

Sesión especial de PANIC 4K: cómo sacar el mayor partido a tu tiempo asignado de observación

24 y 26 de
septiembre
2025



**Sesión especial de PANIC 4K:
cómo sacar el mayor partido a tu tiempo asignado de observación**

The first 4K infrared camera for the European sky



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PANIC 4K team:

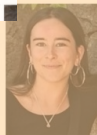
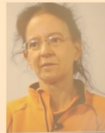


Left to right, from top to bottom, in alphabetical order:

M. Alter, P. Bizenberger, M. C. Cárdenas, E. Chamorro Villar, B. Dörner, M. Fernández,
J. Gallego, A. J. García Segura, A. Guijarro Román, J. Helmling, A. Huber,
J. M. Ibáñez, U. Mall, K. Meisenheimer †, R. J. Mathar, S. Muñoz Torres, V. Naranjo.

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PANIC 4K team:



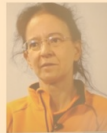
1) Ana Guijarro (CAHA) → Overview

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J. M. Ibáñez, U. Mall, K. Meisenheimer, T. R. J. Mathar, S. Muñoz Torres, V. Naranjo.

2) Vianak Naranjo (MPIA) → GEIRS

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PANIC 4K team:



3) Antonio J. García Segura (IAA) → OT, Observing Tools

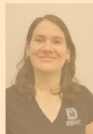
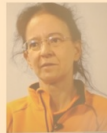


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PANIC 4K team:



4) José Miguel Ibáñez (IAA) → Quick Look and Pipeline

J. M. Ibáñez, U. Mall, K. Meisenheimer †, R. J. Mathar, S. Muñoz Torres, V. Naranjo.

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PANIC Institutions:



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CAHA15-CE-3902



Infraestructuras
Científicas y Técnicas
Singulares

Sesión especial de PANIC 4K: cómo sacar el mayor partido a tu tiempo asignado de observación

Calar Alto



ALMERÍA, SPAIN

Latitud: $+37^{\circ}13'25''$ (N)

Longitud: $-2^{\circ}32'46''$ (O)

Altitud: $+2168$ m



Sesión especial de PANIC 4K: cómo sacar el mayor partido a tu tiempo asignado de observación

PANIC has been designed
for the 2.2m and 3.5m telescopes



- First light in November 2014
- PANIC operational until July 2018: good [performance](#) and [results](#)
- Two of its four 2K detectors were suffering from degradation
- Upgrade in August 2018, PANIC traveled back to the MPIA to be refurbished
- Changed to a new technology device: a state-of-the-art monolithic 4K sensor (HAWAII-4RG™)
- Design a new mount for the detector, adapting the readout electronics and the control and data acquisition software
- PANIC returned to Calar Alto in October 2022
- Commissioning at the 2.2 m during semesters 24A, 24B and 25A

Sesión especial de PANIC 4K: cómo sacar el mayor partido a tu tiempo asignado de observación

PANIC is a PANoramic Near Infrared camera for CAHA



Waning crescent Moon of
January 18, 2025 with
subwindow of 9' x 26'

<i>Instrument/telescope</i>	PANIC/2.2m
<i>FOV</i>	26.3 x 26.3 arcmin
<i>Pixel scale</i>	0.37 arcsec/px
<i>Detector</i>	4096x4096 pixels, monolithic HAWAII-4RG
<i>Pixel Size</i>	15 micron
<i>Intrinsic image quality DEE80</i>	≤ 1.84 px, 0.68 arcsec
<i>Image distortion</i>	$< 1.3\%$
<i>Wavelength range</i>	0.8 μm to 2.5 μm
<i>Standard broad band filters</i>	Z, Y, J, H, Ks
<i>Narrow band filters</i>	H2, Br-gamma

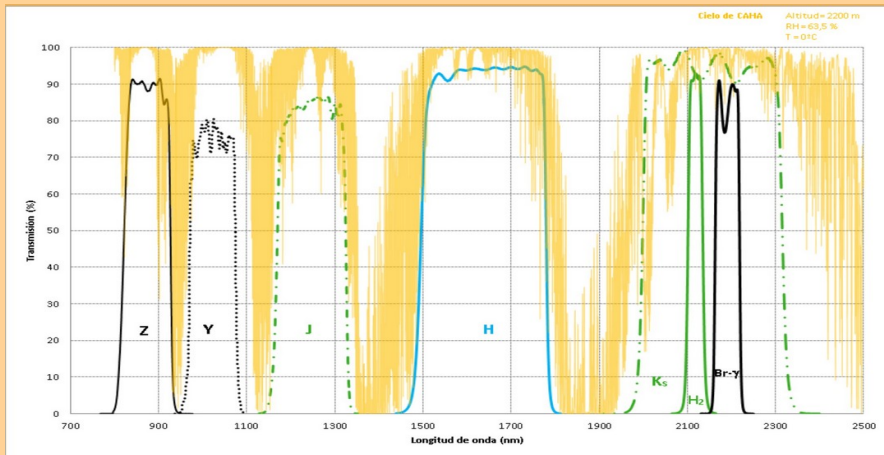
<https://www.caha.es/PANIC>

Sesión especial de PANIC 4K: cómo sacar el mayor partido a tu tiempo asignado de observación

PANIC Filters:

Near-infrared atmospheric transmission

MLP (IAA) with KOPRA (<https://www.imk-asf.kit.edu/english/312.php>)

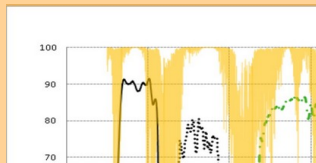


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PANIC Filters:

Near-infrared atmospheric transmission

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M. Concepción Cárdenas (MPIA) → Optics,
AIV, System Engineer, Project management

PANIC has 4 filter wheels,

- with capacity of up to 15 filters
- there are currently 7 filters installed
- and 8 empty filter positions

→ More info in WEB page and Conchi Cárdenas (MPIA)

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The PANIC Detector

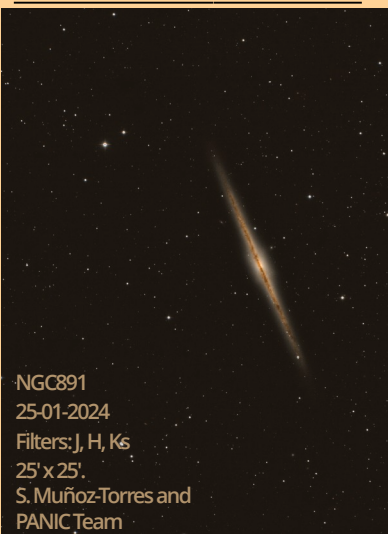


Parameter	Measured (MPIA)
Gain (e-/ADU)	2.3
Full well (e-)	107201 (46609 ADU)
Linearity error < 5% (ADU)	1866 to 35000
Linearity error < 1% (ADU)	3733 to 27996
Dark current mean (e-/s)	0.049
Readnoise / e-	15.9 ± 2.9
Persistence (%) (5 min after saturation)	0.0102
Pixel crosstalk (%) (upper+lower)	1.81
Channel crosstalk (%) (saturated spot, worst case)	3.90

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The PANIC Detector



NGC 891

25-01-2024

Filters: J, H, Ks

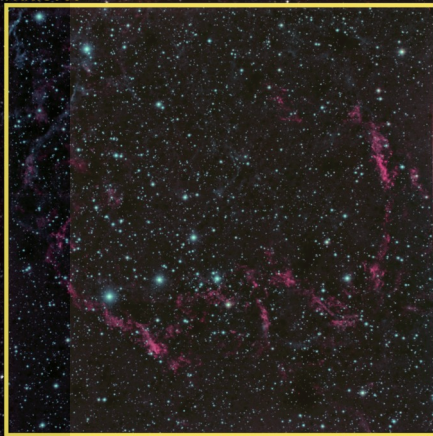
25' x 25'.

S. Muñoz-Torres and

PANIC Team

2MASS color

PANIC FoV



SNR IC443 - Date: 18-01-2025 - Instrument: PANIC - Telescope: 2.2m (CAHA) - Filters*: J, Ks, H2

34.65' x 35.7'



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Overview of available Software Packages

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Software Packages: Observations

NEAR INFRARED Observations



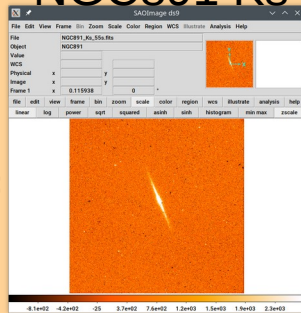
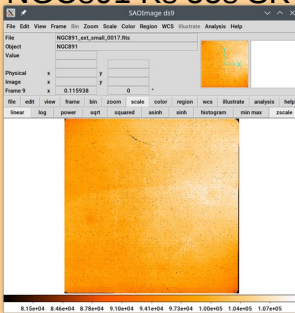
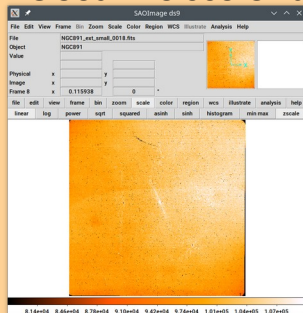
OBJECT – SKY dither is crucial:

- Technique where an astronomical object is deliberately moved to different positions on the detector during a sequence of exposures (< 60 s on position)
- NIR sky background is bright, variable and structured

NGC891 Ks 55s OBJ

NGC891 Ks 55s SKY

NGC891 Ks



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GEIRS: Generic Infrared Software

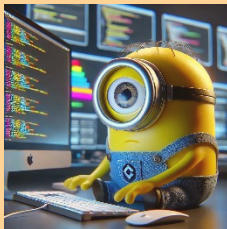


The screenshot displays the PANIC 4K software interface. The main window has a menu bar (File, Modules, Options) and a control panel with various settings. The 'wait' section includes a dropdown for 'ReadWoConv' and a value of 5.530939. The 'cntsr' section has a value of 3. The 'Subwin Specifications' section includes a 'Read' dropdown set to 1, a 'Save' checkbox, and several other checkboxes. The 'Subwin Specifications' section also includes a 'Subwin off' dropdown and a 'Subwin Specifications' section with 'Endless' and 'Abort' buttons. The 'panic.20220815_0001' file is selected. The 'Start Macro' button is visible. A smaller window on the left shows a list of filters, with 'ColdStop' highlighted in green. The right-hand panel shows additional image processing options like 'bin', 'brown', 'current image', and '1/222 / 2.25 sig'.

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OT: Observation Tool



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0 General program information

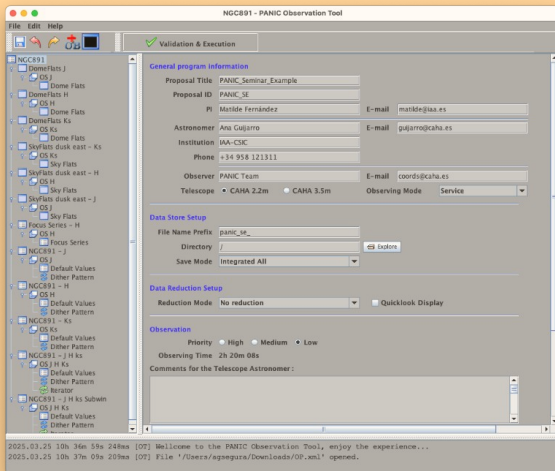
- Target
- Instrument Setup
- Observing constraints
- Comments to observer

0 Data Store Setup

0 Data Reduction Setup

0 Observation info & comments

Focus Series
Dome Flats
Sky Flats
Darks
Science



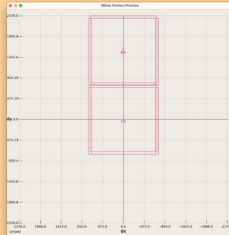
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OT: Observation Tool



Dither pattern

- Point source
- Extended Target
- Sky-Target
-



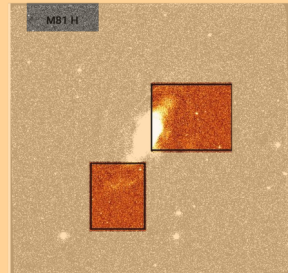
Dither Pattern Preview

Subwindows

- ✓ Avoid saturation
- ✓ Reduced Int. time

Example of subwindows

- 1,35s Int. time



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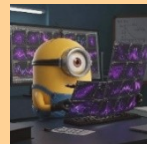


Software Packages: Quicklook and Data Reduction

QL: Quick-Look



- Why?
- Graphical Tool for quick and interactive data processing using PAPI quick-mode
- Verify whether observations are proceeding as expected
- Examples:
 - 0 - PANIC Focus determination
 - 0 - Sky-subtraction
 - 0 - Astrometric calibration
 - 0 - Master calibrations



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QL: Quick-Look



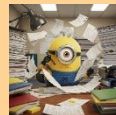
The image displays two software interfaces side-by-side. The left window is 'PANIC QuickLook', which includes a menu bar (File, View, Settings, Calibrations, Tools, Help) and a toolbar. It features input/output directories, a list view filter, and a data list view showing a table of files with columns for filename, image type, filter, number of images, and TEXP file. The right window is 'SAOImage ds9', showing a menu bar (File, Edit, View, Frame, Bin, Zoom, Scale, Color, Region, WCS, Illustrate, Analysis, Help) and a toolbar. It displays a large astronomical image of a star field with a coordinate grid at the bottom.

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PAPI: Pipeline



- Why?
- Requirement!
- Data volume (40-50 GB/night)
- Complex H4RG detector artifacts (non-linearity, bad-pix, cross-talk, persistence)
- Crucial Sky subtraction & Dither patterns
- Distortion correction
- Automate reduction, improve data quality, enable quick-look (on-line) and science-ready outputs (off-line)



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PAPI: pipeline

> ./run_papi.py -s /data/jm_2024_12_13_cds/ -p



```
File Edit View Search Terminal Tools Help
jmg@papi:~/papi$ python3 ./run_papi.py -h
(papi) jmg@papi:~/papi$ python3 ./run_papi.py -h
[...]
```

```
File Edit View Search Terminal Tools Help
jmg@papi:~/papi$ python3 ./run_papi.py -h
[...]
```

PANIC potential Scientific Cases:



Extragalactic Astronomy

- Extragalactic Surveys
- GRBs, GRBs at high redshift
- Mapping of nearby galaxies
- Morphological characterization
- Star formation and stellar populations
- Magnetic field
- Distance scale
- Searches for high-redshift quasars
- Clusters and Superclusters of galaxies

Galactic Astronomy

- Galactic survey
- Galactic plane and bulge

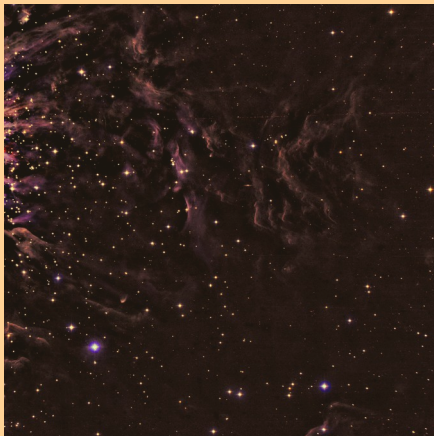
Solar system

- Trans-Neptunian's, minor bodies
- Comets

Stellar evolution, star formation, exoplanets

- Accretion disks of young stars
- Search for post-AGBs
- Measures of stellar sizes
- Low mass objects, exoplanets
- Probing the IMF down to ~ 1 -Jupiter mass. A deep star forming region survey.
- Testing the brown dwarf ejection scenario: a survey around Bok globules.
- X-ray binary counterparts
- Asteroseismology
- Supernovae searches
- Active stars

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M42 - 25-01-2024

Instrument: PANIC - Telescope: 2.2m (CAHA)

Filters: Z, J, H, Ks - 25' x 25'.

S. Muñoz-Torres and PANIC Team

Centro Astronómico Hispano en Andalucía (CAHA)

Call for proposals at the Calar Alto

2.2 & 3.5 meter telescopes

Spring semester 2026 (26A)

January 1st, 2026 until June 30th, 2026



DEADLINE: October 15th, 2025

14h00m00s (UT) at the latest

Earliest date for submission: September 16th, 2025



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