

2025/01/24

Meeting about NIKA2 re-commissioning preparation.

This is a schematic summary of what was discussed and decided.

Samuel is coordinating the NIKA2 hardware upgrade.

Stefano and Angel are coordinating the NIKA2 re-commissioning that comes after.

Stefano will distribute the minutes to all participants
and EVERYONE will check if all needed points are well set

Attendees to the meeting:

Alessia Ritacco
Angel Bongiovanni
Carlos Duran
Carsten Kramer
Dave John
Juan Macias-Perez
Nicola Ponthieu
Samuel Leclerc
Stefano Berta
Stergios Amarantidis

Agenda:

- decide the list of participants to the recommissioning weeks, both on site and remotely;
- discuss and decide the main operations that need to be carried out;
- discuss and decide the main observations that will be performed and the kind of scans needed for the re-commissioning;
- discuss and decide the data processing effort needed, both during the weeks and later, including what information we would like to extract from the above mentioned scans;
- AoB

Time line of operations at the 30m telescope in the next two months, as scheduled and as re-defined today at this meeting:

- Feb 3rd - 10th: holography (see notes below)
- Feb 10th - 18th: NIKA2 Winter-2024 4th pool week (AoD Stefano)
- Feb 18th - 25th: NIKA2 Winter-2024 5th pool week (AoD Stergios)
- Feb 25th - Mar 3rd: EMIR observations
- Mar 4th - 11th: NIKA2 upgrade (see below)
- Mar 11th - 18th: EMIR observations
- Mar 18th - 25th: NIKA2 re-commissioning (see below)
- Mar 25th - 30th: EMIR observations
- Mar 30th - Apr 1st: 2nd intervention on the NIKA2 hardware to change the relative position of the arrays (along the z axis)

- End of May or beginning of June: 2nd part of the NIKA2 re-commissioning

Holography session (Feb. 3rd - 10th)

- Carlos points out that it would be good to have maps of reference objects before and after the holography session (i.e. readjusting the surface).

- We will use Uranus bam maps
- We have already many Uranus beam maps "before" the holography session

(NIKA2 past pool weeks)

- We will take new Uranus beam maps during the NIKA2 that come after the holography (Feb 10th - 25th), both in total power and in polarimetry mode.

Summary of the NIKA2 upgrade (March 4th - 11th):

- change 1mm arrays
- change dichroic
- change of cryo lenses
- change of IR-blocking filters

Preliminary plan for the upgrade:

- Feb 25th - March 3rd: warm up NIKA2
- NIKA2 will be already warm on 2025/03/04
- March 4th - 11th: actual NIKA2 upgrade
- March 11th - 17th: NIKA2 cooling down (maybe start already on the 9th)
- March 11th - 17th: EMIR week

Carlos wishes to have a list of the actual upgrade operations. A detailed list day by day might be difficult to prepare, because the details depend on how long each operation takes in practice. A simple sequence of operations (e.g. we change at first this, and then that) should be easier to produce. Samuel will check.

Would it be possible to observe with EMIR at night (with flexible times)?

- we cannot ask science observers, because we need to be flexible
- therefore it is better to avoid science EMIR projects and instead use the night time for technical observations

People on site (Samuel will get in touch with them and make sure the trips/stay will be organized):

- Samuel,
- Martino,
- Alessandro,
- likely Gregory Garde,
- 1 or 2 people from the receivers group
- the presence of the telescope group is not strictly needed for this intervention

If during cooling there are problems -> we need to re-open immediately !!!

Re-commissioning (March 18th - 25th), people availability:

- Stefano at the telescope
- Carsten at the telescope
- Stergios at the telescope
- Angel at the telescope
- Juan at least remotely, maybe at the telescope
- Nicolas remotely intensely at the beginning (except 18/3 @17 and 21/3 in the evening)
- Samuel remotely
- Xavier remotely 20-24/3
- Alessia available remotely 18-21 (Tue-Fri)
- Brisa is warned of the chance of using EMIR if anything goes wrong

Re-commissioning (March 18th - 25th), plan.

Originally, two weeks were booked for the re-commissioning. The plan was to quickly assess the relative focus between the three arrays and decide if we need to re-open in order to move the arrays and bring them to the same focus position (as much as possible).

The re-commissioning has now been reduced to one week in March and a second week at a later time, possibly at the end of May or beginning of June. In fact we realised that warming up takes 5 days, cooling down takes ~one week, and therefore re-opening the cryostat to move the arrays would occupy more than one week and we would have had no time for the second part of the re-commissioning (after the 2nd opening).

Here comes the updated plan.

- March 11th - 17th: NIKA2 cooling down (maybe start already on the 9th, see above)
- March 18th: start the re-commissioning of NIKA2, after cooling down
- We are going to use the use t22 account
 - > copy the current scripts into the directory PaKo/202503/
- IMPORTANT NOTE: if problems pop up during the recommissioning?
 - > re-open! (hardware people be ready)
 - > use EMIR meanwhile
- March 18: the first action is the new sweep (Martino, Alessandro, Dave)
- we then spend one-two days for the first characterization of the arrays, aimed at determining the new kidpars (IDL pipeline). Nicolas will work with us remotely during these first phase.

Details about all operations are given in the next Section, below.

(weather permitting)

- new arrays
 - > first guess of kidpars from Martino's design
 - > a full beam map would take 30 min
 - > the data red of a full beam map, take roughly the same time
 - > Therefore we decide to take a smaller beam map, on the central kids only
 - > check the source on the TOI, if it's here, then proceed
 - > process the small beam map
 - > if on focus, determine kidpars for central KIDs
 - > otherwise refocus and repeat
 - > the smaller beam-map saves 1-2 hours over the whole procedure
 - > the reference (central) pixel shall be determined!
 - > when on focus and the central kidpars are there, proceed
 - > full beam maps
 - > full kidpars
 - > produce also PIIC preliminary RPPs (Stefano)
- this process will take ~2 days, including the new kidpars/DAFs and likely also the verification of the relative focus between the arrays. It might be faster, but let's count ~2 days
- at this stage we will know if we need/want to re-open the cryostat to adjust the relative position of the arrays (along the z axis).
- CASE A) the re-opening will happen (very likely).
 - The re-opening is already scheduled for March 30th (Sunday).

For the rest of the March 18-25th week, we proceed with the first part of the re-commissioning, aimed at characterizing the new arrays and test/characterize as much as possible the upgraded NIKA2

On March 25th (Tuesday, maintenance day) @ 10:30
start warming up NIKA2

On March 30th (Sunday) @ 10:30 the 2nd hardware intervention will begin and will take 2 days (until Tuesday morning). The arrays will be moved along the z-axis in order to bring them to the same focus (as much as possible)

The 2nd half of the re-commissioning (after the 2nd intervention) will be at the end of May or beginning of June, because April is

fully taken by EHT and in the first half of May not everyone will be available.

- CASE B) we decide not to re-open (unlikely).

We proceed with as many re-commissioning operations as possible, including the full characterization of the instrument, as described in the next Section below, including stage-2 operations such as a pointing session and de-focused beam-maps.

Detailed list of operations / observations to be carried out during the NIKA2 re-commissioning campaign (March 18th - 25th, plus maybe May/June):

- new sweep
closed window
will show already if any KID has enhanced noise
(no info about the dichroic performance)
- check DAQ on sky, check traces:
we could again already see if there are problems with some KIDs
noise properties
also shows if the dichroic is healthy
check source and beam width
- pointing, focus, pointing, beam-map
this very first observations might be a bit tricky, because we likely do not have the possibility to alternate the new sweep to the old sweep (because we have completely new arrays). Nicolas will intervene and use the IDL pipeline to determine the first kidpars. We will follow the procedure outlined in the previous Section above:
 - > small beam maps, limited to the central kids only
 - > check the source on the TOI, if it's here, then proceed
 - > process the small beam map
 - > if on focus, determine kidpars for central KIDs
 - > otherwise refocus and repeat
 - > at this stage, the smaller beam-map saves 1-2 hours wrt full beam maps in case we need to repeat and re-iterate
 - > the reference (central) pixel shall be determined!
 - > when on focus and the central kidpars are there, proceed further
 - > full beam maps
 - > full kidpars
- produce also PIIC preliminary RPPs (Stefano) and finally enable the PIIC monitor.
- This might take up to ~2 days. Hopefully faster, but let's keep some margin.
- any possible idle times could be filled by EMIR or with the PIMP
- I insert the PIMP operations here, but they could be performed also later, in case there's no occasion at this point:

Determine / check the passbands with the PIMP
Who on site is able to run the PIMP?
Samuel will be available online to instruct Stefano or others at the telescope on how to use it. Moreover the online documentation will help (see the NIKA2 Wiki)

The PIMP needs a special .ini file for the DAQ

The PIMP will be craned up to the cabin in advance
(either during the Holography week, or during the NIKA2 hardware intervention)

Analyse the PIMP data -> Juan

- Once the full beam maps and kidpars/DAFs will be ready and analysed, we will assess the "flat field", i.e. we assess if the current shadowing caused by the old dichroic is gone. We can also assess how big is the difference in beam shape/s (i.e. focus) across the f.o.v.
- with the focus maps + beam maps, we assess immediately how much is the focus difference between Arrays 1,2,3. few scans are in principle enough, but we'll need some statistics, in order to be more conclusive and determine the offset with high enough precision. These scans can be part of the initial 2 days, or might some more time, depending on how long it takes us to complete the kidpars/DAFs.
- At this point, we can assess the focus situation and meet a decision: does the upgraded NIKA2 need to be opened again, so to optimize the (relative) position of the three arrays and bring them to the same focus?

Are there any other issues that need to be solved by opening the cryostat?

- CASE A) we decide that we need/want to re-open the cryostat to adjust the relative position of the arrays and bring them to the same focus. [and/or to solve any other issues]
 - assess by how much the arrays need to be moved (and which arrays) [Samuel, simulations vs. observations]
 - the re-opening is already scheduled for March 30th, two days. Notify the hardware people that they need to prepare to come to the telescope.
 - proceed with the re-commissioning for the remaining days, up to March 25th.
 - keep taking pointing, focus, calib_1scan, beam maps of calibrators
 - beam maps of Uranus in total power AND polarimetry mode
 - polarized beam maps of QSOs
 - importantly, polarized beam maps of 3C286
 - perform the full characterization of the arrays and NEFD in total power. Preferred targets:
 - 1h on HLS (bright source)
 - older scans are available before any upgrade (telescope and NIKA2)
 - first assessment of new sensitivity
 - if good, then spend time on G2 (faint source)
 - deep integration on faint source G2 (5-10 hours)
 - older scans are available before any upgrade (telescope and NIKA2)
 - Orion-B big maps with extended emission,
 - older scans are available before 30m painting and after painting (before NIKA upgrade)
 - M8182 big maps with empty sky, a bright compact source and a faint extended source
 - older scans are available during new servo system upgrade, before 30m painting
 - perform the full characterization of NIKA2-Pol.
 - If the external calibrator is confirmed to be working properly, use it too!
 - Preferred targets:
 - polarimetry QSOs
 - polarimetry Crab Nebula
 - beam map on 3C286
 - beam map Uranus in pol-mode
 - If the external calibrator is confirmed to be working properly, take some scans with the external calibrator on and off. We need to characterize the zero level of the external calibrator. To this aim, short scans are sufficient.

- the NIKA2 warming up will start on March 25th @ 10:30
 - the 2nd hardware intervention will happen from March 30th to April 1st
 - the 2nd part of the re-commissioning will take place either during the last week of May or during the first week of June
- CASE B) we decide that we do **not** need/want to re-open the cryostat.
- proceed with the full re-commissioning on NIKA2 for the remaining days, up to March 25th.
 - keep taking pointing, focus, calib_1scan, beam maps of calibrators
 - perform a full pointing session
 - beam maps of Uranus in total power AND polarimetry mode
 - polarized beam maps of QSOs
 - importantly 3C286
 - take also de-focused beam maps (with few different focus positions; be aware that this takes quite some time). The aim is to determine the best offset to use in order to have the best focus on avg over the whole focal surface (at the moment this is the "famous" 0.2 mm offset).
 - perform the full characterization of the arrays and NEFD in total power. Preferred targets:
 - 1h on HLS (bright source)
 - older scans are available before any upgrade (telescope and NIKA2)
 - first assessment of new sensitivity
 - if good, then spend time on G2 (faint source)
 - deep integration on faint source G2 (5-10 hours)
 - older scans are available before any upgrade (telescope and NIKA2)
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 - older scans are available during new servo system upgrade, before 30m painting
 - perform the full characterization of NIKA2-Pol.
 - If the external calibrator is confirmed to be working properly, use it too!
 - Preferred targets:
 - polarimetry QSOs
 - polarimetry Crab Nebula
 - beam map on 3C286
 - beam map Uranus in pol-mode
 - If the external calibrator is confirmed to be working properly, takes some scans with the external calibrator on and off
 - We need to characterize the zero level of the external calibrator. To this aim, short scans are sufficient.
 - the re-commissioning ends on March 25th
 - if necessary, a 2nd re-commissioning week will happen either on the last week of May, or on the first week of June

2nd part of the re-commissioning (last week of May or first week of June).

Either in the case that the cryostat is opened a second time on march 30th, or it's not re-opened but the re-commissioning week is not enough to perform all needed observations, we will have a second part of the re-commissioning.

It will take place during the last week of May or during the first week of June.

We can reserve only one week.

If this second chance is washed away by bad weather -> shift to September

AoB

Analysis a posteriori ("at home"):

- complete the derivation of the NEFD
- update the exposure time calculator
- analyse the PIMP data and provide new band passes, to be put online.
Keep also the old band passes, to be used with all data taken before the upgrade!
- complete the determination of new kidpars and DAFs
- perform the data reduction and performance comparison using the know/preferred targets that have been observed:
 - before the new 30m paint
 - after the pain and before the NIKA2 upgrade
 - after the NIKA2 upgrade (including new paint, obviously)
- analyse polarimetry data and see if/how the instrumental leakage has changed.
- similarly, assess any changes of the polarization angle systematic offset.

Channels of communication

- wiki
- daily meeting video.iram.es
@ 12:30
- emergency phone
- Skype channel in control room (ID: mrt-iram.es)
- Slack (?)

Disk space:

there need to be enough space
nika2-a / b
easy transfer and space from Granada to Grenoble is ok (but takes time)
Juan will make sure to have enough space on the LPSC machines

Happy re-commissioning!
See you in March!
