

# Minutes of the September 9 2011 meeting for the preparation of the 3<sup>rd</sup> run of NIKA at Pico Veleta

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Participants:

Néel: AB, AM, CH, NB

IPAG: FXD, NP

IRAM Gre: SL, RZ, MR, (KS)

IRAM Gra: NB, AS, DJ, (WB)

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## Summary

- 3 main upgrades on NIKA: cryogen free cryocooler, 1kHz modulation, KID arrays.
- Run planning: 6 days for installation and tests, 7 observing nights.
- Possible locations and water-cooling supply for the compressor to be confirmed.
- 6x25 liters of liquid Nitrogen needed.
- NIKA data transfer line (cabin to control room), and NIKA network structure at the telescope to be defined.
- Need a FTP server of NIKA data, and possibly a VNC connection.
- Need to write a program to get telescope data from the ELVIN server and reformat them into a stream usable by Camadia (NIKA acquisition program).
- Create a NIKA entry into NCS.
- Write a Mopsic code to calculate a NIKA pointing model from its IMBFITS.
- Focus calibration: custom procedure using minimaps seem best, otherwise use standard with wobbler and TTL signal in the receiver cabin.
- Source list: most are known sources to make sure we understand the instrument, but also 2 science grade projects.
- ➔ Still many things pending to prepare correctly the run, these items and the persons identified to treat them are highlighted using red fonts in the minutes below.

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## Minutes

**The text in bold characters highlights the main items of the discussions.**

*The text in italic gives answers to questions raised during the meeting.*

*The text in italic red reminds tasks to do and persons who may do them.*

### NIKA upgrades (AB & AM):

- **Cryogen free cryostat** (60mK base temperature, several cooling already done in lab)
- **Dichroic** from Cardiff
- **2 arrays** for the 2mm band (Al, dual polarization with Hilbert meander geometry), and 2 arrays for the 1mm band (Antennas from SRON, TiN LEKID from Néel-IRAM). Some correlated noise excess in TiN. All arrays better than previous run, in particular 1mm band.

- More **shielding** against magnetic field
  - 1 kHz **modulation** of the tones and automatic procedure to follow the tones (=> measure **I, Q, dI, dQ** better tuning & processing of “parasites” seen in previous run data)
- Same optics and same pumping system as last year.

### Cryocooler compressor:

- **Default location** in the **cable spiral room** (1<sup>st</sup> floor of the telescope), use the 45m long He lines already installed at the telescope
  - **Backup options** in case there’s a problem with this location: try the on the floor in the **receiver cabin** or the **floor just below**. To estimate the validity of these two backup options:
    - We need to know what is possible at the 30m: dimensions of the possible locations, length of the He lines needed, power supply and water supply available. Note that the compressor **ran at Néel** only with **5m long He** lines.
    - Granada staff needs the specifications of the cryocooler.

➔ *Several emails exchanged on that topic since January 2011, mainly between Philippe, Santiago and Samuel:*

*Cryocooler spec: **PT407, CP2870: 380/420 VAC, 3 phases, 50 Hz, 7 kW, 48x46x56 cm***

*Santiago wrote: “I have checked that the 3 phases **electrical distribution can handle the 7 kW** of power. For the water cooling system I suggest that we just **use water from the tap** and not a closed cycle like the one we have for the multibeam receiver.”*
  - HERA and EMIR water system can’t be switched off because they do observations alternately with NIKA, however the cabin has a backup cooling system that could be used; Dave will check.
- Pending: confirmation for the possible locations of the compressor for the backup options, confirmation about the water system to be used ➔ Dave, Santiago.*

### Planning of the run:

- **Wed 12: Installation** and start cooling ➔ **2:00 PM to 6:00 PM** currently scheduled (+/- 1h uncertainty). We need somebody from the **Granada staff** who can manipulate the **crane**.
- **Tue 13:** Check **data transmission** and **network** between receiver room and control room. We need somebody from the **Granada staff** who can help on that topic (see Network paragraph below).
- **If there’s a problem** with the cryocooler **compressor** in the spiral cable room, install it **elsewhere** on **Fri 14 or Sat 15**, preferably at **night** or in the **morning**. ➔ Need several hours and somebody from the **Granada staff** who can manipulate the **crane** and help to find the **best location**. In any case (problem or not with the compressor) we will need somebody from the Granada staff who can **remove M3** for optical **alignment with the laser**.
- Fri 14 to Mon 17: Use the telescope 1-2 h per day for tests on detectors, software, radio pointing, and so on...

- **Tue 18** (night 17 to 18) to **Mon 24: Observations** from **1:00 AM to 2:00 PM**.
- Nicolas will find out what to do about the overlapping time of NIKA observations with the regular maintenance of the telescope. It causes no problem to the NIKA team if the observations have to be interrupted.

### Personnel of the run:

The NIKA team will send their list of persons. Basically it will be similar to last year: request 4 room with possibly 2 persons per room => **up to 8** persons from **Néel + IPAG**. Persons from other collaborators (SRON, Cardiff) may want to participate; it's OK with Néel if they use the Padollano hotel as last year.

*Pending: list and dates of the NIKA staff, lodging possibilities at Pico Veleta → Alessandro, Samuel.*

### Fluid Supply:

- 6x25 liters of liquid Nitrogen.
- No liquid He
- Compressed He gas with very pure quality
- Compressed air lines.

### Network:

- 2 possibilities: share the NIKA private network with the IRAM network, or use a separate line for NIKA. The 2<sup>nd</sup> option would be the best since a lot of data will be transmitted.
- In any case **NIKA needs one good line (e.g. 1 Gb/s optical link)**; it has to be better than the 2 cables used last time (some errors occurred with the packets transmitted) because their quality might not be good enough to handle a large number of pixels with more data per pixel (I and Q like last time, but also the new dI and dQ).
- Walter will check what could have been the problem with the 100Mb/s cable used last time, and if a spare optical cable could be used.
- It would be good that **somebody from the Granada staff** who can help with the data **network and cabling** is present at the telescope on **Thu 13**.

*Pending: line that can be use to transmit data from receiver to control room, structure for the NIKA network → Walter, Miguel?*

### NIKA Data:

- It would be highly desirable to have a **VNC connection** from **Grenoble** (and possibly Granada) to **Pico Veleta** to be able to access the NIKA data, so that collaborators (from IRAM like Robert or possibly others Néel/IPAG collaborators) can access the NIKA data computer.
- A **FTP server of the NIKA data** is necessary (see IMBFITS below).
- Xavier and Alain will email Walter to put this in place.
- Wiki: continue with the existing pages.
- **IMBFITS:**
  - A program will convert raw data from various FTP locations and convert them into a quantity (RF) proportional to the signal (it will “linearize” backend data).
  - We need a program that take **ELVIN server data** from the telescope Control System (NCS), **reformat** them into a stream usable for processing the **NIKA data** (object, coordinates, date, etc.).

- We need also the logs of the PaKo commands to associate them with the NIKA data.
  - Either somebody from Granada writes this program or at least put in place a system allowing to interrogate ELVIN from Grenoble so that somebody from Néel or LPSC work on the program and test it with real ELVIN data.
    - *After the meeting Alain has sent an email with the specifications for the program that will request data from ELVIN.*
- Volume of data bigger than in previous run: still ~200 pixels but more data per pixel with 5 quantities instead of 3 previously: 4 raw + 1 processed (I, Q, dI, dQ, RF).
  - Xavier will provide test data FITS files to Albrecht so that he can check that everything is OK in the structure.

*Pending:*

- *FTP server and VNC connection → Walter?*
- *Program to request and reformat Telescope data from the Elvin server or procedure to open Elvin to Grenoble → Walter, Hans? (possibly Alain, Juan M., Fouad).*
- *Check the FITS files created by NIKA match the specifications requested for an integration with the telescope standard → Xavier, Albrecht, (Robert?).*

### **Pointing model:**

- **Procedure** to reach the best calibration level possible:
  - Creates the entity **NIKA in the NCS**.
  - Start with a pointing model copied from another receiver (e.g. MAMBO 2).
  - Use the standard procedure of pointing (cross scans, and 3 points focus).
  - **Map** a point source to know the **geometry of the array** (in sky).
  - Take few hours to observe many **pointing references** (quasars).
  - Transfer the data into **IMBFITS**.
  - Calculate the NIKA pointing model (Robert will treat IMBFITS with **Mopsic**).
  - Implement the **pointing model into NCS**.
  - Do a pointing on a reference nearby a source regularly and focus some time to time (very rough indication: every 1h +/-30m for pointing and 2h +/- 1h for focus depending on observing conditions...).
- The pointing session will make sense only if Robert has finished his program to reduce it.
- NIKA will have a **quick look** program allowing to deduce **approximate pointing** (use Az El from ELVIN sent every second and interpolate to build coordinates in sky for each pixel).
- The standard **focus** procedure takes 3 “snapshots” of the same location each with a different focus (M2 shift on the optical axis), but this is not good for NIKA which needs for a given pixel a measure on source and a measure off source → write a PaKo script that will be the custom NIKA focus routine, and which will takes 3 **minimaps** each with a different focus. Size of the minimap ~30” → ~ 3 minutes integration time to take a custom NIKA focus → **10 min for a calibration on sky** when counting the dead time.
- Is it better to **use the 2mm array** or the 1mm as reference for the pointing ? → 1mm has a smaller beam, but the sky quality is much better at 2mm, so that 2mm is actually better.
- Use 1 real pixel as reference, not a virtual pixel that would represent the center of the array.
- **Option** of using the **wobbler** for focus: need synchronization; is it possible to have the TTL signal in the cabin ? Ask Juan.

*Pending:*

- NIKA entry in NCS → Walter, Hans? (Albrecht?)
- IMBFITS structure for Mopsic → Xavier, Robert, (Albrecht?)
- Program to create pointing model from NIKA IMBFITS data → Robert
- PaKo scripts for NIKA custom focus → Xavier, (Hans?)
- Wobbler TTL into the cabin → Juan?

**Astronomy:**

- Same source list as last year, plan to repeat observations on **known sources** to **check** we understand the **calibration, sensitivities**, etc.
- Use primary calibrators (planets) and secondary calibrators from IRAM database.
- Start with relatively strong sources then goes to fainter and **fainter sources** (e.g. AGB with different fluxes) to check the scale and dynamic of the KIDs.
- Variety of sources: galactic, galaxies, clusters...
- Faintest sources ~**10-20 mJy** (e.g. list Omont-Cox), it will be particularly interesting to see if the 1mm channel detect them.
- 2 objects more **science** oriented than the others (several scientist involved in collaboration with Xavier): (1) **blind survey** of a small field including some known faint sources, integrate for ~10h, (2) ~ 4'x4' maps of **galaxy clusters** (at least 1 at  $z \sim 1.5$ ) known but never observed at a resolution as high as the 30m.
- Identification of possible **parasitic signals**: we will use a mirror **shutter closed** at the entrance of the cryostat and **record data** (including telescope data) at different times of the day (e.g. when other instruments do observations), and with **different environment conditions** (e.g. door of the cabin open or closed, lights switched on and off, etc.) then look if parasites are presents (e.g. jumps, excess noise, spikes,...), give the data to Albrecht in order to do correlations with the environment outside NIKA and other instruments and try to identify the possible parasite sources (instrument itself, conditions in the cabin).

*Pending: finalize source list and interact with IRAM for a possible iteration → Xavier, Roberto?*