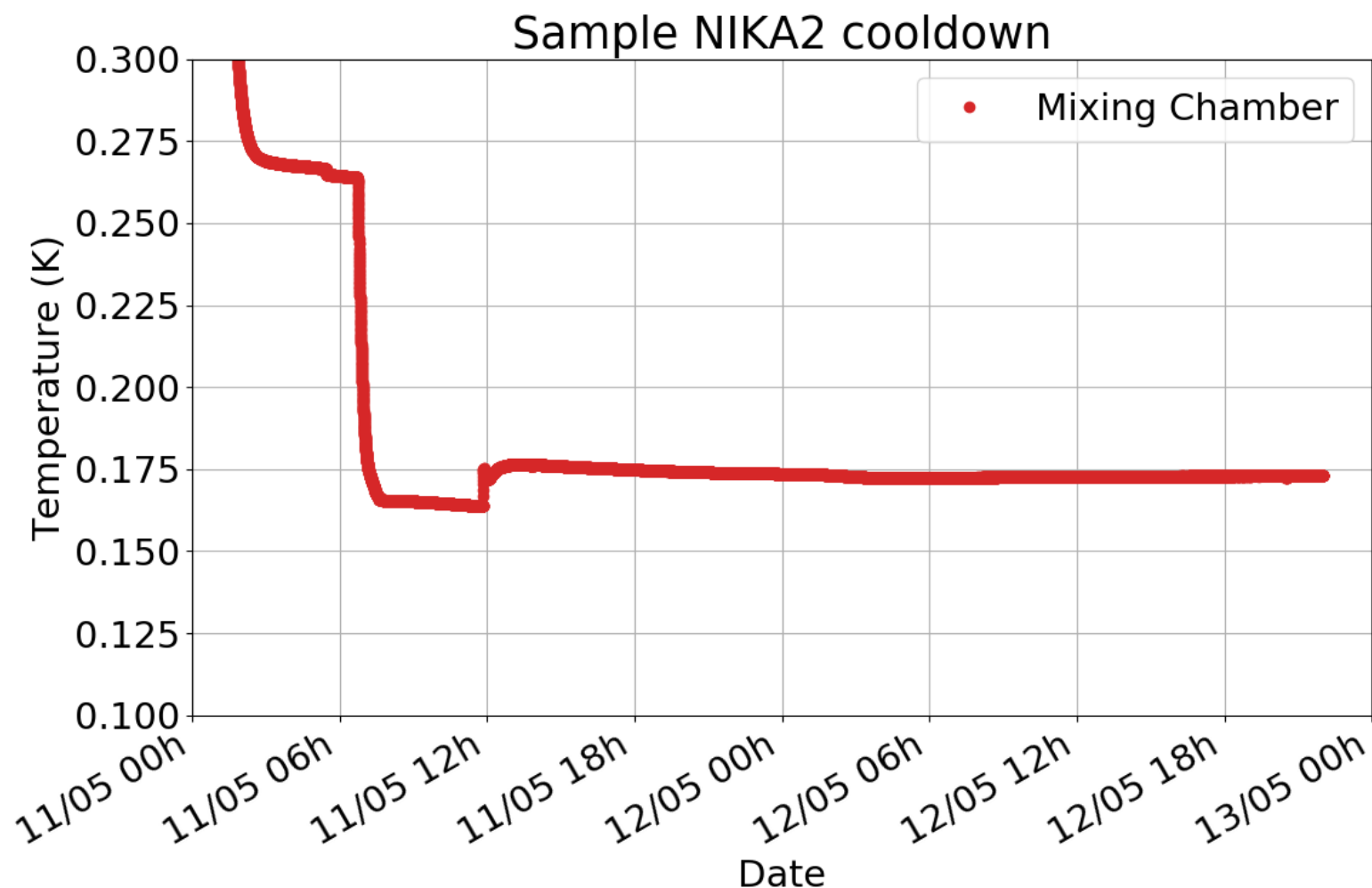
~1 day, reach <200mK, based on dilution cooler



Cooling down NIKA2

- Step 2: condensation/dilution mode

~1 day, reach <200mK, based on dilution cooler



Final steps

- Once NIKA2 is cold, final steps/checks:

Turn on temperature regulation

Turn on cold amplifiers

Turn on electronics, synthesizers, etc..

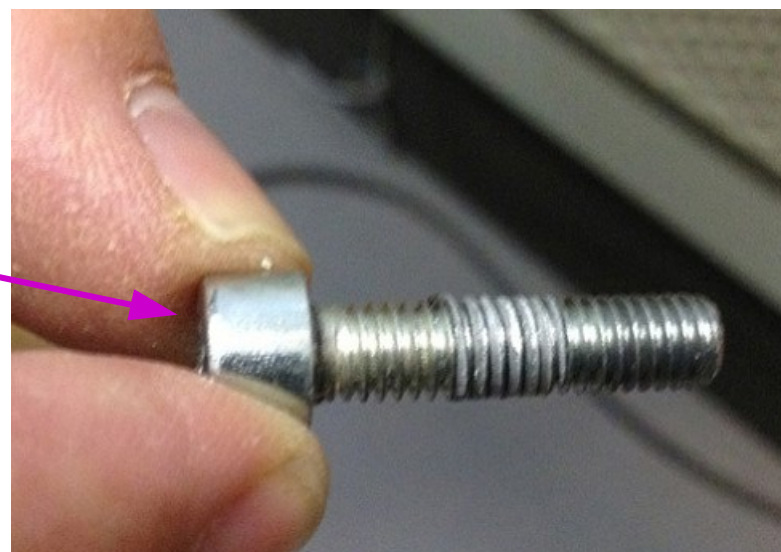
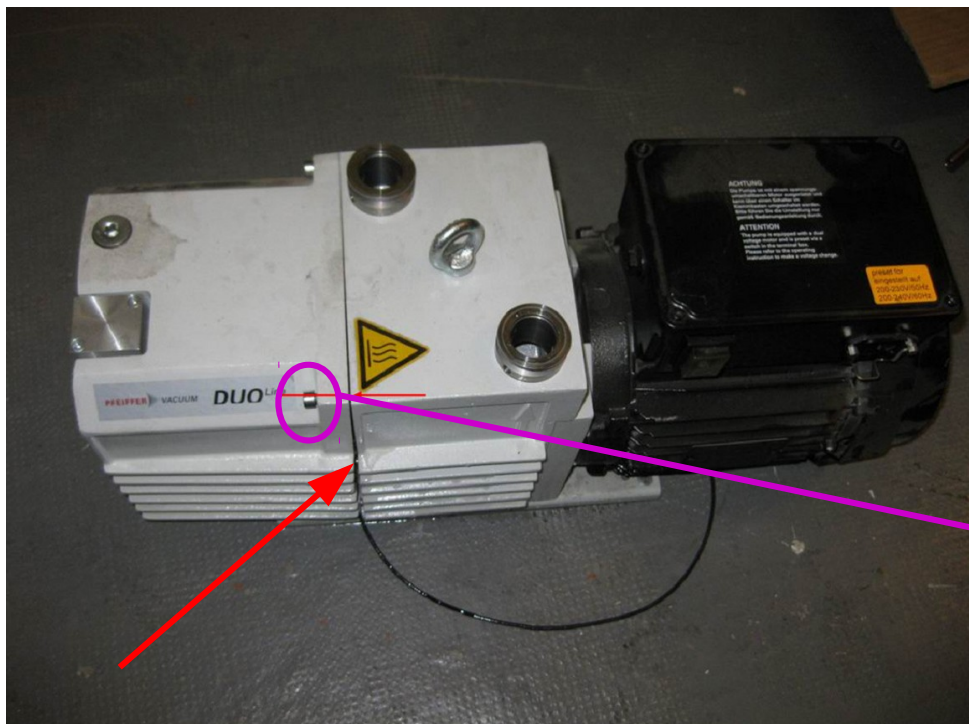
 Green light for next phase (software checks, ...)

Exceptional interventions

- A smooth cooldown is 'easy'
- But... things can go wrong!
- Worst case: serious emergencies

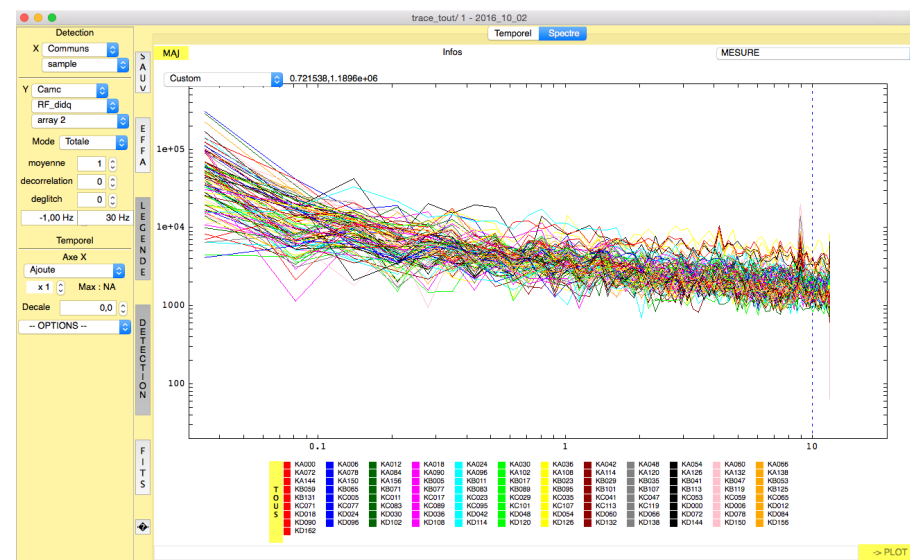
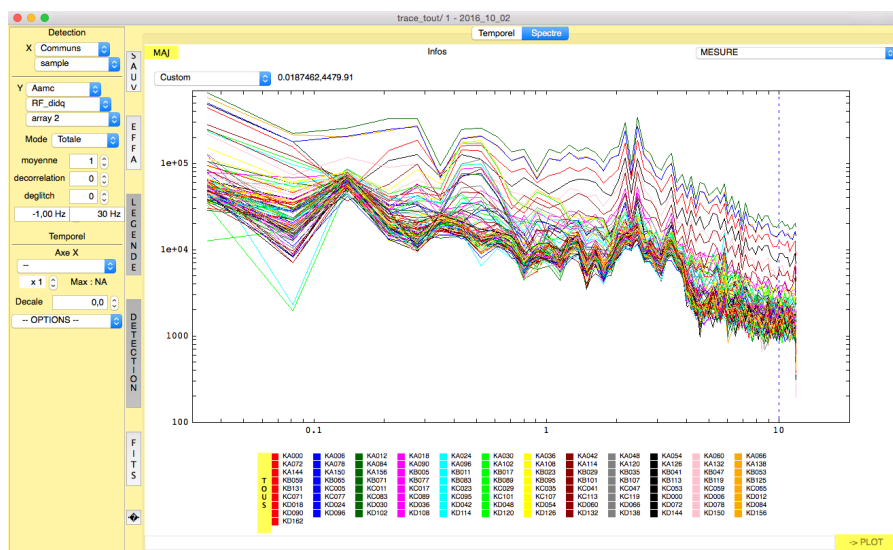
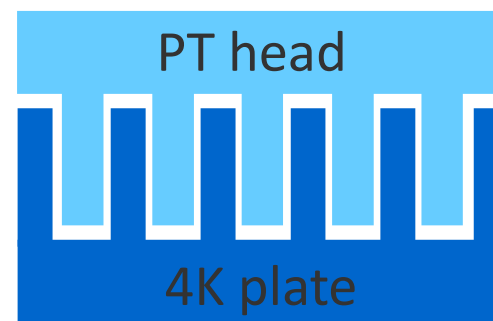
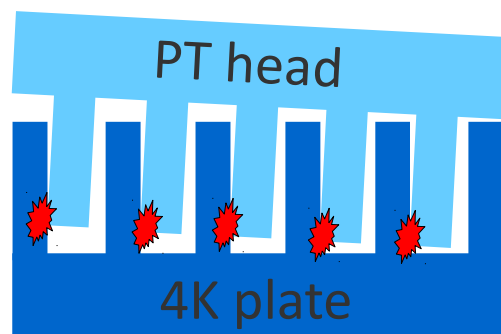
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Exceptional interventions

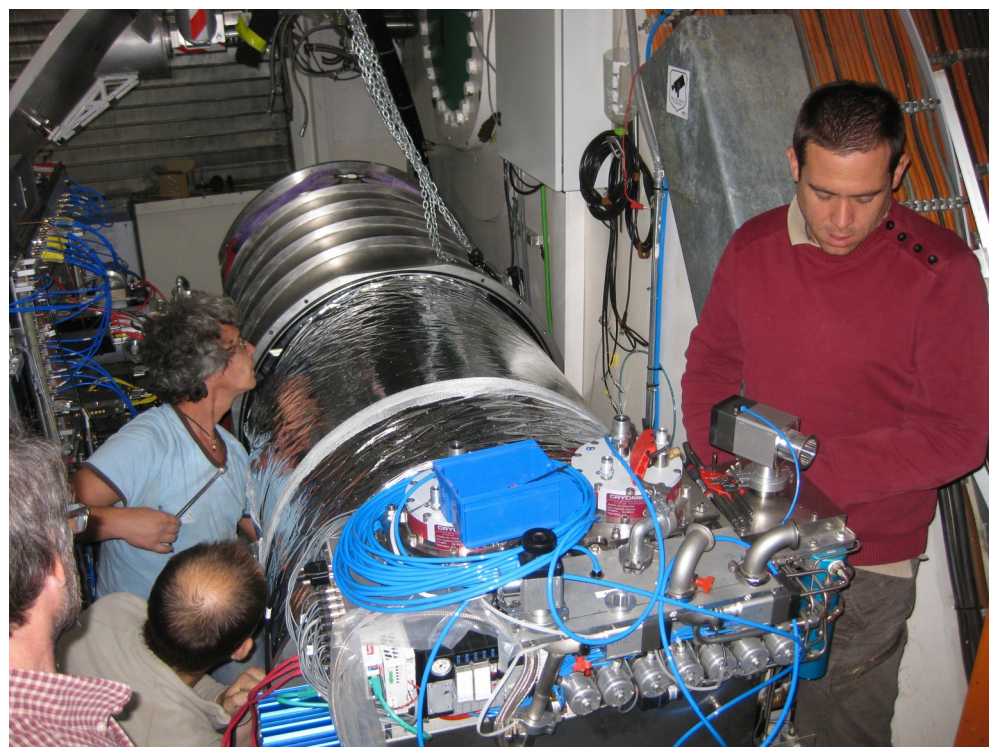
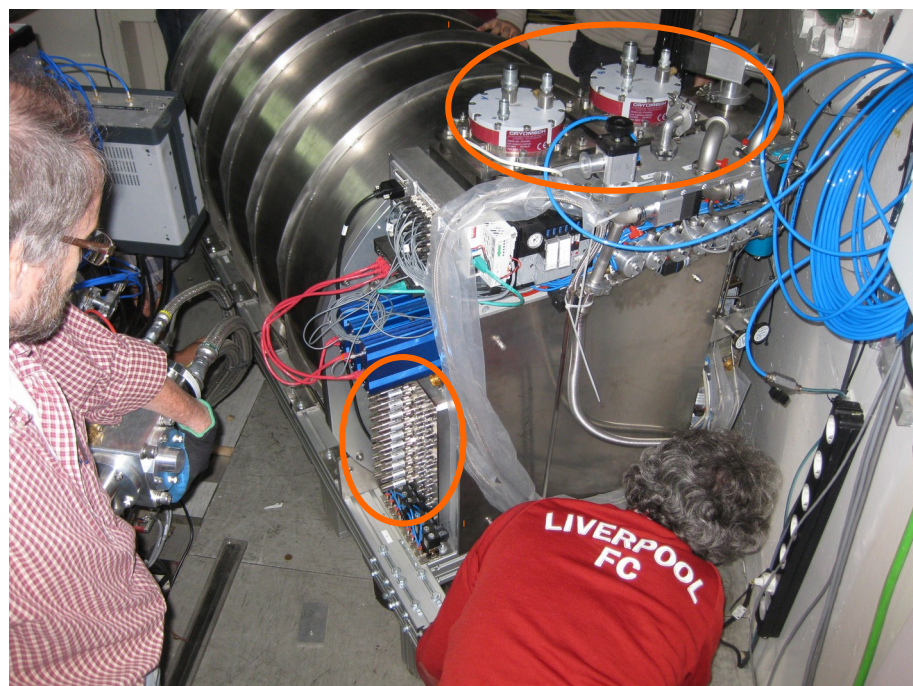
- Avoid emergencies with planned maintenance
- Typical examples: oil filters, PT alignment, ...



Exceptional interventions

- Some interventions need access to cryostat (dichroic, ...)
- Possible, but tight, during 1 maintenance slot
- Sometimes need to count more than that

➔ *Time, people, risks...*



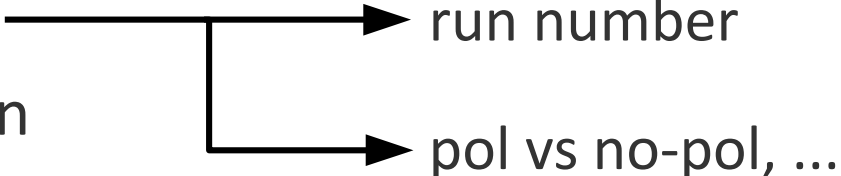
Exceptional interventions

- Some interventions need access to cryostat (dichroic, ...)
- Possible, but tight, during 1 maintenance slot
- Sometimes need to count more than that

➔ *Time, people, risks...*

Be reasonable!

Preparing the software

- Again, can be easy
- But in general at least some hiccups..
- Take time (and margin!) to:
 - 1 - Turn on amplifiers
 - 2 - Turn on synthesizers and NIKEL boards
 - 3 - Check NIKEL boards status (and act accordingly)
 - 4 - Update the 'ini' files 
 - 5 - Launch the acquisition
 - 6 - Perform sanity checks

Preparing the software

- Again, can be easy
- But in general at least some hiccups..

```
slot 2: IP=192.168.1.152      ping is OK      IPBUS is OK
slot 4: IP=192.168.1.154      ping is OK      IPBUS is OK

***** ip = 192.168.1.160      crate array 2      *****

slot 2: IP=192.168.1.163      ping is OK      IPBUS is OK
slot 1: IP=192.168.1.162      ping is OK      IPBUS is OK
slot 4: IP=192.168.1.165      ping is OK      IPBUS is OK
slot 3: IP=192.168.1.164      ping is OK      IPBUS is OK

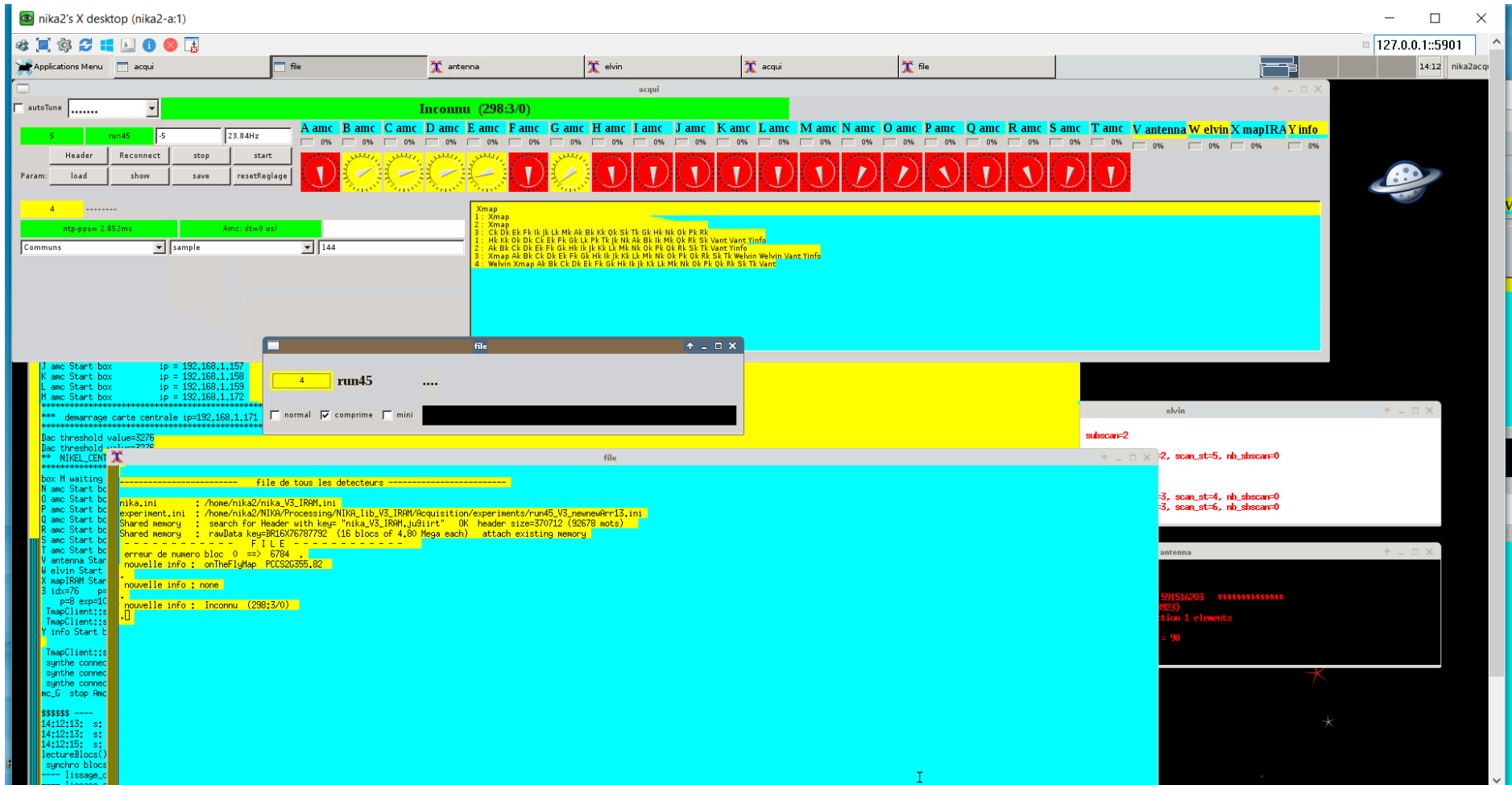
***** ip = 192.168.1.170      crate array 3      *****

#####
2019-05-29T13:54:15.412488
MissingBoard in array3, with IP=192.168.1.172
MissingBoard in array3, with IP=192.168.1.173
MissingBoard in array3, with IP=192.168.1.174
MissingBoard in array3, with IP=192.168.1.175
MissingBoard in array3, with IP=192.168.1.176
MissingBoard in array3, with IP=192.168.1.177
MissingBoard in array3, with IP=192.168.1.178
MissingBoard in array3, with IP=192.168.1.179

nika2@nika2-a:~/NIKA/Processing/NIKA_lib_V3_IRAM/Acquisition/appli$
```

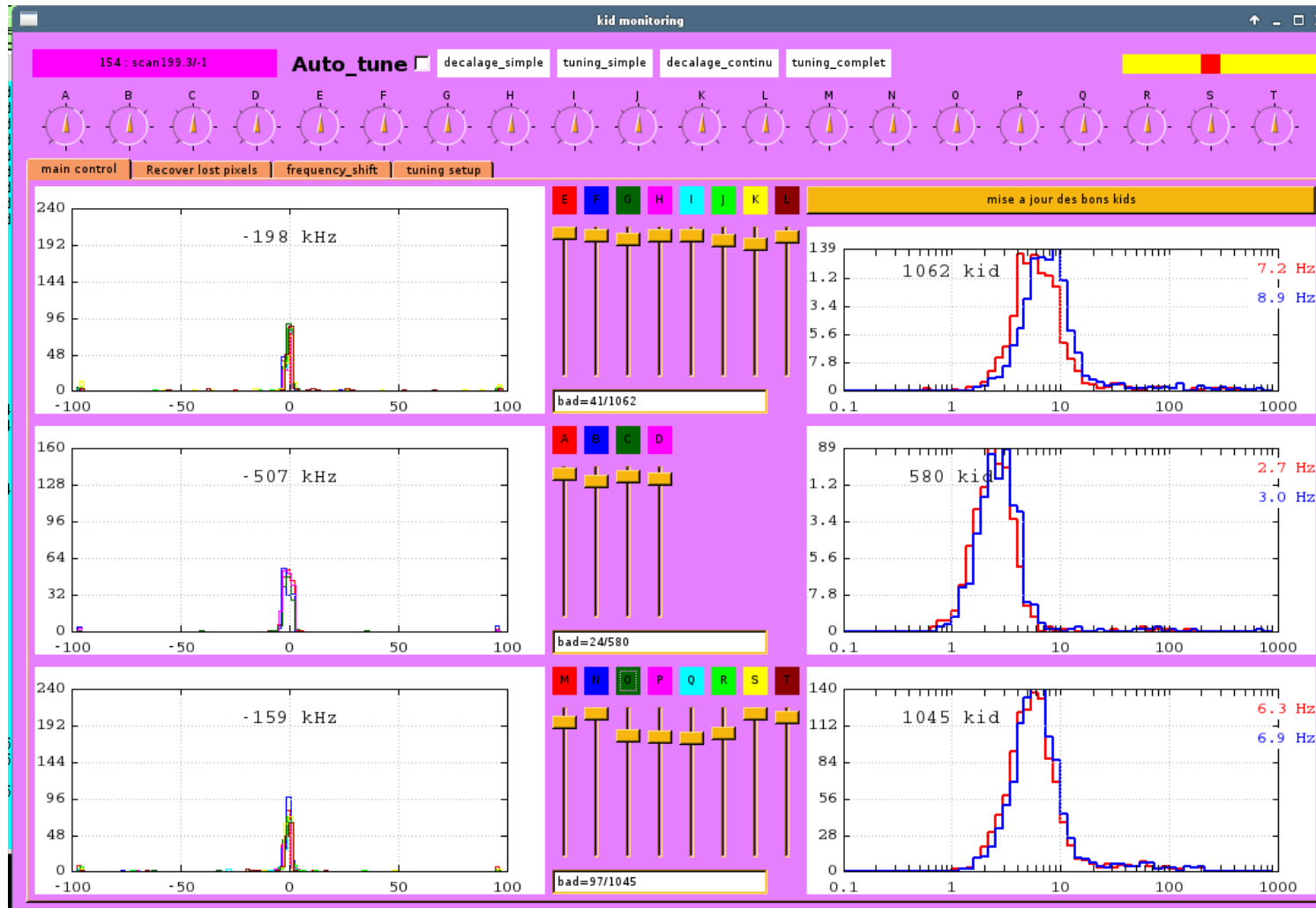
Preparing the software

- The easy case:



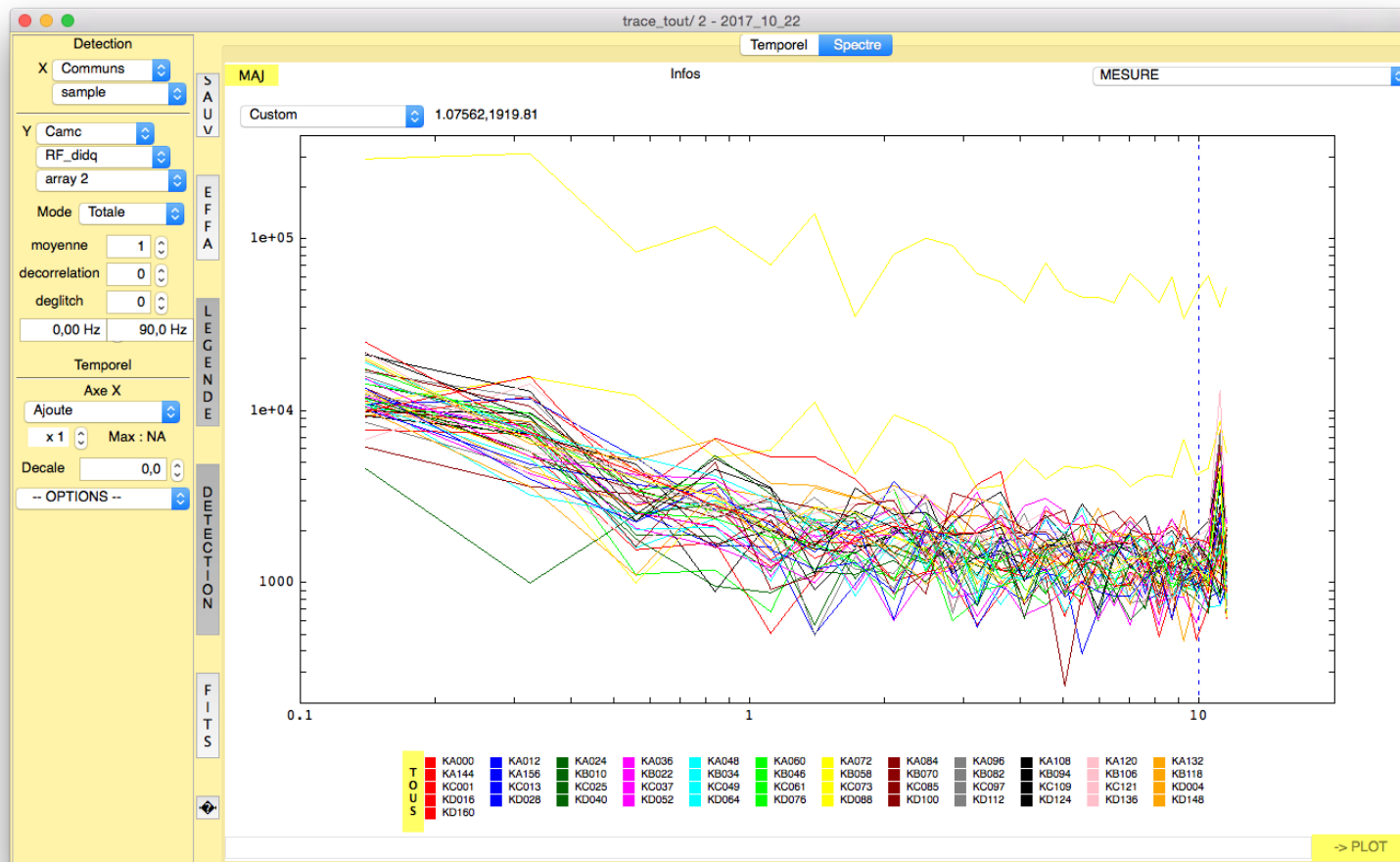
Preparing the software

- The easy case:



Preparing the software

- The easy case:



➡ **GREEN LIGHT** for the pool!

Standard problems

- In order of increasing annoyance...

Unresponsive electronic board/amplifiers box

```
slot 2: IP=192.168.1.152      ping is OK      IPBUS is OK
slot 4: IP=192.168.1.154      ping is OK      IPBUS is OK

***** ip = 192.168.1.160      crate array 2      *****

slot 2: IP=192.168.1.163      ping is OK      IPBUS is OK
slot 1: IP=192.168.1.162      ping is OK      IPBUS is OK
slot 4: IP=192.168.1.165      ping is OK      IPBUS is OK
slot 3: IP=192.168.1.164      ping is OK      IPBUS is OK

***** ip = 192.168.1.170      crate array 3      *****

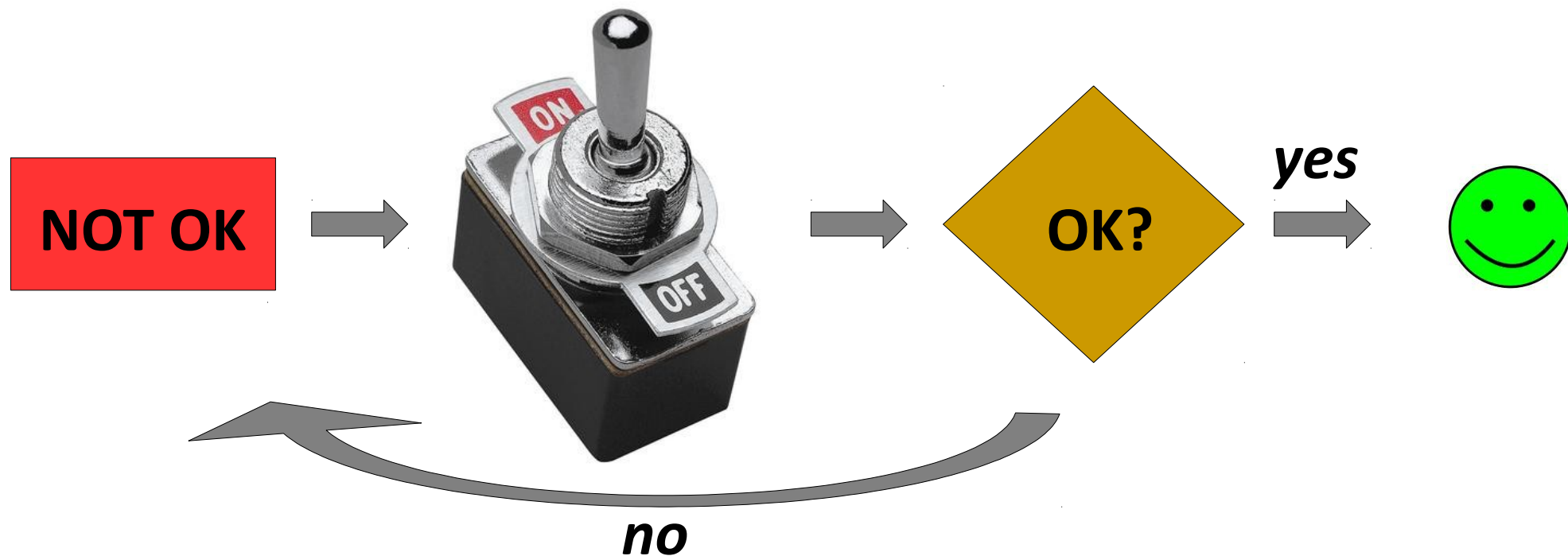
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2019-05-29T13:54:15.412488
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MissingBoard in array3, with IP=192.168.1.177
MissingBoard in array3, with IP=192.168.1.178
MissingBoard in array3, with IP=192.168.1.179

nika2@nika2-a:~/NIKA/Processing/NIKA_lib_V3_IRAM/Acquisition/appli$ █
```

Standard problems

- In order of increasing annoyance...

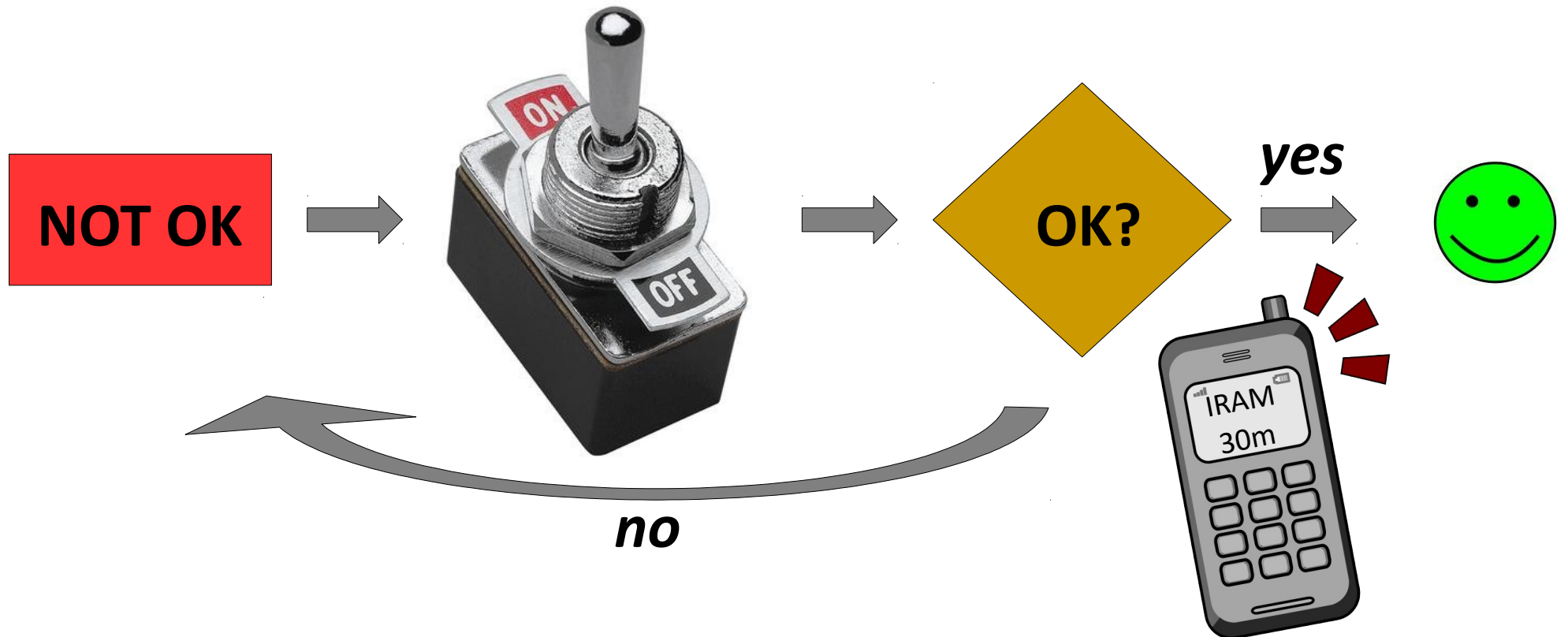
Unresponsive electronic board/amplifiers box



Standard problems

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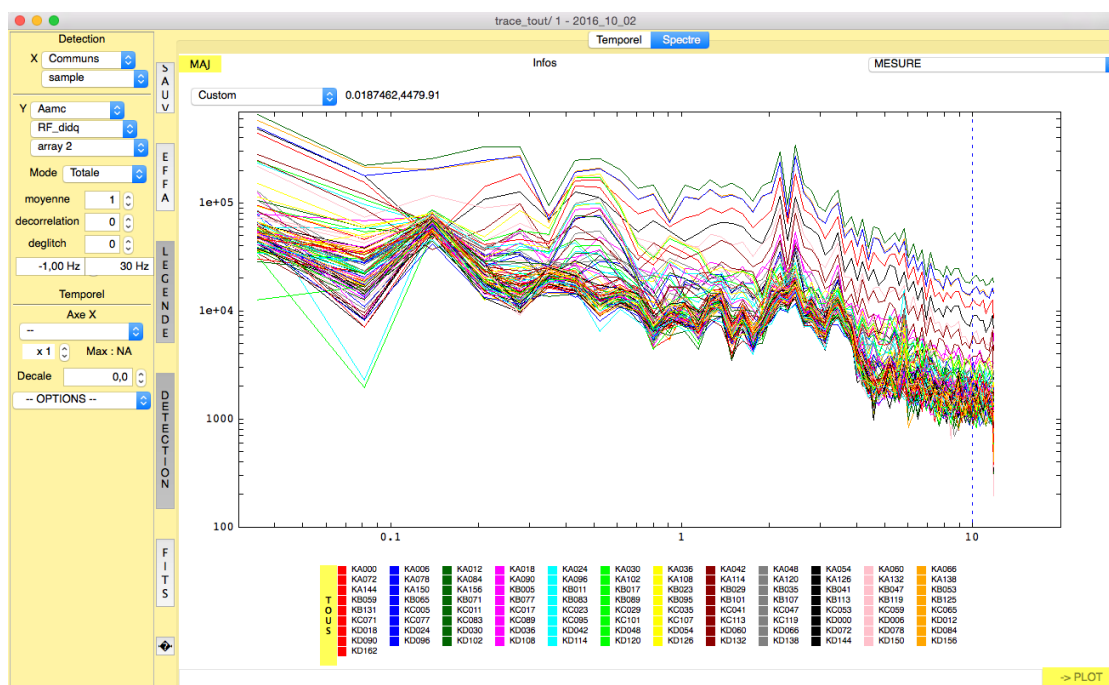
Unresponsive electronic board/amplifiers box



Semi-standard problems

- In order of increasing annoyance...

PT noise visible

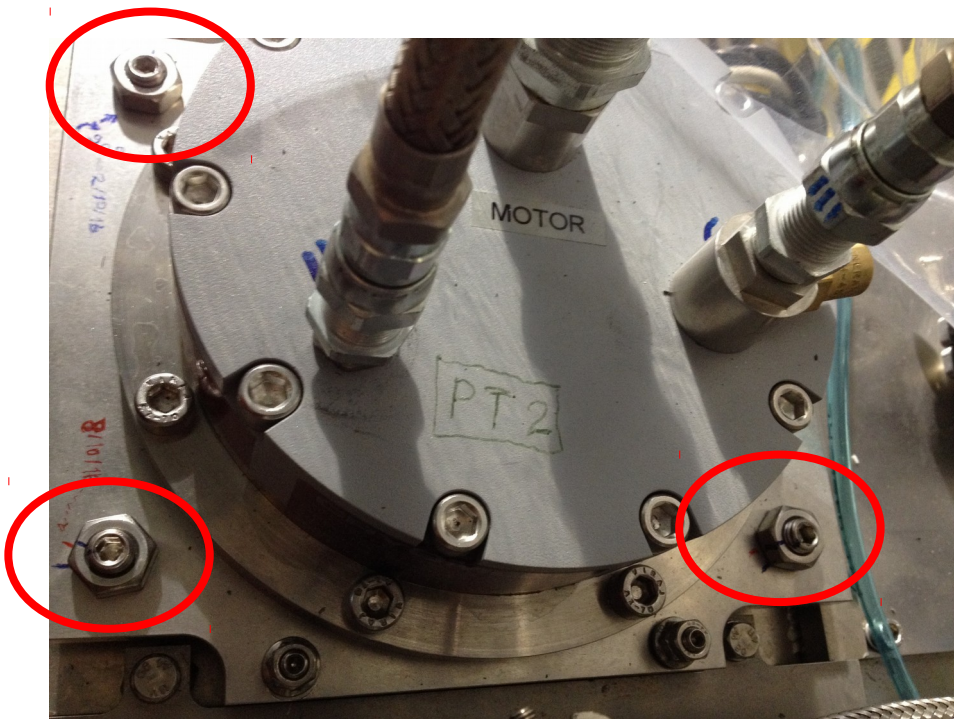


Semi-standard problems

- In order of increasing annoyance...

PT noise visible

Need to adjust many screws. Follow the doc, be patient, careful, and calm! (easy to miss the best position..)



Handwritten notes and diagrams:

1) untight all counter bolt
 all 4

2)

no 4: $\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} - \frac{1}{4} - \frac{1}{4} - \frac{1}{4} - \frac{1}{4}$
 no 1: $\frac{1}{4} + \frac{1}{4} - \frac{1}{4}$
 no 2: $\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} - \frac{3}{4} - \frac{1}{4} - \frac{1}{4} + \frac{1}{4} - \frac{1}{4}$
 no 3: $\frac{1}{4} + \frac{1}{4} + \frac{1}{4} - \frac{3}{4} + \frac{1}{4} - \frac{1}{4} - \frac{1}{4}$

4 is optimal -
 mais bruit de tracer

1: $-\frac{1}{4} + \frac{1}{4} - \frac{1}{4}$
 2: $-\frac{1}{4}$
 3: $-\frac{1}{4}$
 4: $-\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} - \frac{1}{4} - \frac{1}{4} - \frac{1}{4}$

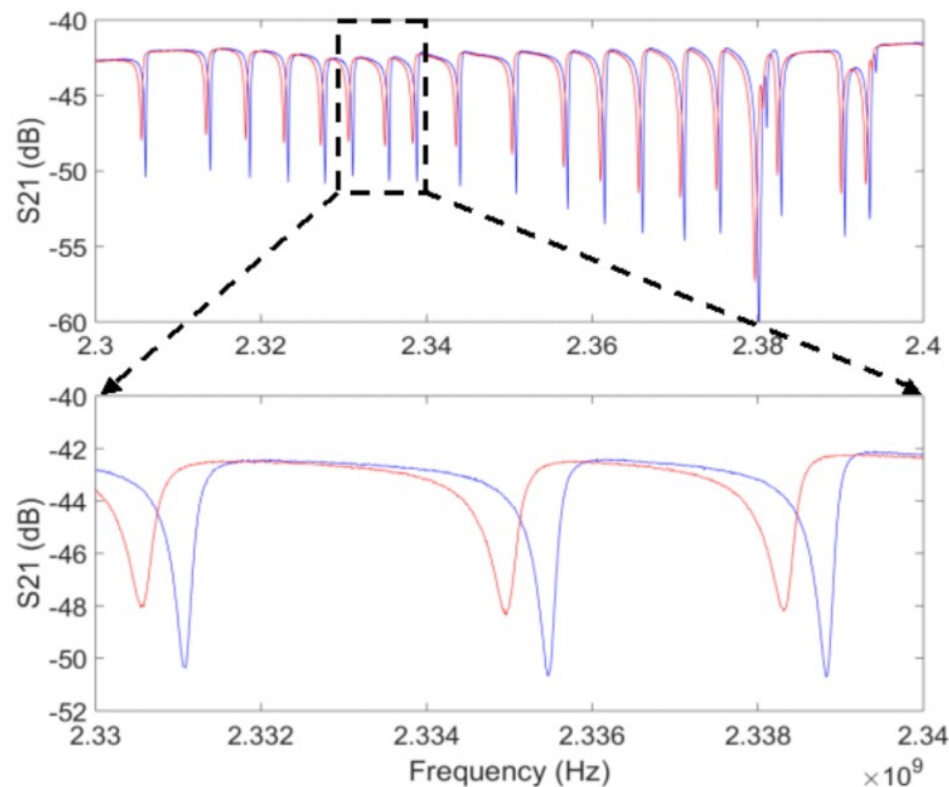
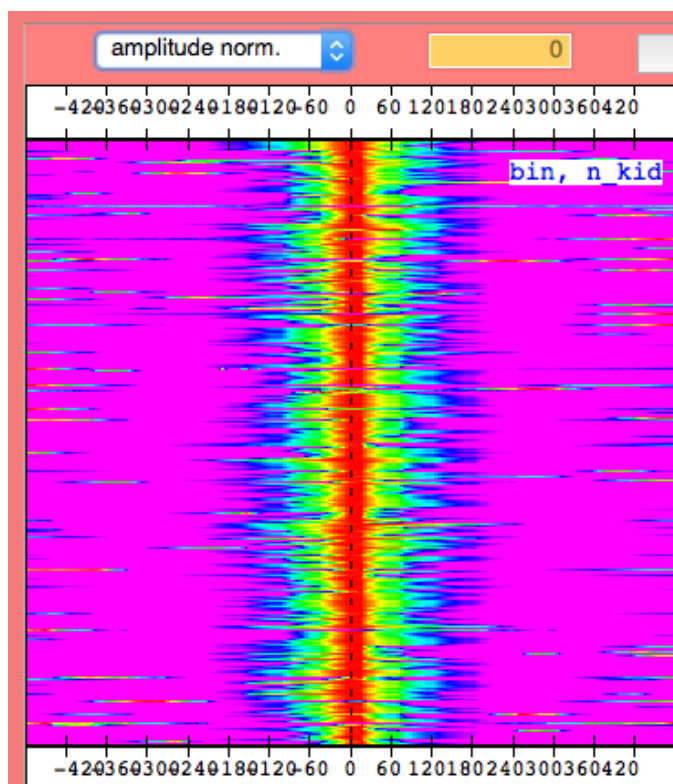
→ 4 vises ensemble + (12) - (12)

Semi-standard problems

- In order of increasing annoyance...

KIDs arrays aging

At the beginning, just after 'reference sweep':



➔ *Tuning OK!*

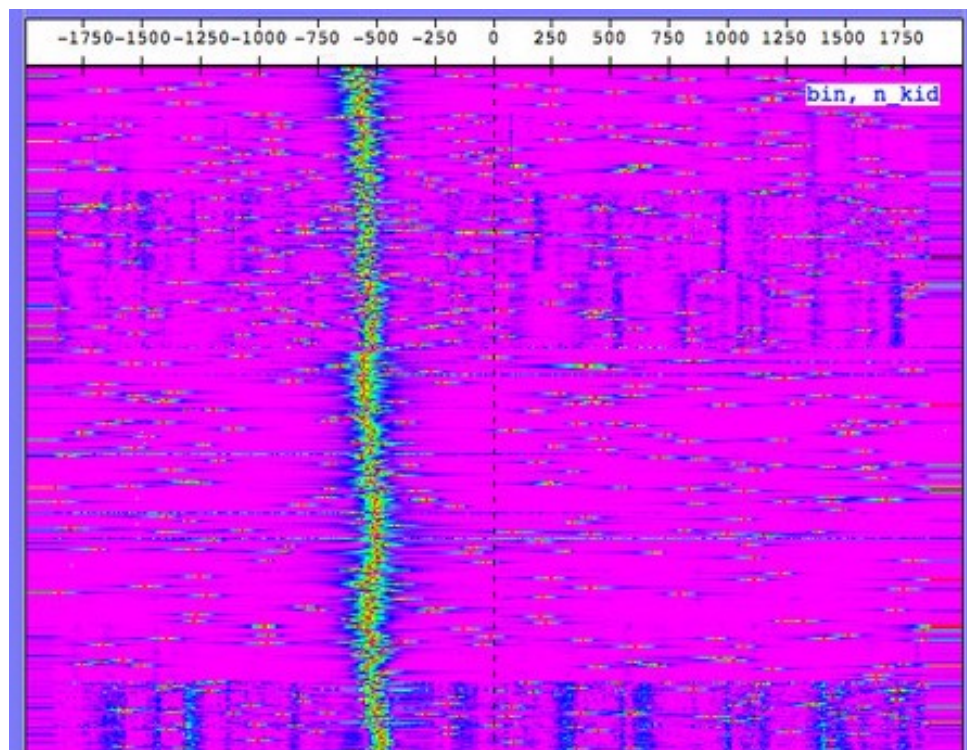
Semi-standard problems

- In order of increasing annoyance...

KIDs arrays aging

Thin Al film ages, Lk increases → f_{reso} shuffled!

Natural process that must be accounted for



➡ *Tuning not OK!*

Semi-standard problems

- In order of increasing annoyance...

KIDs arrays aging

Planning updates of reference frequency sweep (1/yr)

Each update implies new focal plane geometry!

Strong impact on data analysis/pipeline

Exceptional interventions

- In order of increasing annoyance...

Major update of the acquisition software (CAMADIA)

Each major update must be 'commissioned'

Problems sometimes not easy to spot, + can have an impact on all data analysis

*To be minimized!
(/stopped?)*

Exceptional interventions

- In order of increasing annoyance...

Major update of the acquisition software (CAMADIA)

Each major update must be 'commissioned'

Problems sometimes not easy to spot, + can have an impact on all data analysis

*To be minimized!
(/stopped?)*

In principle, no longer a problem (V3 will soon be frozen)

(Still some ongoing debugging)

Handing over NIKA2 to IRAM

- Work in progress
- Cryostat: we are there!

Many thanks to Santiago, Dave, Juan-Luis

IRAM in charge of all cooldowns + standard maintenance

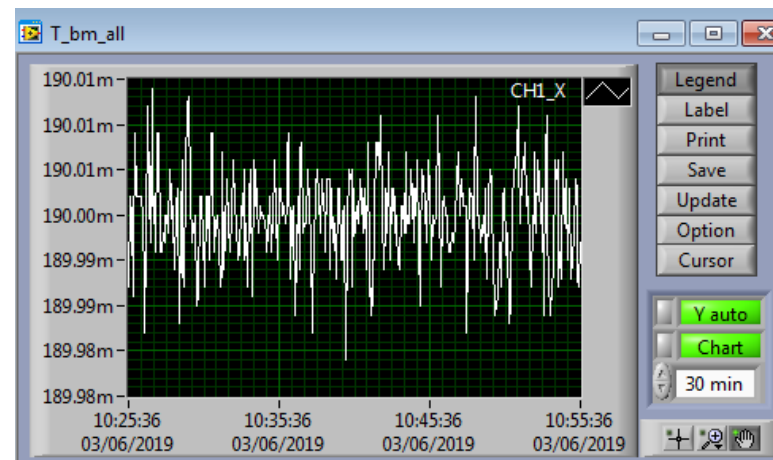
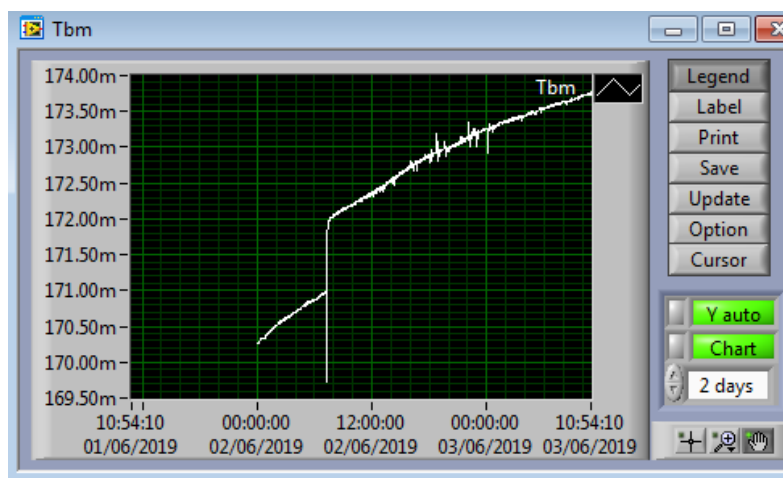
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Last cooldown just finished!



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IRAM in charge of all cooldowns + standard maintenance

Last cooldown just finished!

NIKA2 cool down procedure. Based on cool down performed on March 22nd 2017

(v13, revised 03.06.2019)

The helium circuit was already evacuated since the previous night (>12 hours pumping). Only the circuit around the traps and the pipes was evacuated, not the part in the cable spiral. See figure 1 for status

NIKA2: Cleaning the traps

(May 30TH-2019, v6.0)

When the pressure difference P101-P103 starts to rise is a sign that the trap is getting clogged by impurities in the gas. To clean the trap we have to warm up the cryostat, either partially or making a

Handing over NIKA2 to IRAM

- Work in progress
- Acquisition: ongoing

Many thanks to Alessia, Bilal, Pablo, all the astronomers ...
The final release of CAMADIA will make things easier



NIKA2 System Recovery for software version **AB_OB**

M. Calvo, A. Monfardini, A. Benoit, A. Catalano, & O. Bourrion

December 17, 2018

Abstract

The present document summarizes the main thing that must be checked to be sure that the NIKA2 acquisition is running smoothly at the 30m telescope, and the steps to follow in order to perform a system recovery in case of need. Procedures to connect (remotely or locally), start, check, and reboot the system if necessary are described. Some of the procedures listed below involving reboots of the electronics should be taken with caution and are not recommended for non-experienced observers. In case of doubt, please contact the IRAM staff or a NIKA2 instrument expert for assistance.

Handing over NIKA2 to IRAM

- Work in progress
- Pipeline: ongoing

Many thanks to NIKA2 'TigerTeam', IRAM software guys,

Tests ongoing, more planned

Handing over NIKA2 to IRAM

- Work in progress
- The bottom line:

Almost there

NIKA2 team happy to help

Main effort on IRAM staff...

*Keep on the constructive
collaboration effort!!*

THANK YOU!