NIKA Pipeline output products, OpenPool2, Version0

The NIKA collaboration and IRAM

April 16, 2015

Abstract

This note describes the data products that the NIKA collaboration provides to external observers for the second NIKA open time pool observations in November 2014 for the version 0. These products are the calibrated maps. Other products will be made available in later versions.

1 Presentation

This version V0 of the NIKA second open pool products has been made by the NIKA team by the 5 December 2014. It is distributed by IRAM. It follows the observing run by 2 weeks which were needed for the data processing.

The products are described the following Sect. 2.

For each project, there are fits files containing the maps of each scan and combined scans of each object. The data processing has been oriented towards the diffuse emission.

There are also illustrative pdf files. You will find that for each object, there is a directory that contains:

- The fits files (RaDec2000 projection) for target sources

- Figures: many pdf files were generated out of the fits files to get a quick look at them. Units in Jy/beam unless otherwise stated. A smoothing has been done with a Gaussian FWHM of 10 arcseconds (only for the figures).

JK pdf are jackknife maps representing the half difference of a random split of scans in two halves.

SNR pdf is the signal-to-noise maps assuming Gaussian white noise.

flux pdf is the brightness map display

stddev pdf is the standard deviation map display

time pdf is the total integration time per 2 arcsecond square pixel.

scan pdf is a brightness display per scan

The main beam calibration was done assuming a Gaussian main beam of 12.5 and 18.5 arcseconds (FWHM). The primary calibrator is Uranus with fluxes of 43.0 and 18.0 Jy.

The main beam to full beam correction is by 1.56±0.10 at 1 mm and 1.35±0.10 at 2 mm. It has not been applied to the maps.

At this stage, the offline products cannot be used for scientific analysis as some photometric uncertainties are still there (mostly opacity effects). The point-source photometry may probably correct at the 20% level at 1mm and 15% level at 2mm. These products must just be used to evaluate the potential return of each observed source.

We hope to deliver a final V1 version of the second NIKA open pool data products in several months including our best strategy of systematic removals.

Contact your NIKA friend of project to give us your feedback.

2 Maps

We provide maps as FITS files for all the individual scans and a combination of scans per source (one fits file per source and per wavelength). Combined maps and individual scan maps are named as `MAPS_1mm_source_v1.fits` and `MAPS_2mm_source_v1.fits`. The signal map (surface brightness map (opacity corrected)), is provided in extension 0 of the FITS files then other extensions contain the standard deviation maps, and exposure time per pixel (hit map multiplied by the sample duration) and then all scans brightness, standard deviation maps. More detailed information is given in the header. We highlight in the following the main issues concerning the map making:

- The standard coordinate system used is Ra.–Dec. (tangential projection: RA—TAN, DEC–TAN).
- We use a nearest grid point projection with a pixel size of 2 arcsec (this can be adjusted by request).
- A predefined header for map projection can be used upon request if provided by the observers
- Pixels of the maps that have not been sampled are set to 0 for the flux maps and zero for the time per pixel maps. Pixels with less than two measurements are set to 0 for the standard deviation maps.

- Zero level is set in all detectors timelines outside the source before combining them.
- Timelines are weighted by the inverse variance of the noise, which is computed outside the source.
- In the case of point source data, electronic and atmospheric contributions to the data are decorrelated using the standard method described in [1]. Basically, a common-mode timeline is built by averaging all timelines and avoiding on-source detectors at any sample. The common-mode is first scaled to each detector and then subtracted from the timelines using a simple regression procedure.
- For extended source data two decorrelation methods can be used. The first of them minimizes the noise but removes large scale structures. It is based on the same common-mode method described above but no masking the source. The second one is based in an iterative procedure. First, a simplified map is constructed using the former method so that the location of the source can be infered. Then this information is used to mask the source when computing the common-mode. This method preserves large scales (up to the size of the array) but is noisier. Both methods are described in [1]. For this release, the two released iterations (when given) correspond to the latter method.

3 Data delivery

The IMBFITS files and (the clean calibrated TOI Not Done Yet) are archived by IRAM and can be provided on request. Calibration products will be available on the NIKA wiki page: `http://www.iram.es/IRAMES/mainWiki/NIKA/Main`

The maps, associated figures and logfiles, are delivered to each project account under :
/vis/xxx-14/observationData/nika
where xxx-14 is your project number. Just after the run, the products of a preliminary offline reduction are provided as version v0. Then a clean version v1 (including calibration products) will be delivered within several months. Observers may contact their respective NIKA instrument friend of project for information regarding the offline processing (`http://www.iram.es/IRAMES/mainWiki/Continuum/PoolOrganization/2ndNIKApool`). Depending on feedbacks, a version v2 may be needed.

References

[1] Performance and calibration of the NIKA camera at the IRAM 30 m telescope, A. Catalano et al., 2014, A&A, 569

[2] Calvo, M., Roesch, M., Désert, F. X., et al., Improved mm-wave photometry for kinetic inductance detectors, 2013, A&A, 551, L12