PANIC Observation Tool

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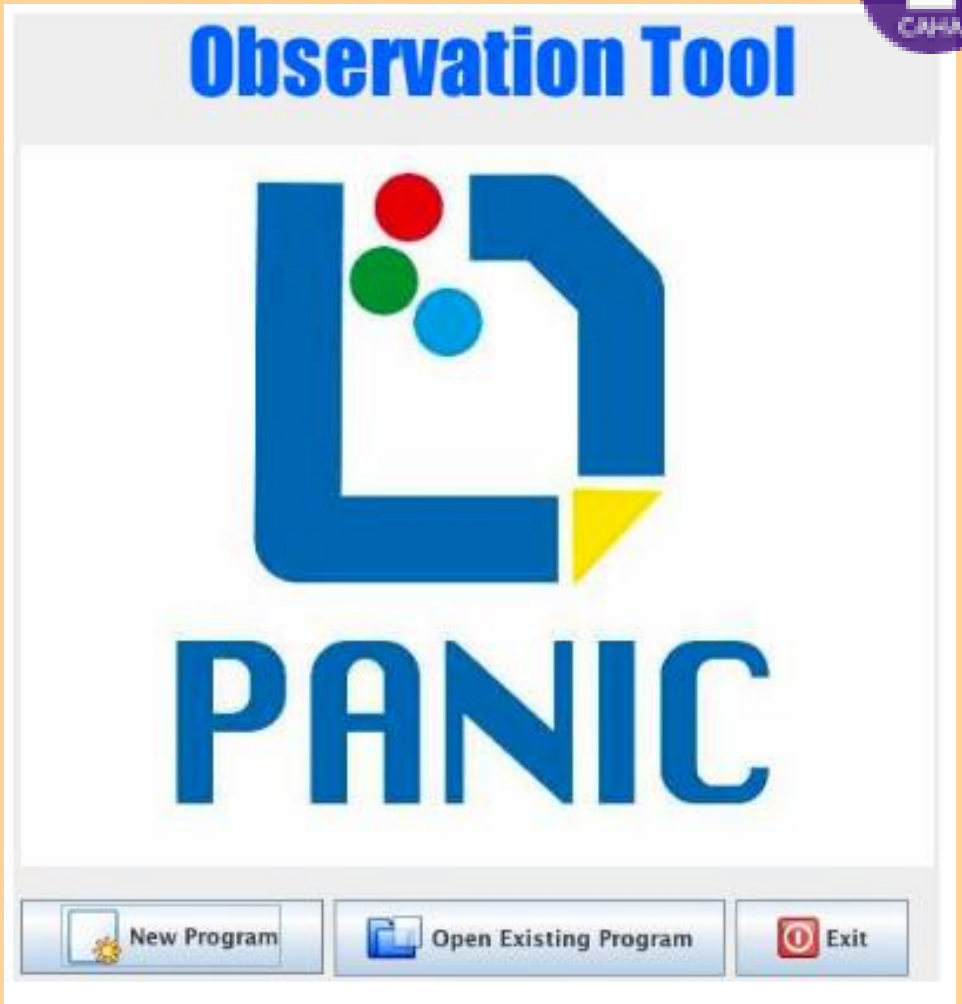
24-Sep-2025

CAHA15-CE-3902

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

PANIC Observation Tool:

- A software package that allows you to prepare your PANIC Observing Program and to execute it at the observatory.
- Specify the observations in a user-friendly way.
- Hides de complexity of the instrument and the telescope control system to the astronomer.
- Allows the support astronomer to optimize the night time arranging distinct observing blocks and programs.



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

PANIC Observation Tool:

Image generated using AI with Microsoft Copilot

Prepare your Observing Program in advance at your office

Send your program to CAHA

Image generated using AI with Microsoft Copilot

Review and Execute your program at observatory

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PANIC Observation Tool:

Download the OT from:
https://home.iaa.csic.es/~agsegura/PANIC_OT/PANIC_OT.jar

User manual:
https://home.iaa.csic.es/~agsegura/PANIC_OT/PANIC_OT_User_Manual.pdf

Links available at PANIC Webpage:
https://www.caha.es/panic

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PANIC Observation Tool:

The OT is written in Java due to this development, it can be used in any platform that has installed Java Runtime Environment (JRE) Version 7.0 or higher.

You can download the latest Java version from:
http://www.java.com/en/download/manual.jsp

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PANIC Observation Tool:

To run the OT from the command line, in a Terminal, move to the directory where the PANIC_OT.jar is, and type the following command:

java -jar PANIC_OT.jar

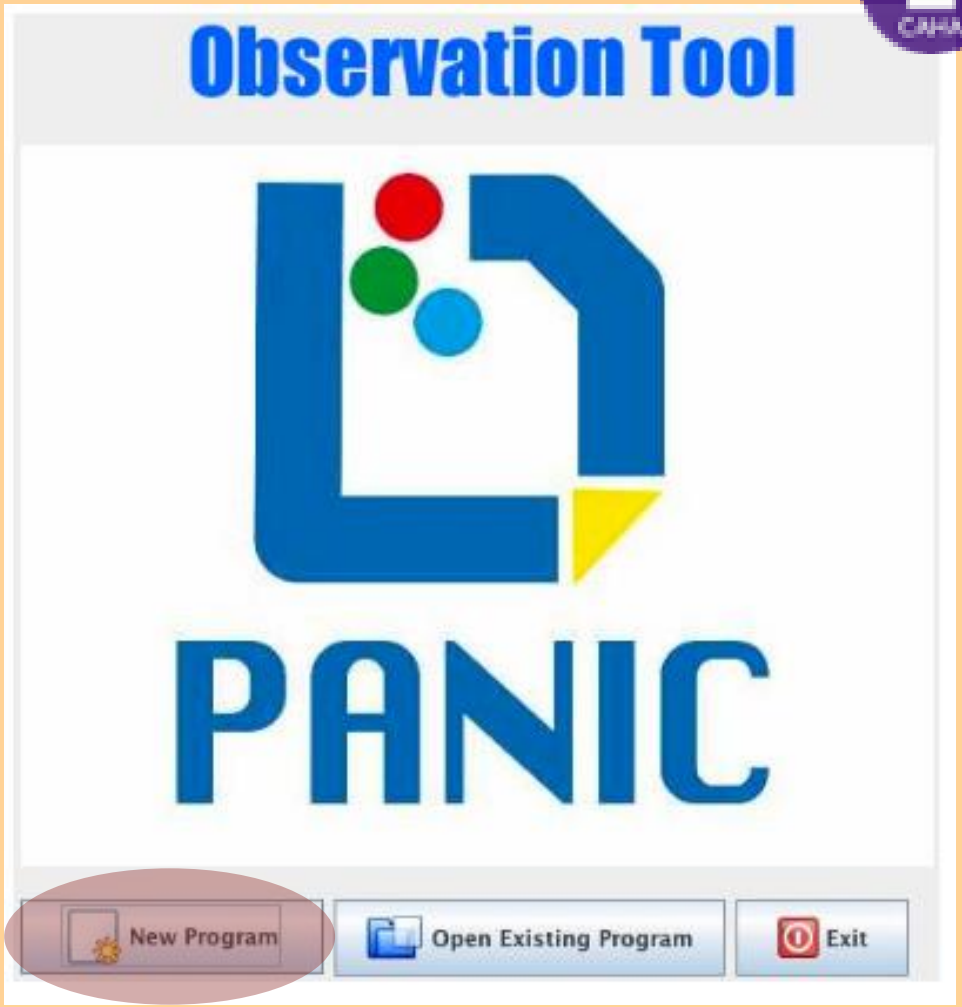
The OT can also be launched by double clicking in the PANIC_OT.jar file at Windows and Mac OS X operating systems.

At the observatory, there is a script you can invoke:

start_ot.sh

PANIC Observation Tool:

- This is the first window you see when you launch the OT, in which you can create a "New Program" or "Open Existing Program"



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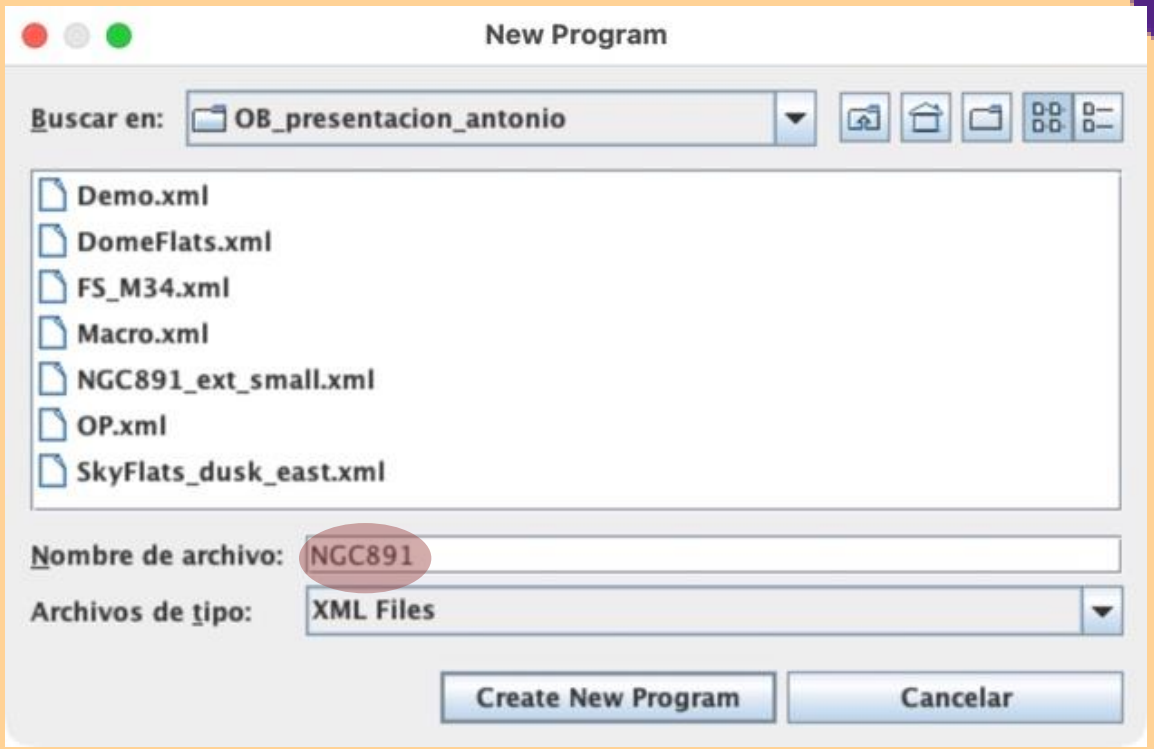
- New Program

We set the program name and automatically the OT adds the .xml extension



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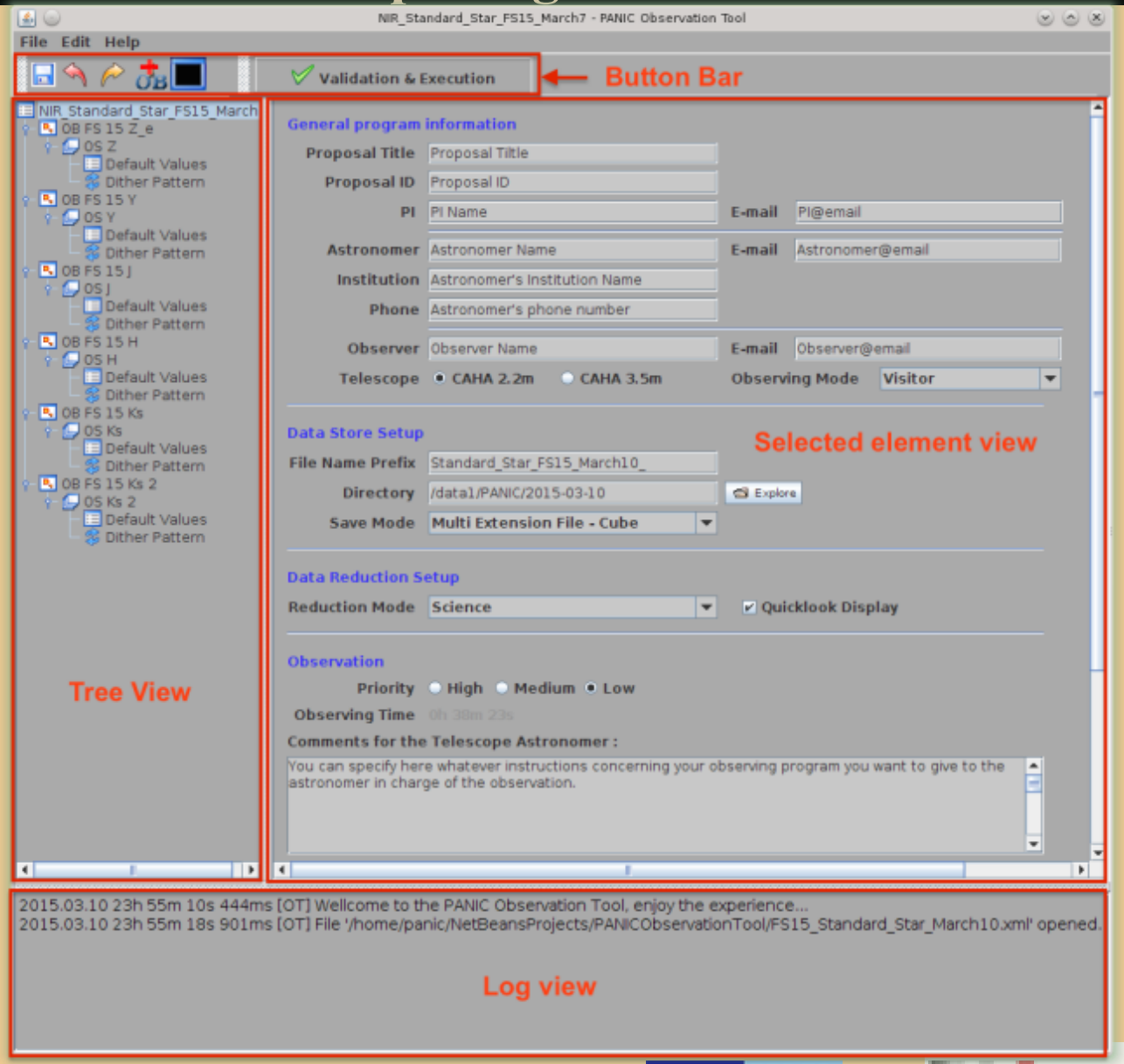
cómo sacar el mayor partido a tu tiempo asignado de observación

PANIC Observation Tool

- Parts of the OT screen:
  - Button Bar
  - Tree View
  - Selected element view
  - Log view



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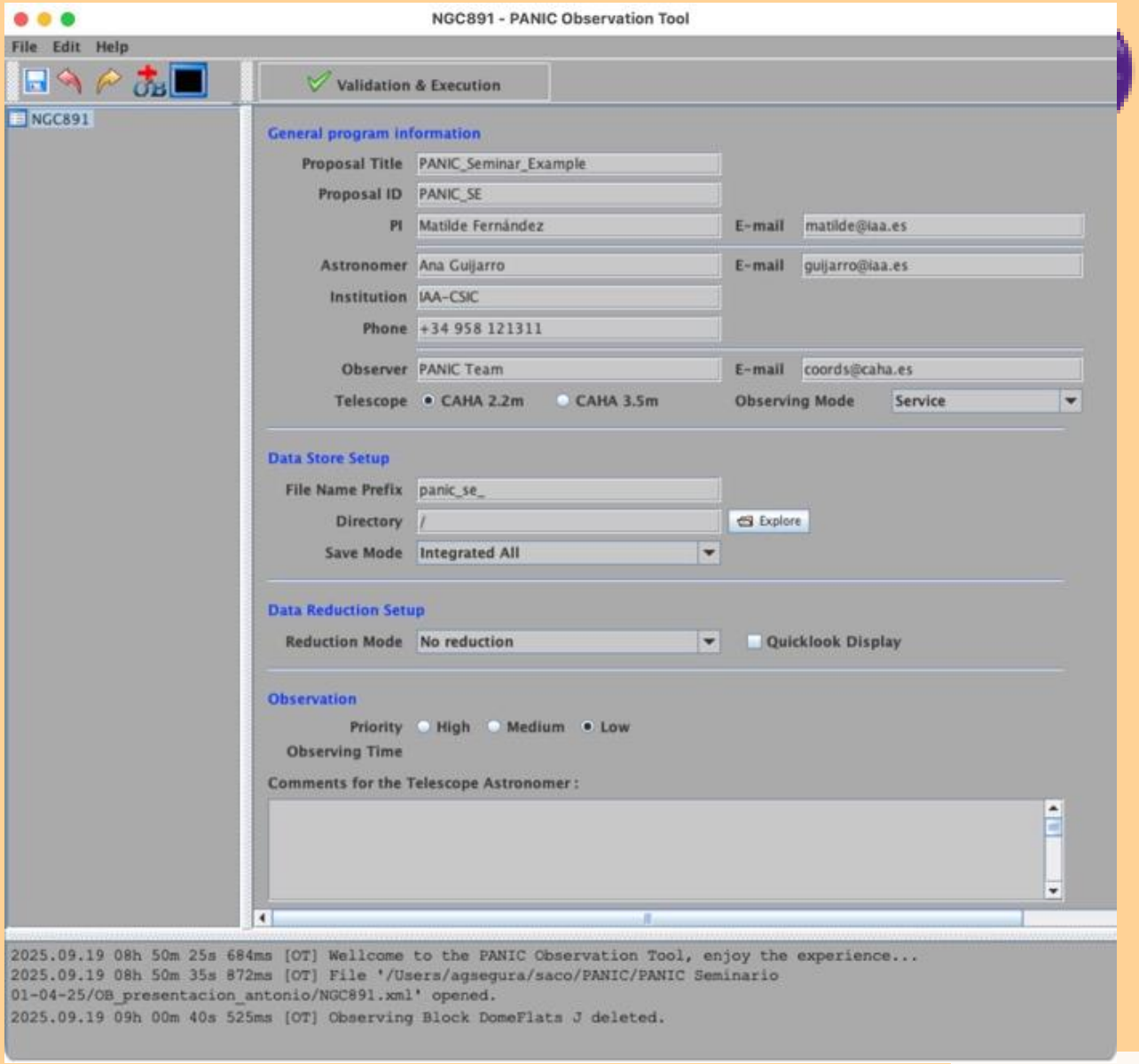
- Observing Program (OP)
  - General program information
  - Data Store Setup
  - Data Reduction Setup
  - Observation info & comments



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PANIC Observation Tool

Observing Block (OB)

- The Observing Block entity is the most important in the OT.
- Astronomers specify their OPs in terms of OBs, which contain all the information necessary to obtain a “single” observation.
- Each OB is related to one target, its instrument and exposure setup parameters, and the required observing constraints.
- Can contain one or multiple exposures, even various instrument configurations with different exposures.
- Each OB will be executed as a block and its results will be considered the smallest dataset of a given OP.
- It is recommenced that one OB last at most one hour, in order whether some error occurs, do not lose much time.

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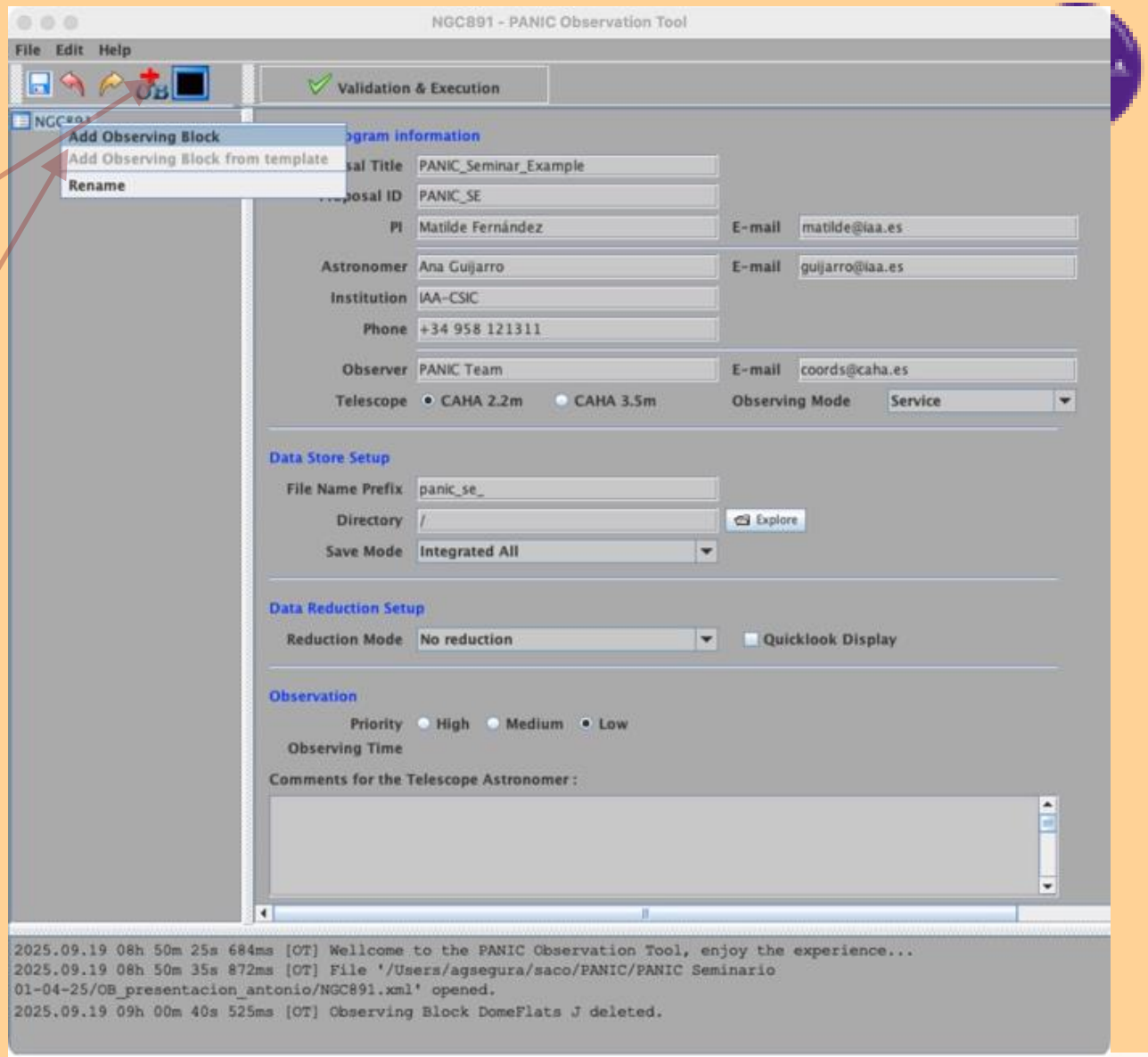
- Add Observing Block

Two different ways to add an Observing Block:

- Clicking at +OB button
- Right clicking at the Observing Program Name on the Tree View



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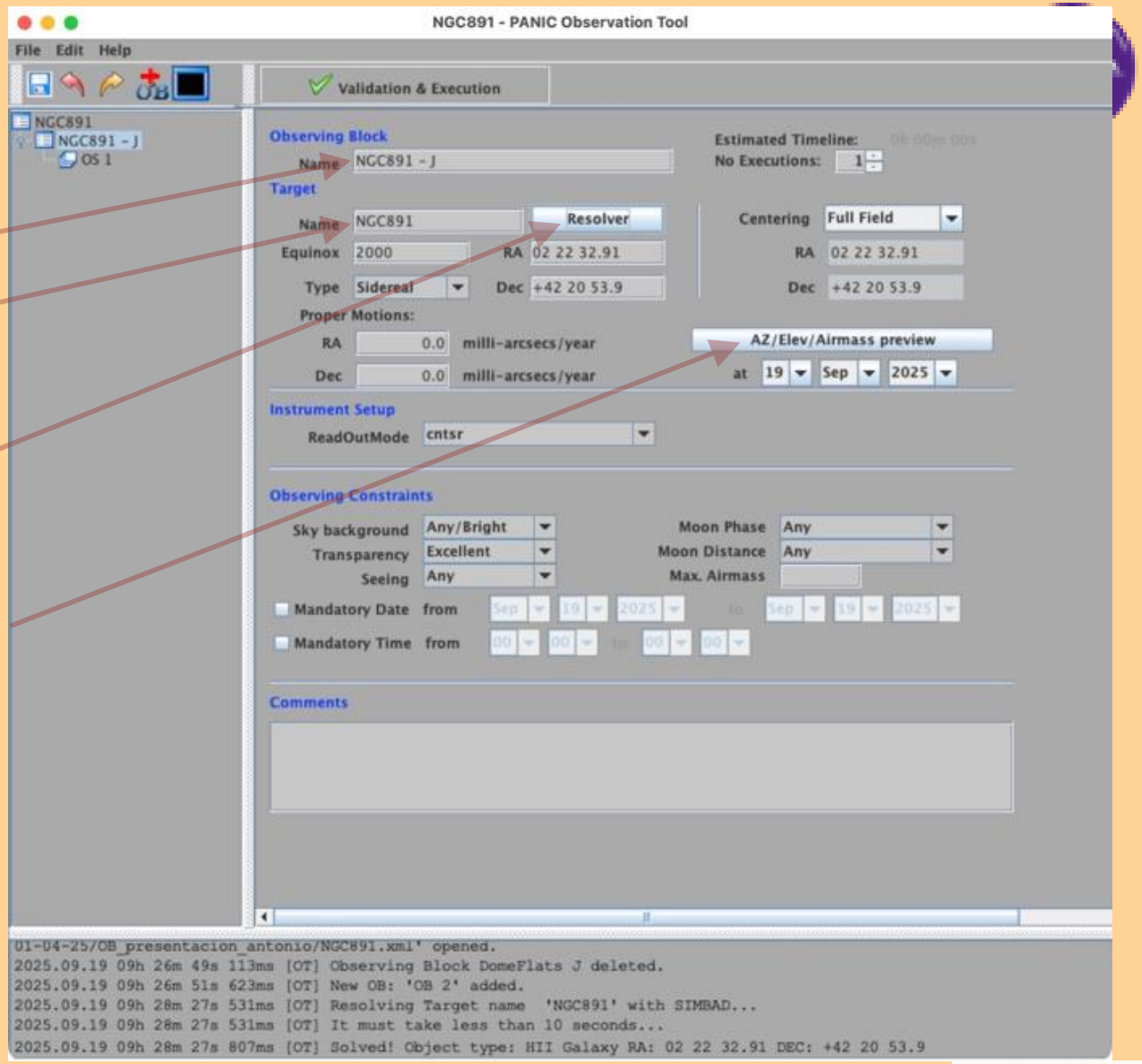
PANIC Observation Tool

- ➢ Observing Block (OB)
  - o Set the Observing Block name
  - o Set Target name
  - o Click Resolver (SIMBAD query of target name)
  - o AZ/Elev/Airmass preview for a given date, generates a new window with the Object Visibility using Startalt, a utility of the Isaac Newton Group of Telescopes at La Palma. Developed by Peter Sorensen, Marco Azzaro and Javier Méndez



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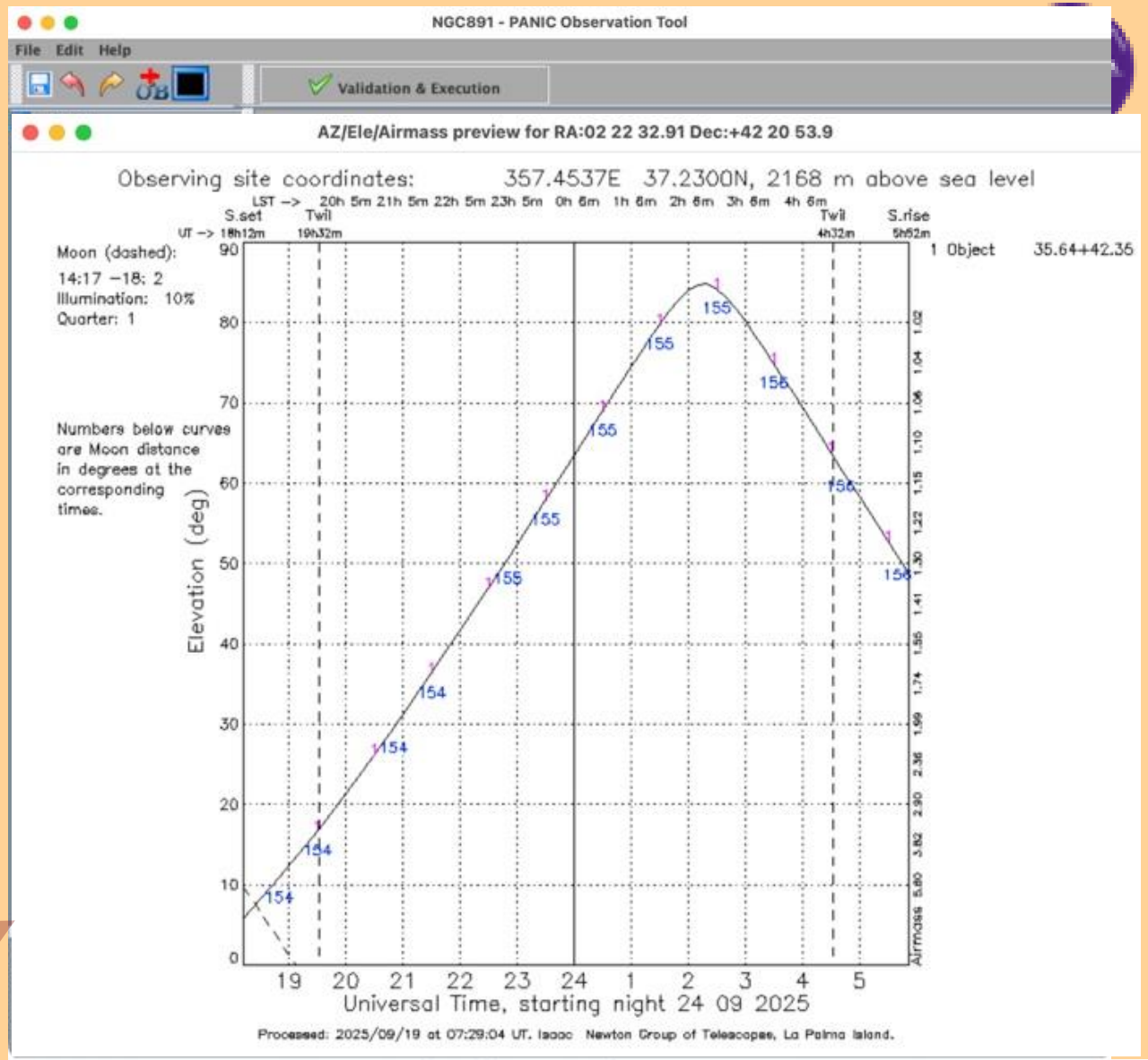

AZ/Elev/Airmass preview

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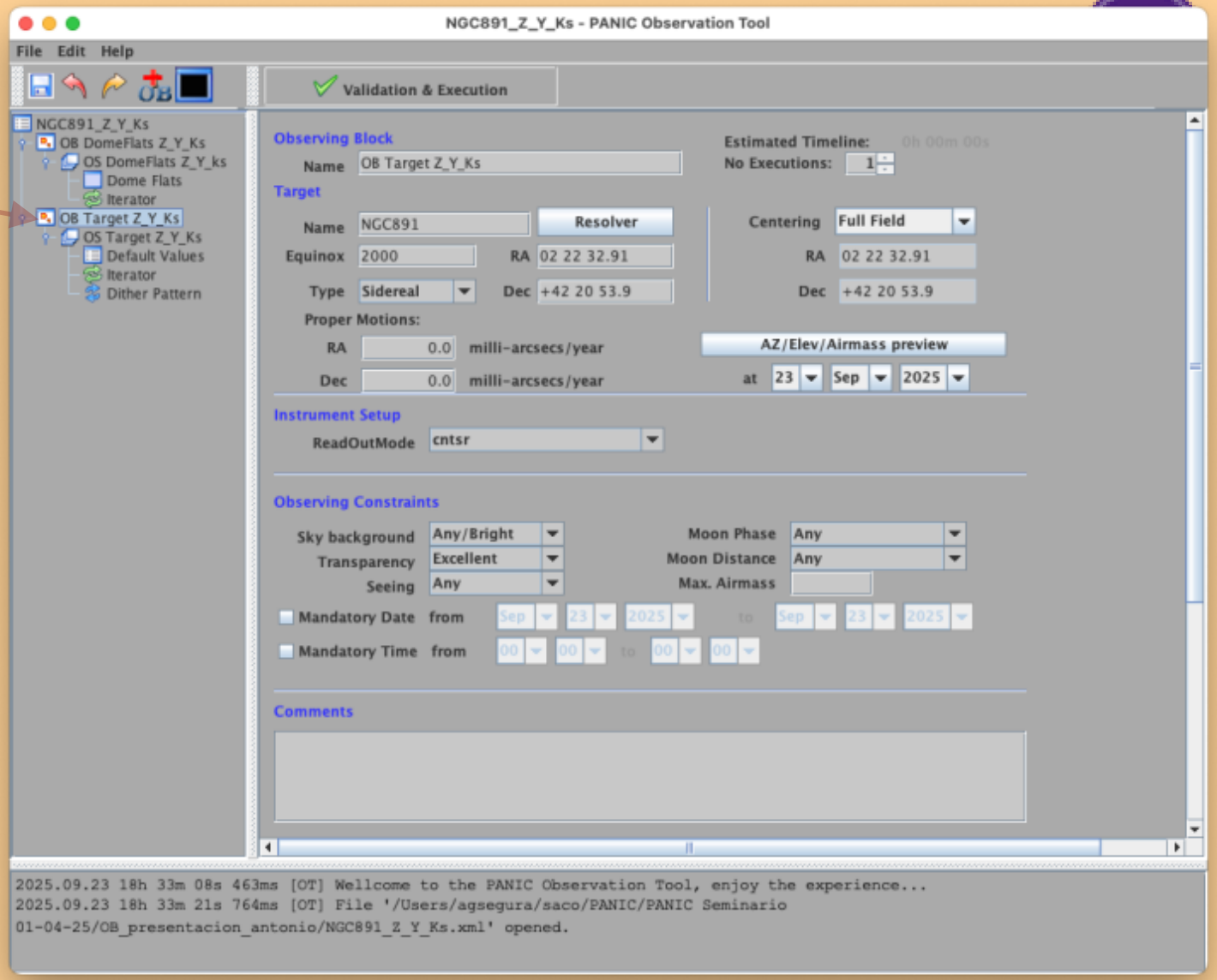
PANIC Observation Tool

Elements in the tree view:

- Observing Block (OB)
  - Target
  - Instrument Setup
  - Observing constraints
  - Comments to observer



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PANIC Observation Tool

Elements in the tree view:

- Observing Sequence (OS)

As a summary of all the programmed actions in this target, we can see a table with one row for each exposure is going to be taken.

Every row contains:

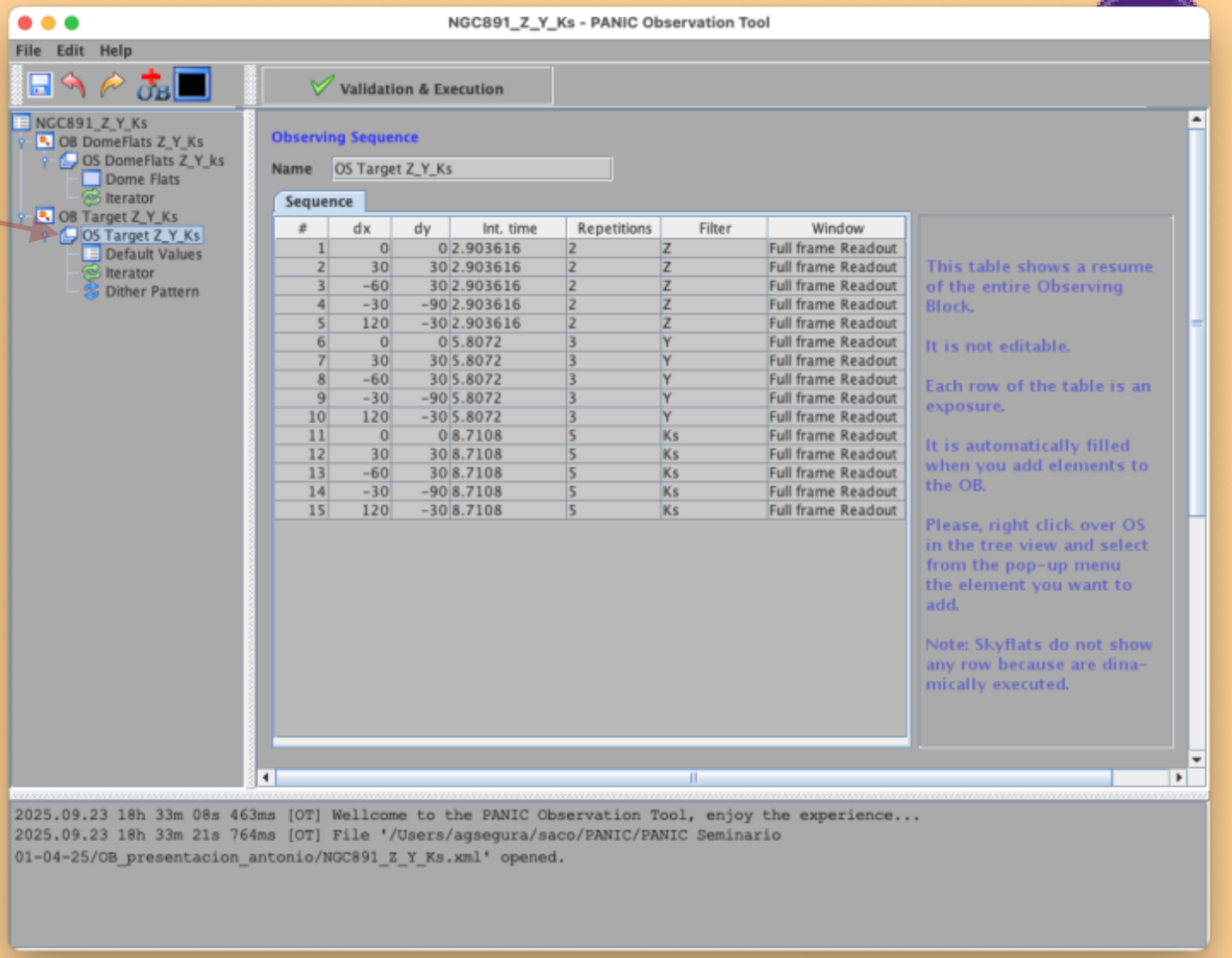
-dx, dy: relative movement, if exist

-Integration time

-Repetitions

-Filter

-Window size



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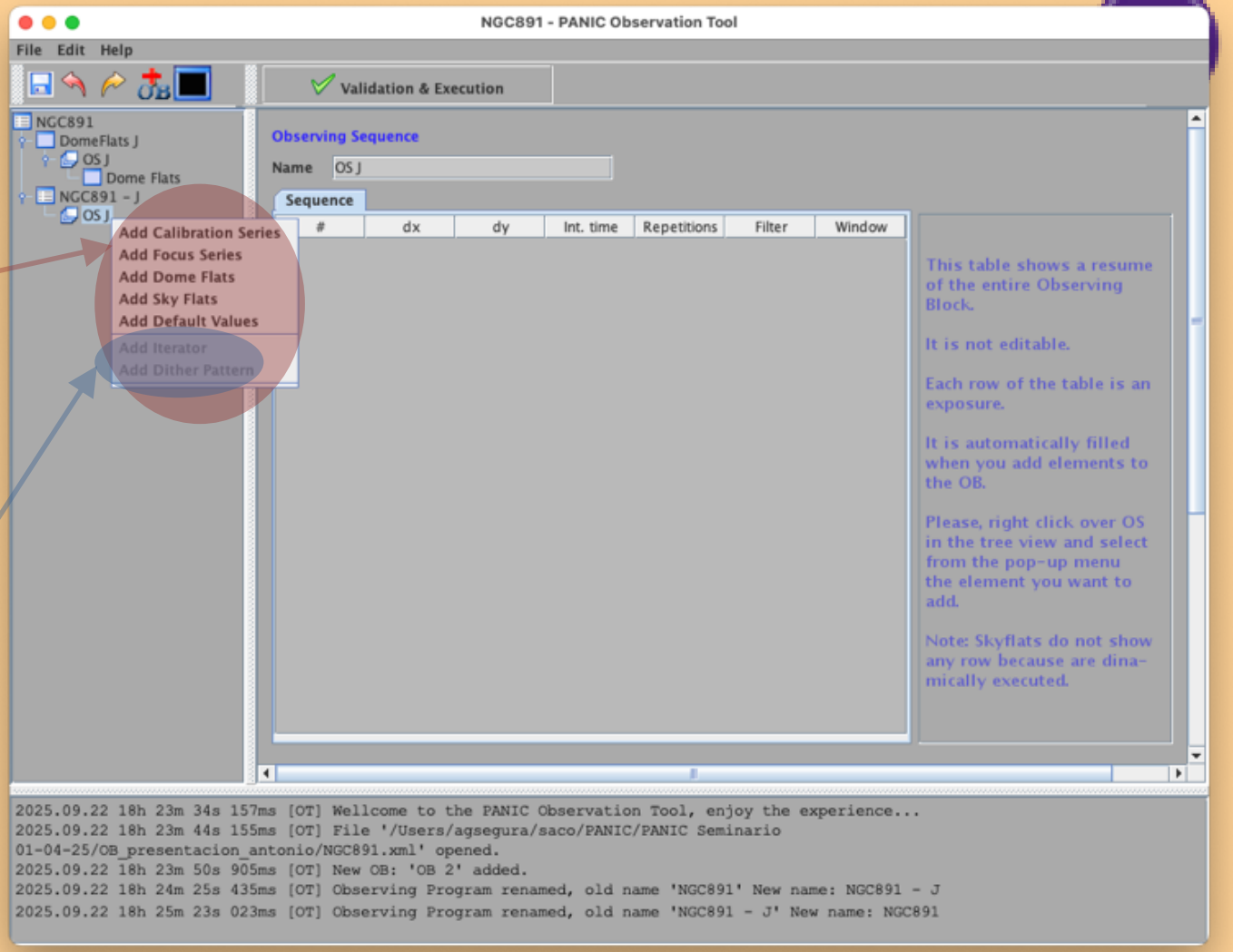
PANIC Observation Tool

- Selecting type of Observing Block:

Right-click on the Observing Sequence element at tree view, and select the type of observation we want to use for this OB.

In addition, depending on the type of OB selected, we also can add an Iterator and/or Dither Pattern.



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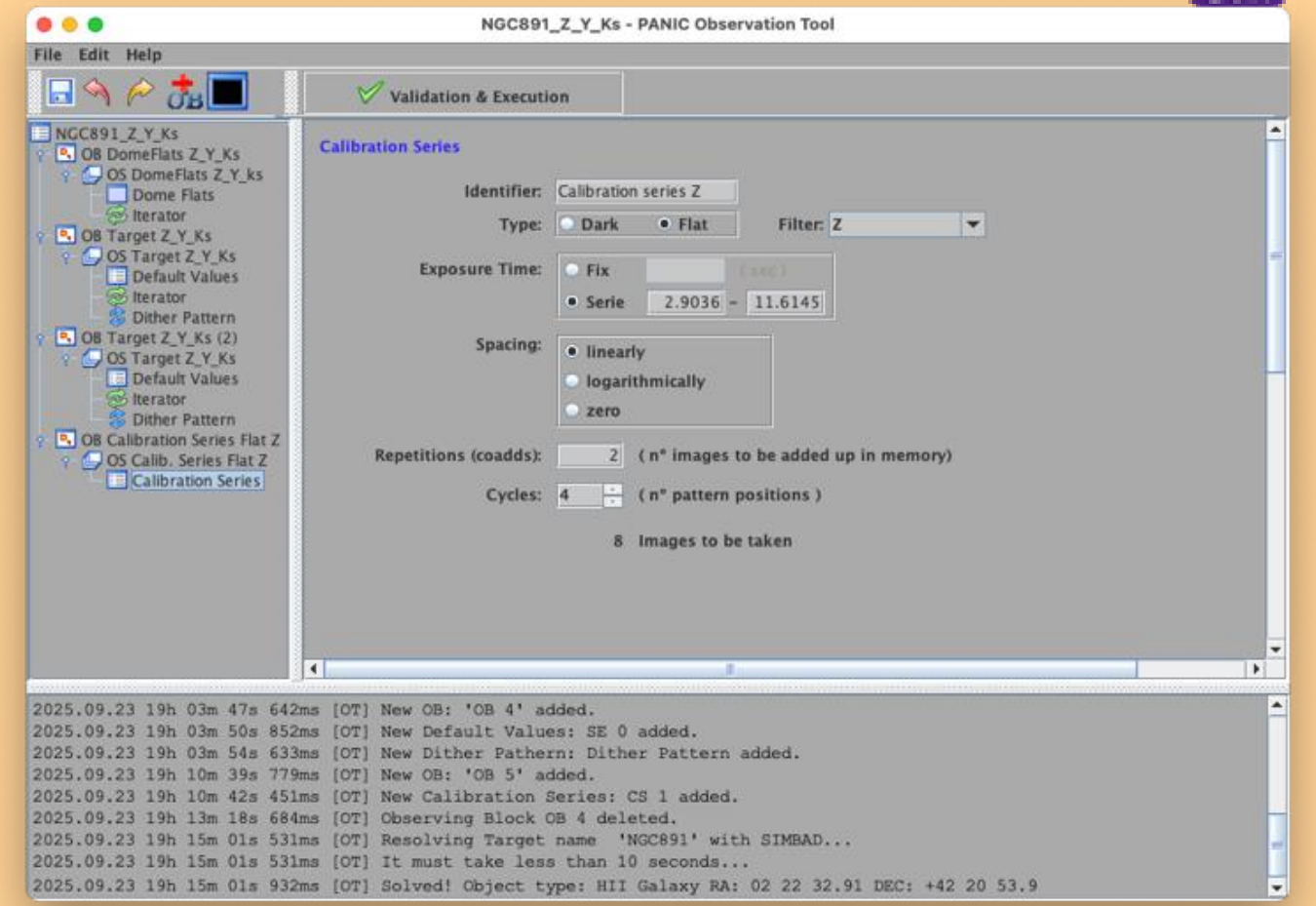
PANIC Observation Tool

- Types of OB: Calibration Series
  - Dark
  - Flat

  Exposure Time:
  - Fix
  - Serie: between two values

  If Series:
  - Linearly
  - Logarithmically
  - Zero = No spacing
    (all exposures at max. value)

  Cycles: # elements of the Series



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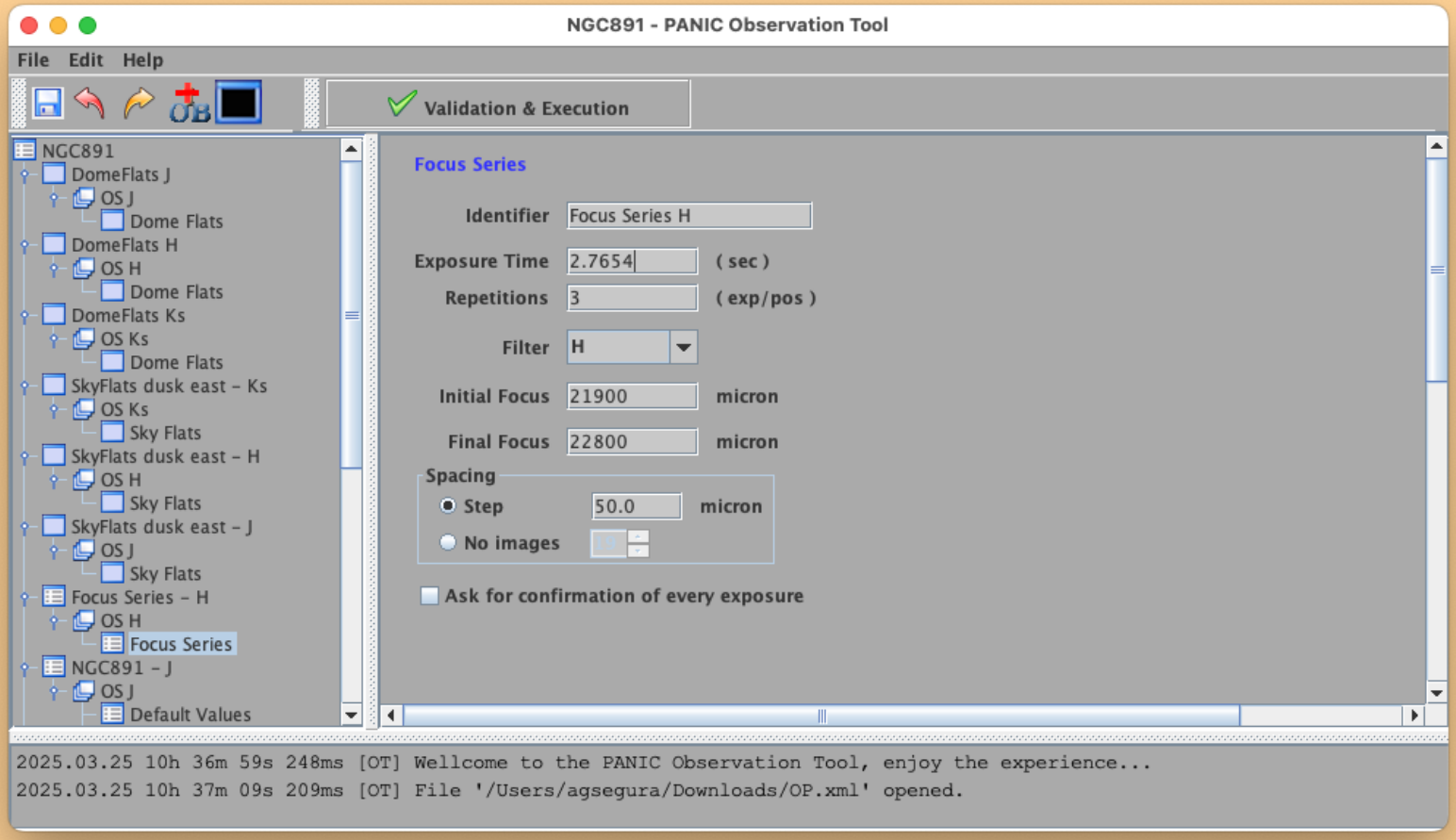
PANIC Observation Tool

- Types of OB: Focus Series



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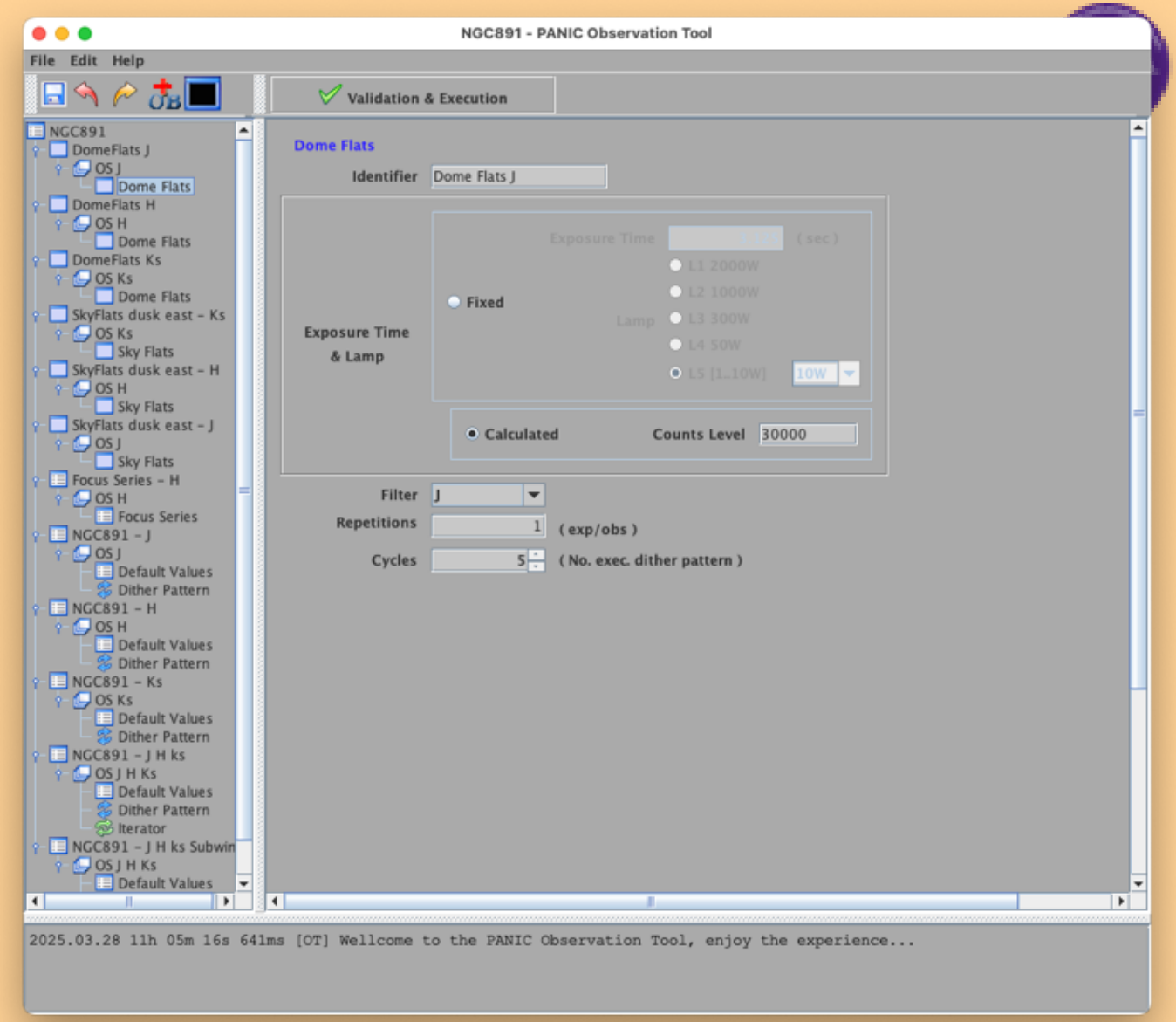
PANIC Observation Tool

- Types of OB: Dome Flats
  - Fixed: We specify Exposure time and Lamp
  - Calculated: We specify the desired Counts Level and the OT calculates the exposure time for the given filter.



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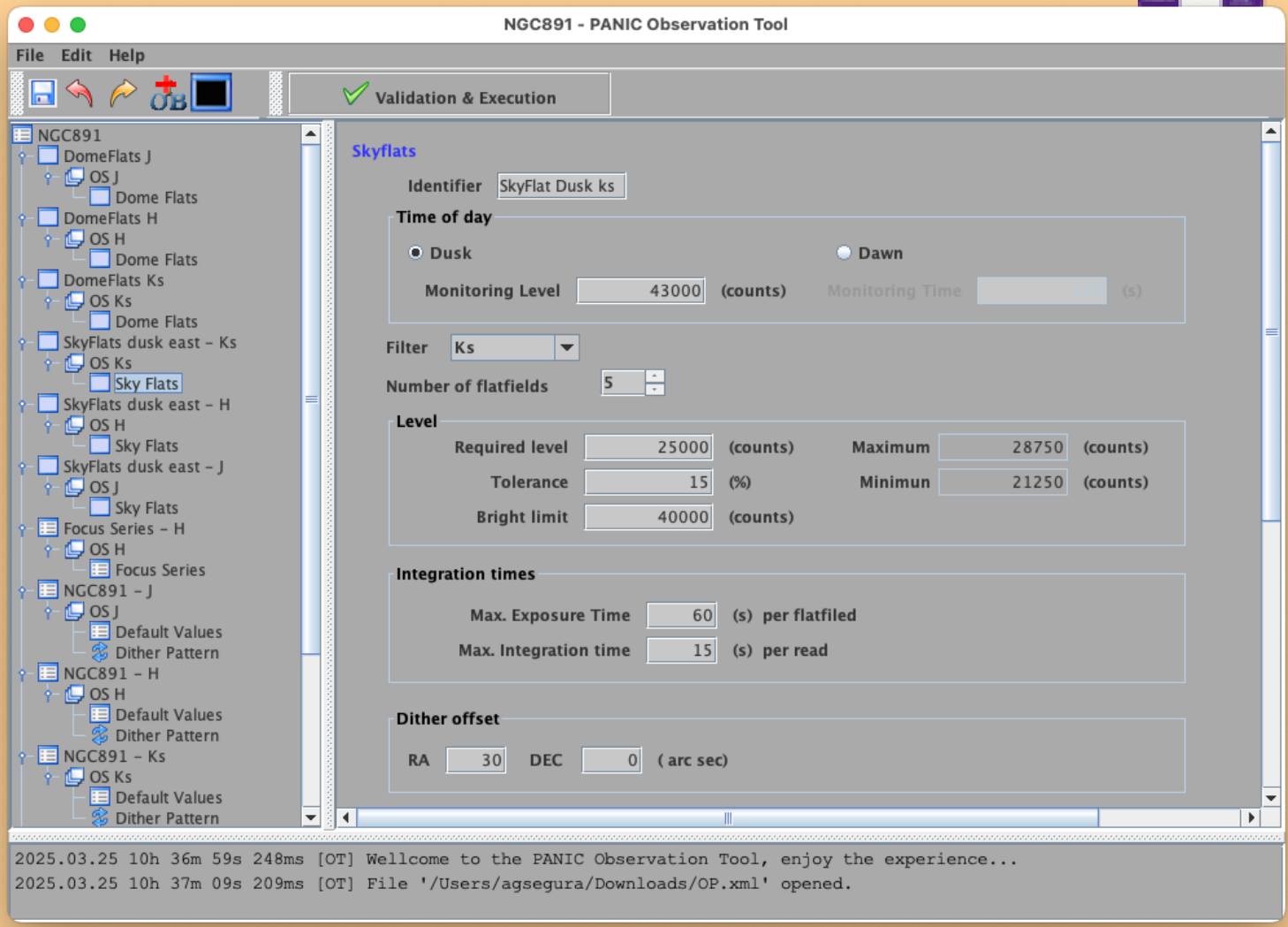
PANIC Observation Tool

- Types of OB: Sky Flats
  - Dusk
    Monitoring Counts level
  - Dawn
    Monitoring exp. time

Dusk	H2, Ks, H, J, Z, Y
Dawn	Y, Z, J, H, Ks, H2



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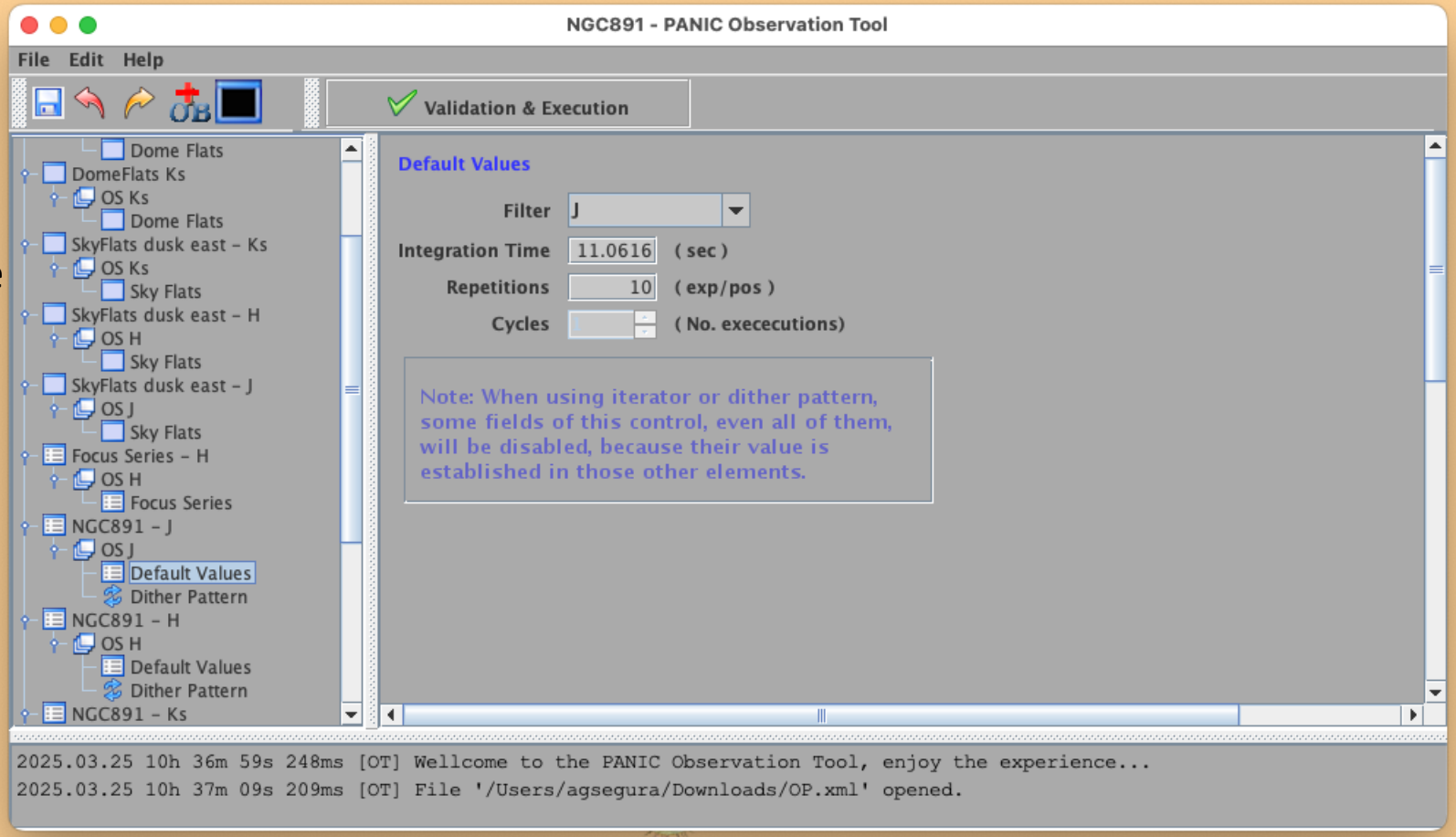
- Types of OB: Default values

To take simple exp.

But we can combine Default values with:

- Dither Pattern
- Iterator



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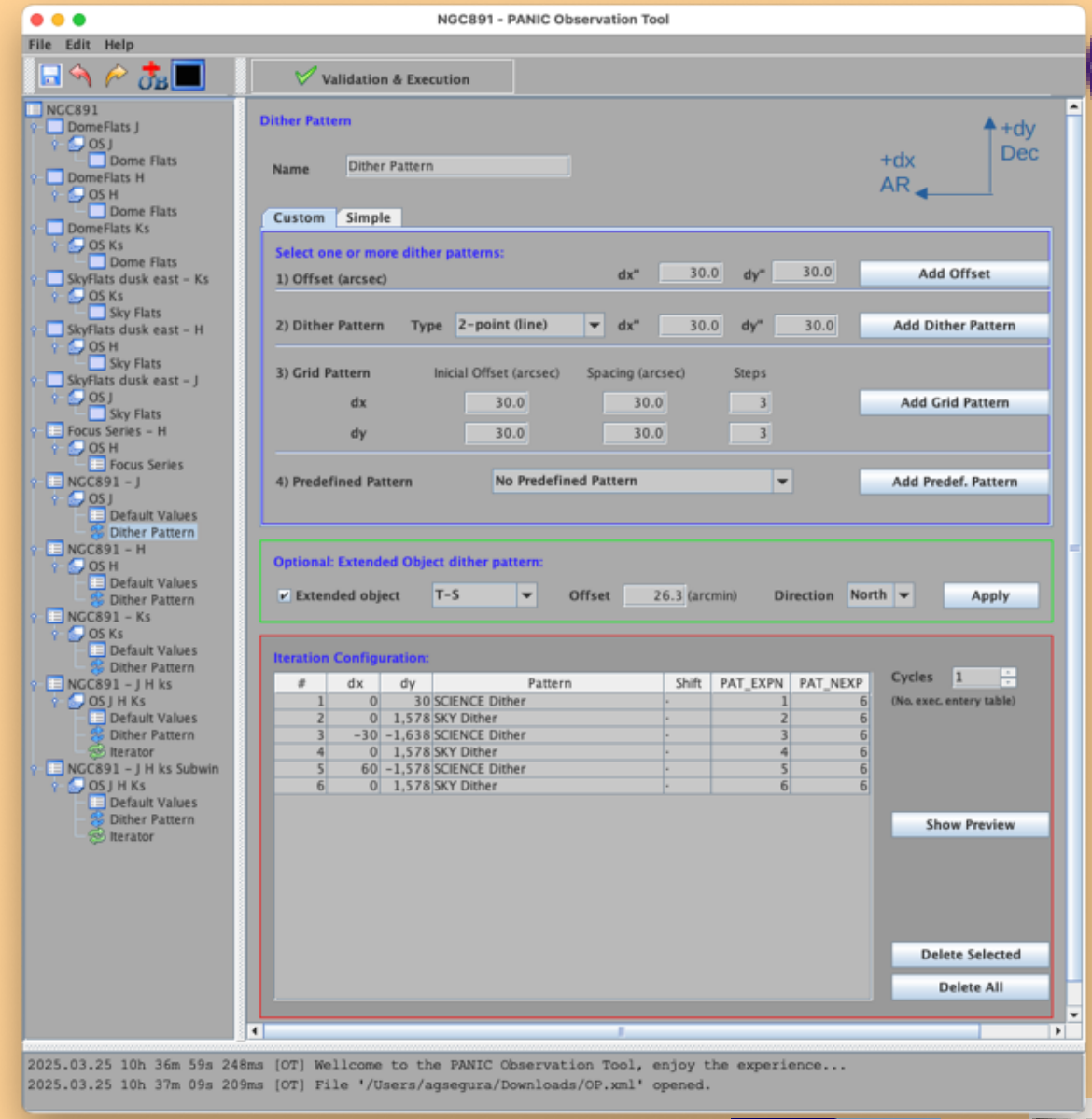
- Types of OB Iterators:
  Dither pattern

Necessary for several key reasons:

- Mitigating bad pixels
- Improving Sky background subtraction
- Reducing systematic noise
- Avoiding persistence effects

In this example we can see:

- Custom Offset selected
- 3 offset positions defined
- ✓ Extended object T-S
  26.3 arcmin
  direction North



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

PANIC Observation Tool

- Types of OB iterators:
  Dither pattern

  - Custom Offset
  - 3 offset positions defined
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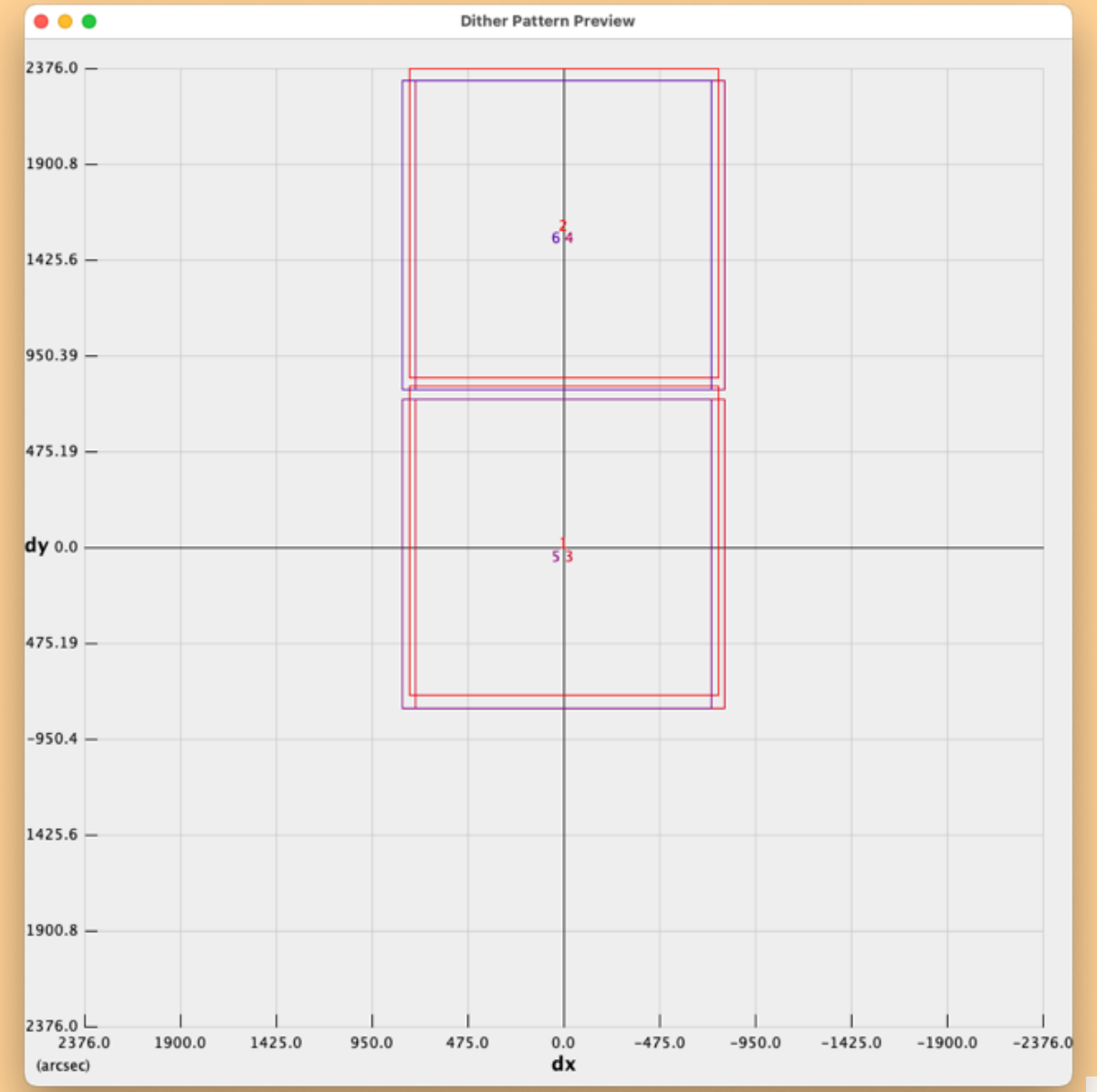
    26.3 arcmin
    direction North

- Dither Pattern Preview



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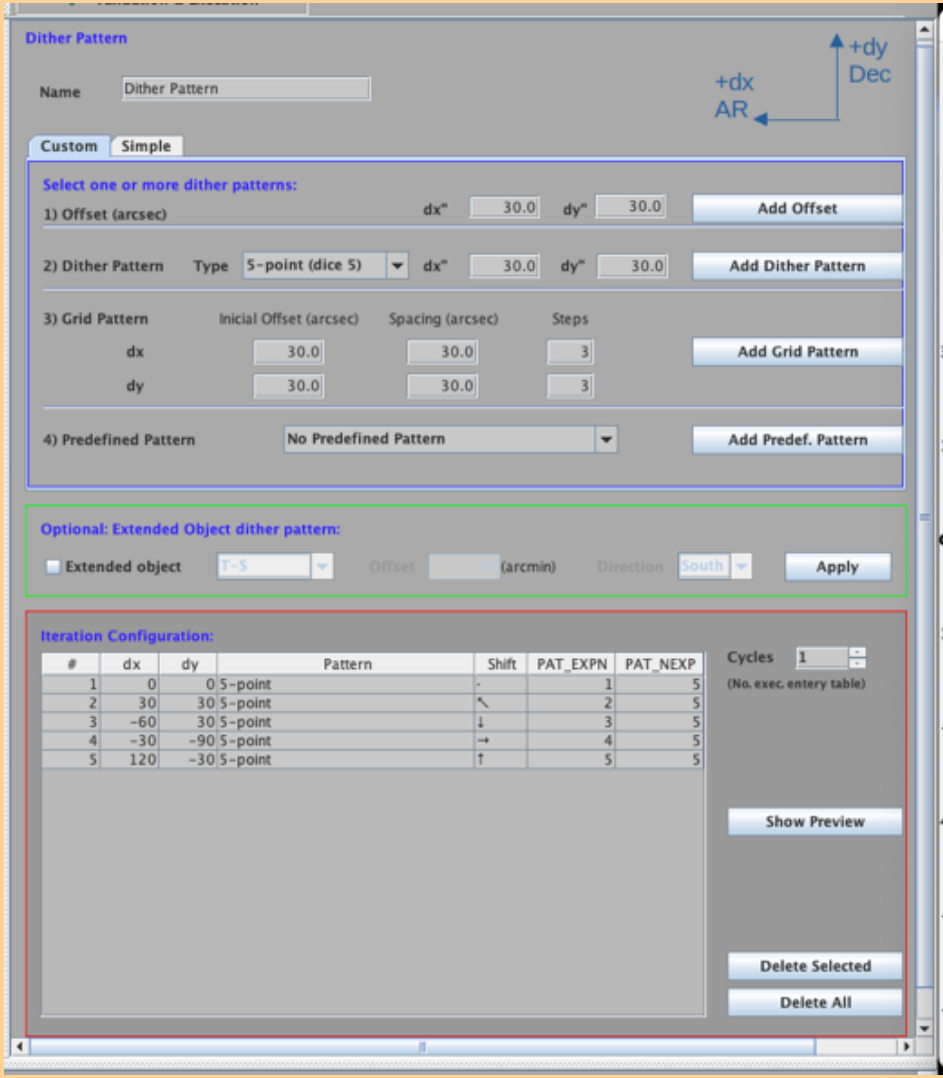
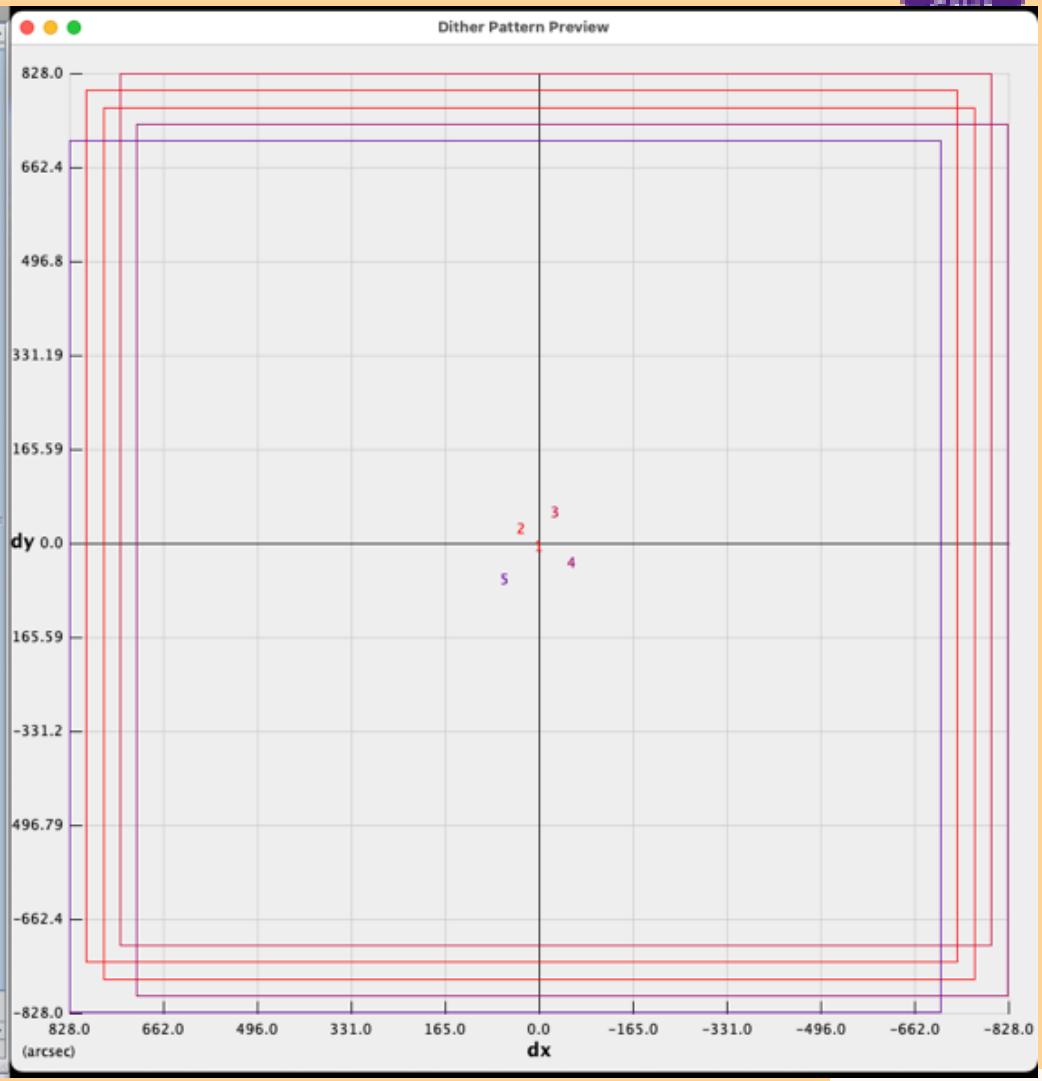
Sesión especial de PANIC 4K: cómo sacar el mayor partido a tu tiempo asignado de observación

PANIC Observation Tool → Dither pattern → Type 5-point (dice 5) & Preview





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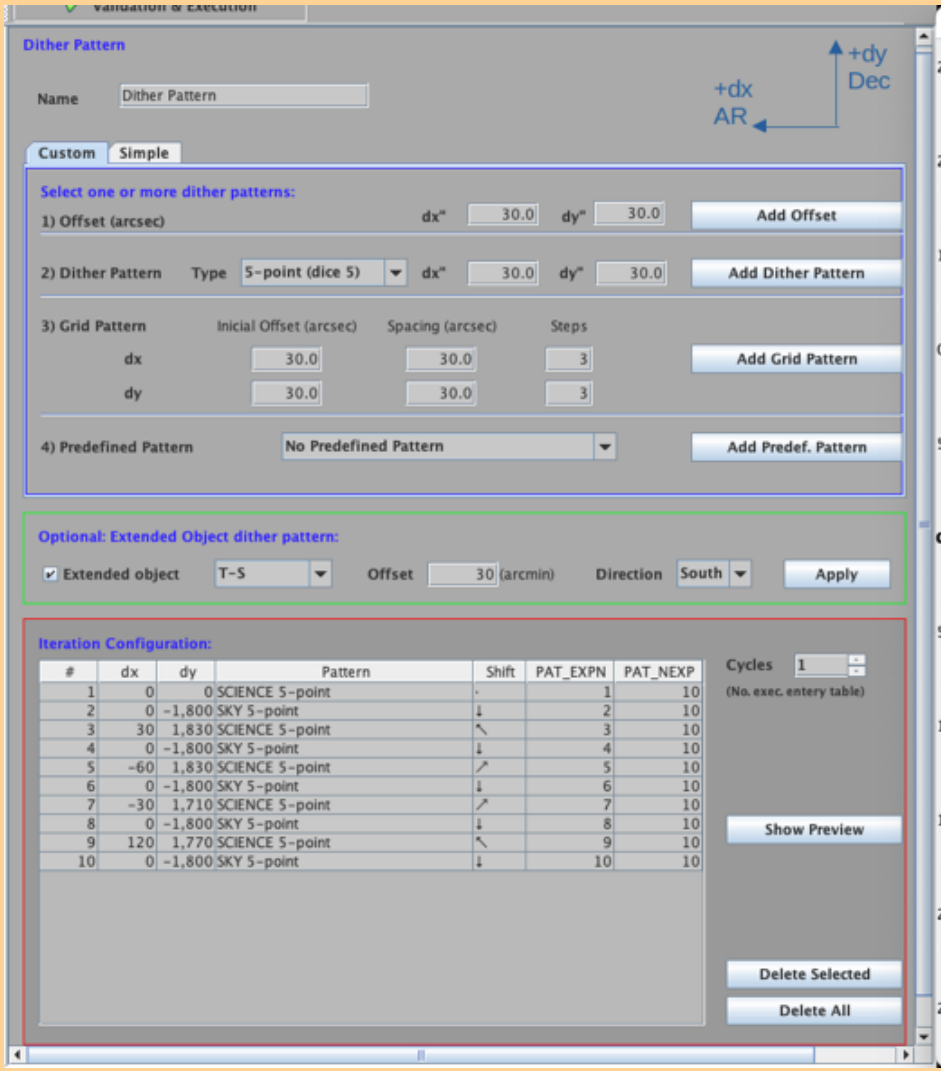
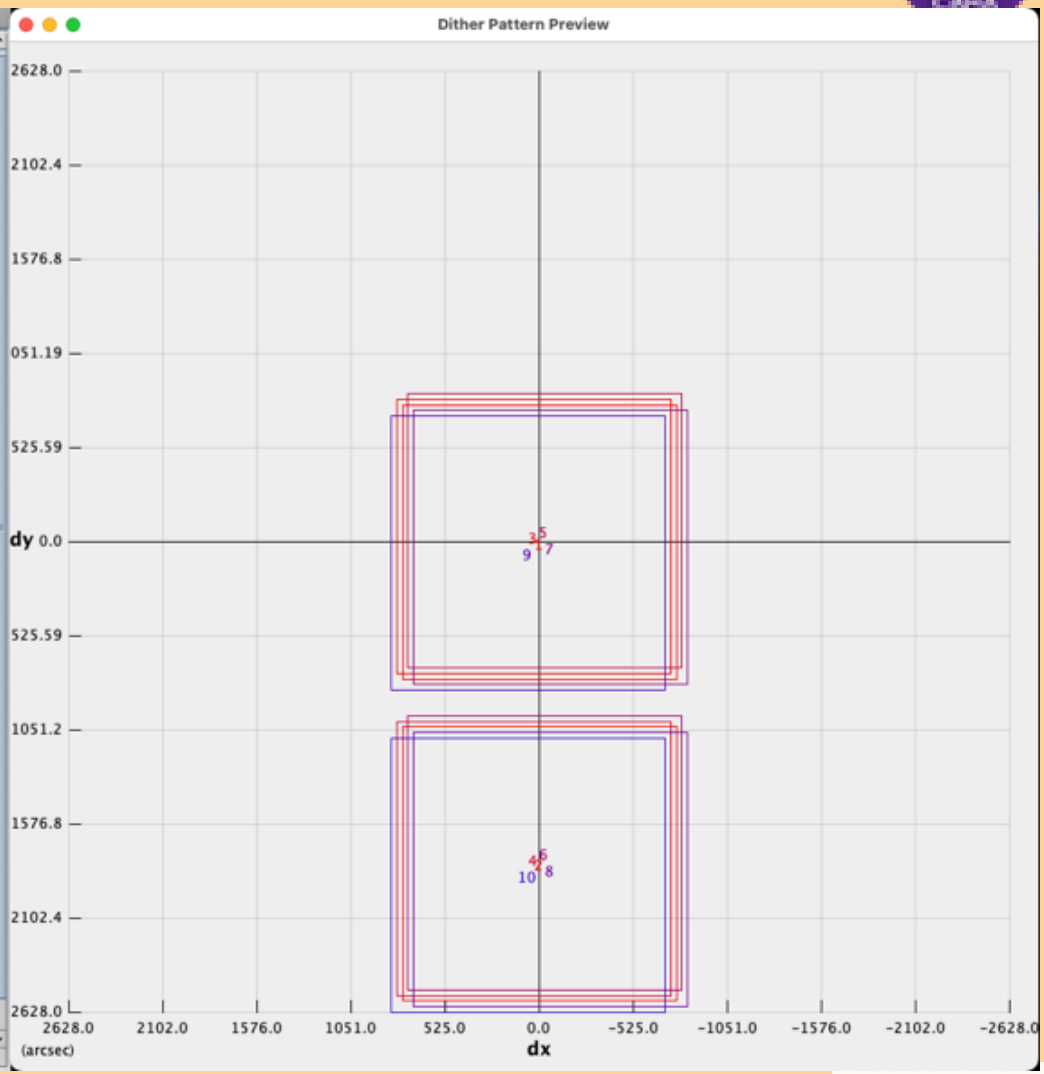
PANIC Observation Tool → Dither pattern → Type 5-point (dice 5) → Extended object T-S & Preview





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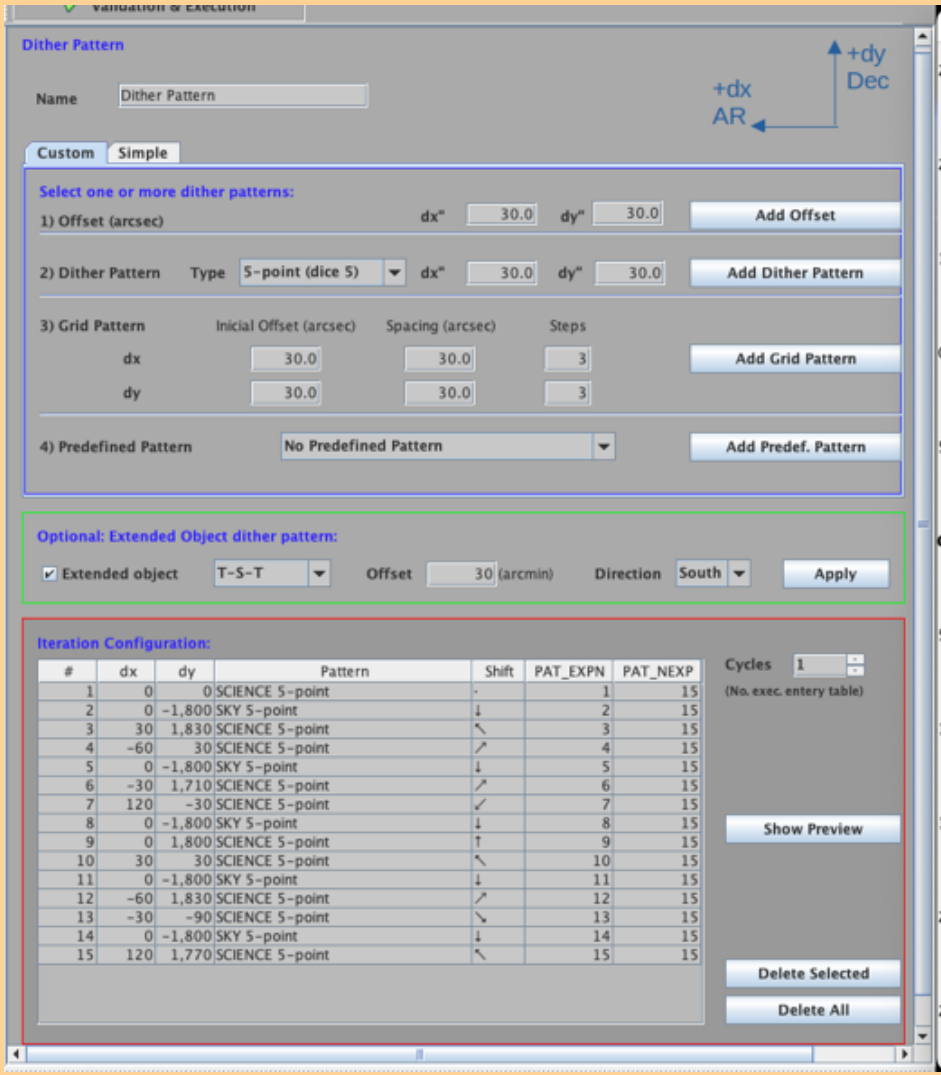
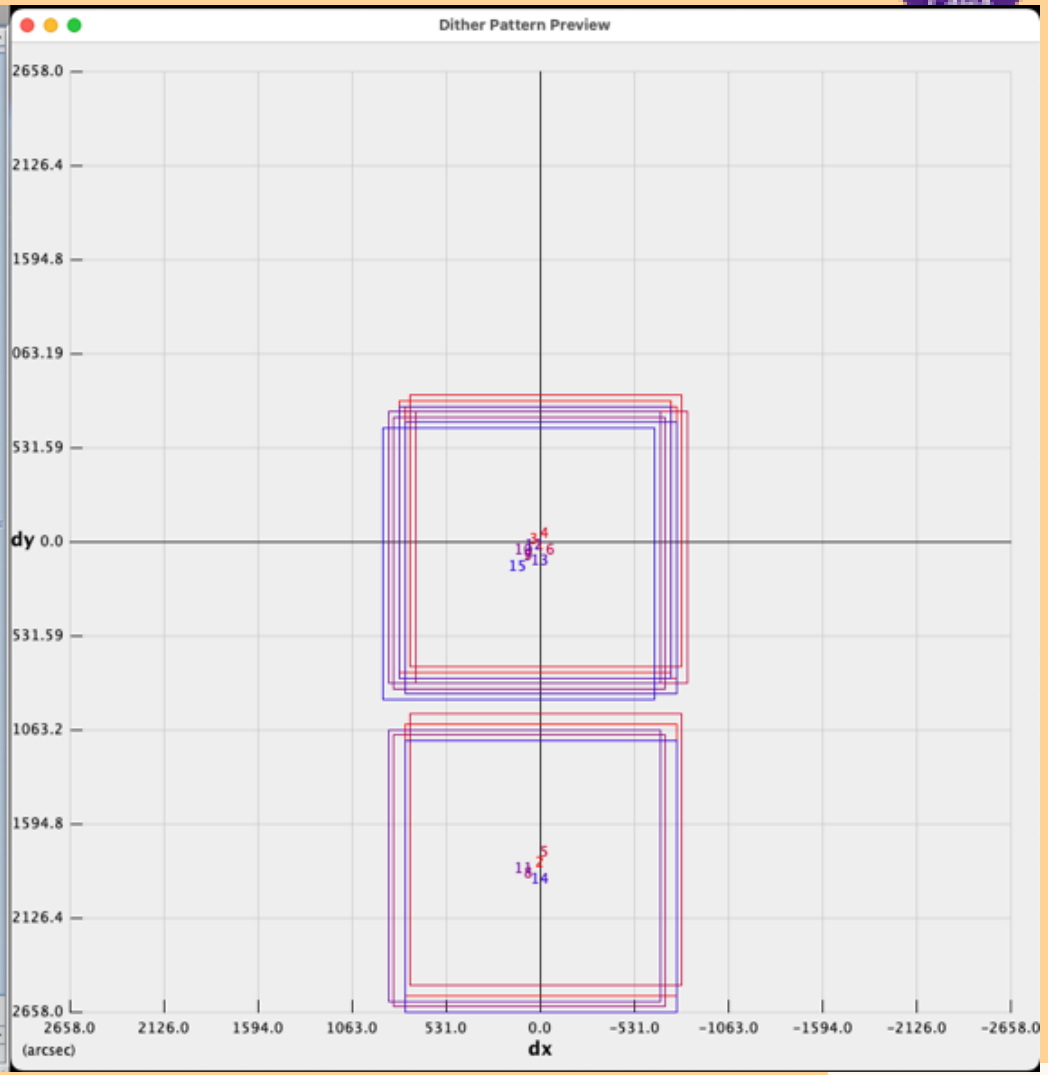
PANIC Observation Tool → Dither pattern → Type 5-point (dice 5) → Extended object T-S-T & Preview



#	dx	dy	Pattern	Shift	PAT_EXPN	PAT_NEXP
1	0	0	SCIENCE 5-point	·	1	15
2	0	-1,800	SKY 5-point	↓	2	15
3	30	1,830	SCIENCE 5-point	↖	3	15
4	-60	30	SCIENCE 5-point	↗	4	15
5	0	-1,800	SKY 5-point	↓	5	15
6	-30	1,710	SCIENCE 5-point	↗	6	15
7	120	-30	SCIENCE 5-point	↙	7	15
8	0	-1,800	SKY 5-point	↓	8	15
9	0	1,800	SCIENCE 5-point	↑	9	15
10	30	30	SCIENCE 5-point	↖	10	15
11	0	-1,800	SKY 5-point	↓	11	15
12	-60	1,830	SCIENCE 5-point	↗	12	15
13	-30	-90	SCIENCE 5-point	↘	13	15
14	0	-1,800	SKY 5-point	↓	14	15
15	120	1,770	SCIENCE 5-point	↖	15	15



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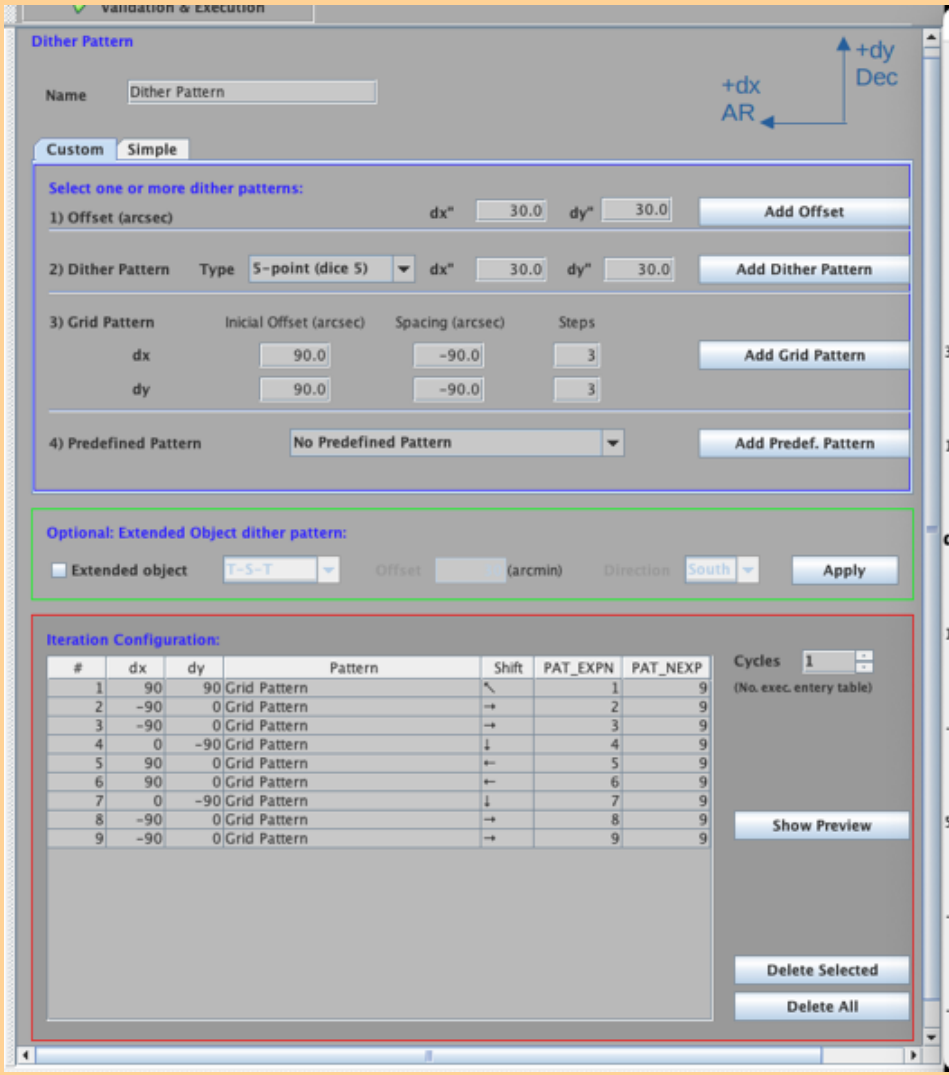
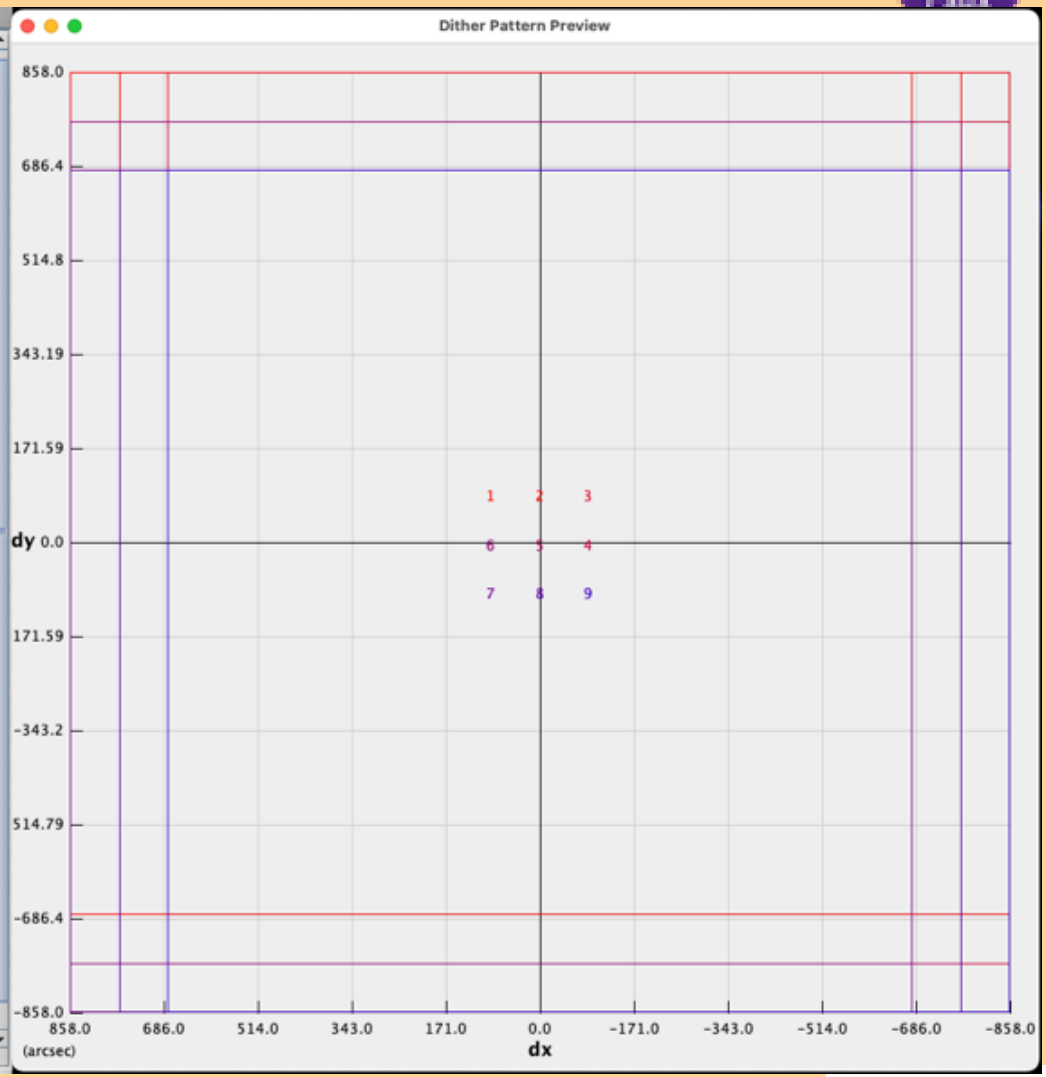
Sesión especial de PANIC 4K: cómo sacar el mayor partido a tu tiempo asignado de observación

PANIC Observation Tool → Dither pattern → Grid Pattern (3x3) & Preview





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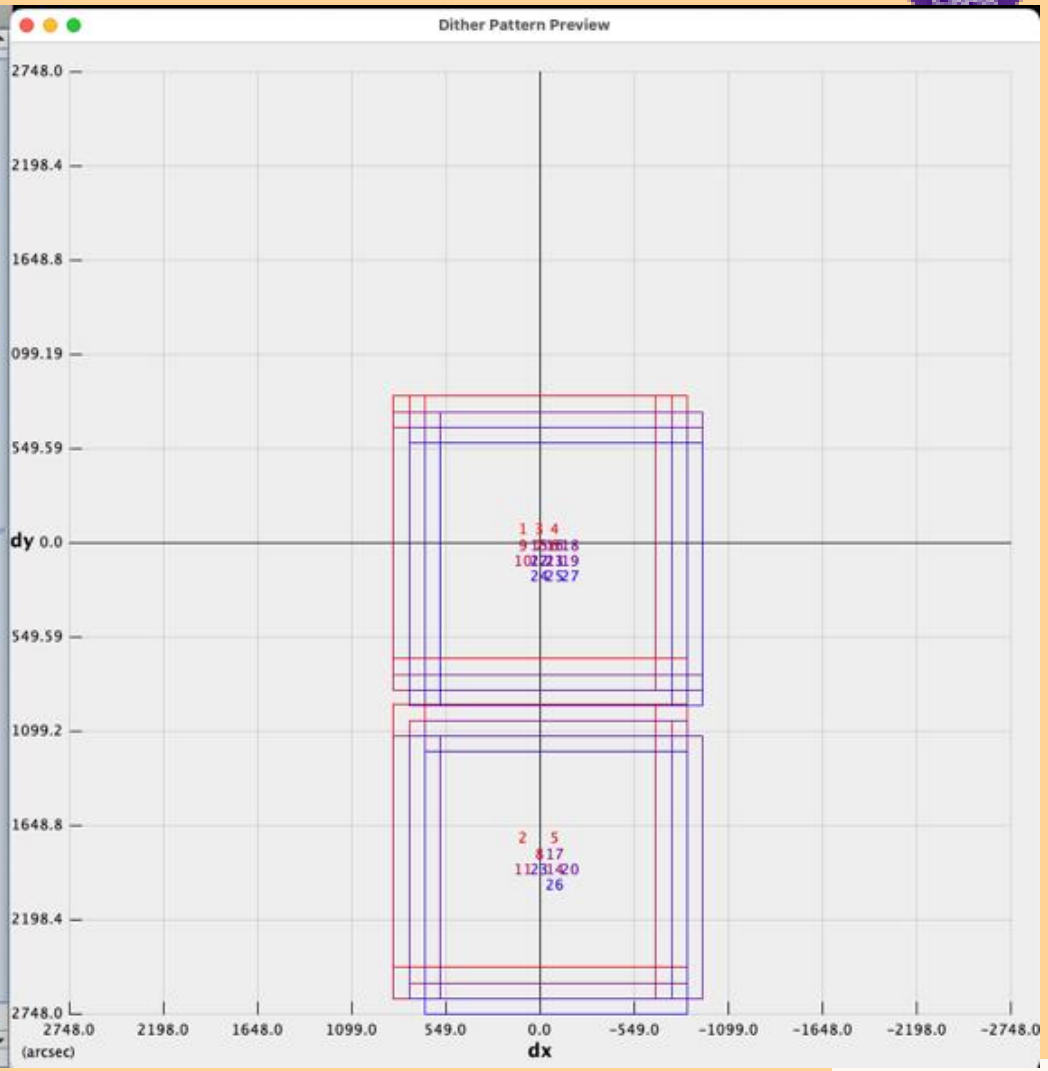
Sesión especial de PANIC 4K: cómo sacar el mayor partido a tu tiempo asignado de observación

PANIC Observation Tool → Dither pattern → Grid Pattern (3x3) → Extended object T-S-T & Preview



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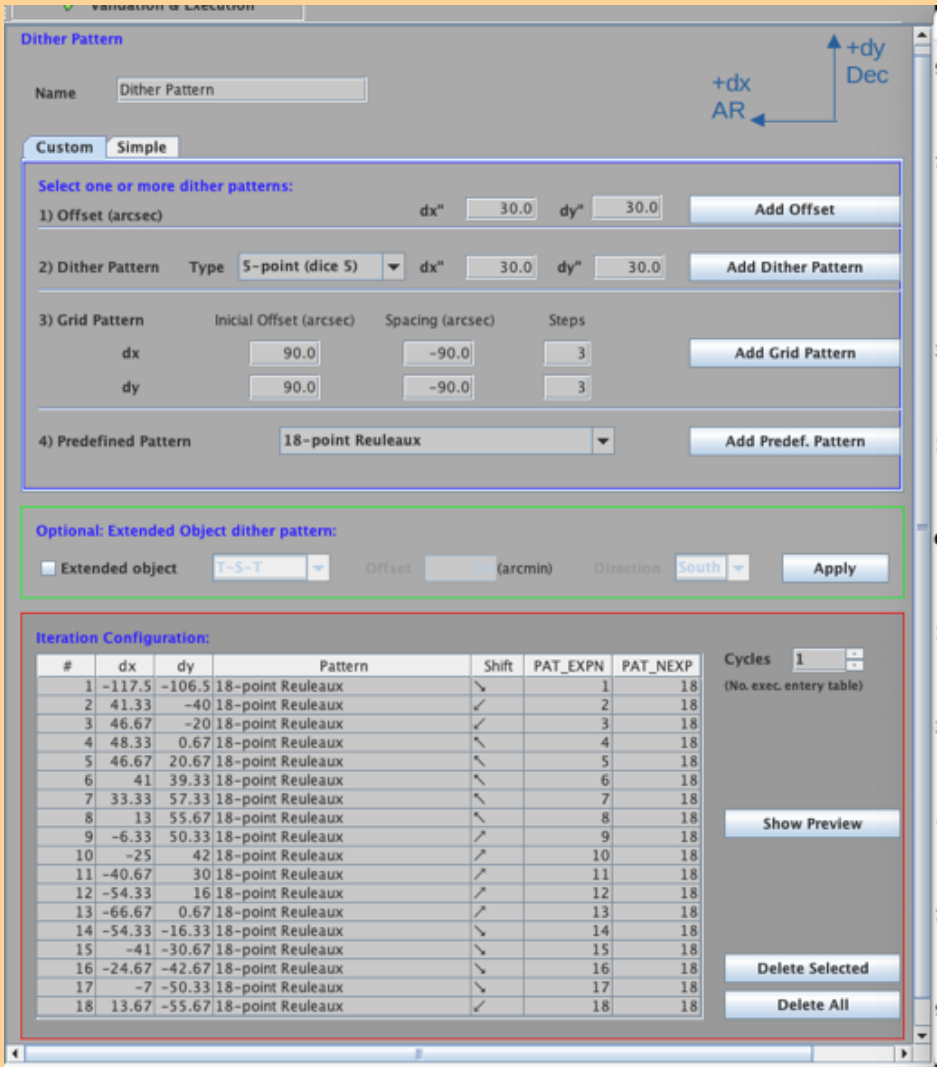
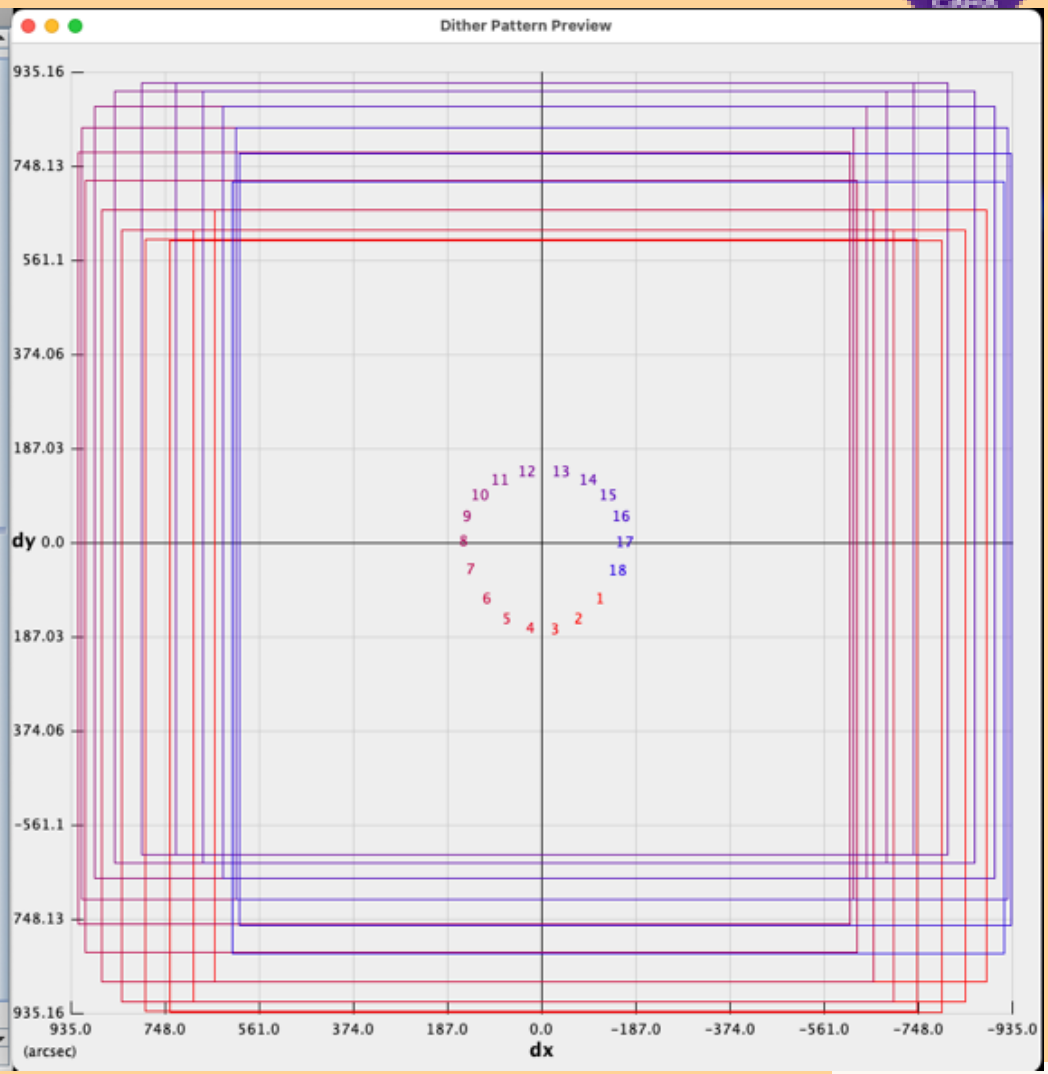
Sesión especial de PANIC 4K: cómo sacar el mayor partido a tu tiempo asignado de observación

PANIC Observation Tool → Dither pattern → Predefined Pattern (18-point Reuleaux) & Preview



#	dx	dy	Pattern	Shift	PAT_EXPN	PAT_NEXP
1	-117.5	-106.5	18-point Reuleaux	↘	1	18
2	41.33	-40	18-point Reuleaux	↙	2	18
3	46.67	-20	18-point Reuleaux	↙	3	18
4	48.33	0.67	18-point Reuleaux	↖	4	18
5	46.67	20.67	18-point Reuleaux	↖	5	18
6	41	39.33	18-point Reuleaux	↖	6	18
7	33.33	57.33	18-point Reuleaux	↖	7	18
8	13	55.67	18-point Reuleaux	↖	8	18
9	-6.33	50.33	18-point Reuleaux	↗	9	18
10	-25	42	18-point Reuleaux	↗	10	18
11	-40.67	30	18-point Reuleaux	↗	11	18
12	-54.33	16	18-point Reuleaux	↗	12	18
13	-66.67	0.67	18-point Reuleaux	↗	13	18
14	-54.33	-16.33	18-point Reuleaux	↘	14	18
15	-41	-30.67	18-point Reuleaux	↘	15	18
16	-24.67	-42.67	18-point Reuleaux	↘	16	18
17	-7	-50.33	18-point Reuleaux	↘	17	18
18	13.67	-55.67	18-point Reuleaux	↙	18	18



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

PANIC Observation Tool → Dither pattern → Predefined Pattern (18 and 36 point Reuleaux Triangle)

THE ASTROPHYSICAL JOURNAL, 536:500–512, 2000 June 10

DITHERING STRATEGIES FOR EFFICIENT SELF-CALIBRATION OF IMAGING ARRAYS

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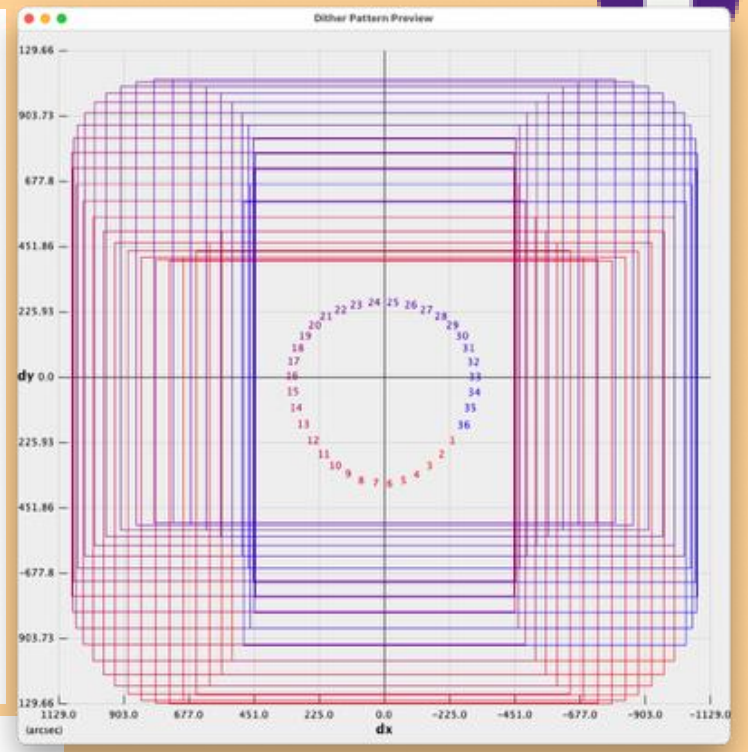
Received 1999 October 5; accepted 2000 January 26

ABSTRACT

With high-sensitivity imaging arrays, accurate calibration is essential to achieve the limits of detection of space observatories. One can simultaneously extract information about the scene being observed and the calibration properties of the detector and imaging system from redundant dithered images of a scene. There are large differences in the effectiveness of dithering strategies for allowing the separation of detector properties from sky brightness measurements. In this paper, we quantify these differences by developing a figure of merit (FOM) for dithering procedures based on their usefulness for allowing calibration on all spatial scales. The figure of merit measures how well the gain characteristics of the detector are encoded in the measurements, and is independent of the techniques used to analyze the data. Patterns similar to the antenna arrangements of radio interferometers with good *u-v* plane coverage are found to have good figures of merit. We present patterns for both deep surveys of limited sky areas and for shallow surveys. By choosing a strategy that encodes the calibration in the observations in an easily extractable way, we enhance our ability to calibrate our detector systems and to reach the ultimate limits of sensitivity that are required to achieve the promise of many missions.

Subject headings: instrumentation: detectors — methods: data analysis — techniques: photometric



3.1. *Reuleaux Triangle*

Take an equilateral triangle and draw three 60° arcs connecting each pair of vertexes, while centered on the opposite vertex. The resulting fat triangle is a Reuleaux triangle. This basic shape has been used to set the geometry of the Sub-Millimeter Array (SMA) on Mauna Kea (Keto 1997).

This shape can be used as a dither pattern by taking equally spaced steps along each side of the Reuleaux triangle. The length of the steps is set by the overall size of the triangle (a free parameter) and the number of frames to be used in the pattern. For an interferometer, Keto (1997) shows that the *u-v* coverage can be improved by displacing the antennas from their equally spaced positions around the triangle.

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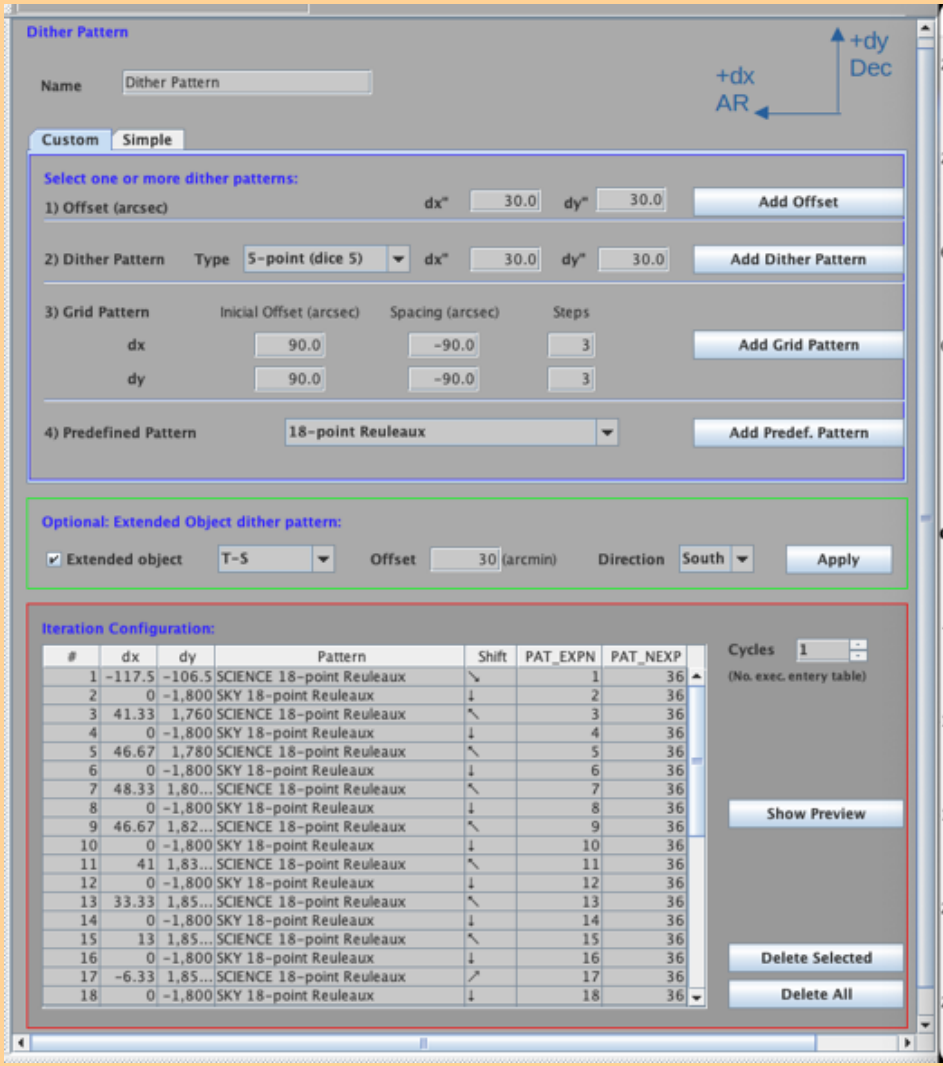
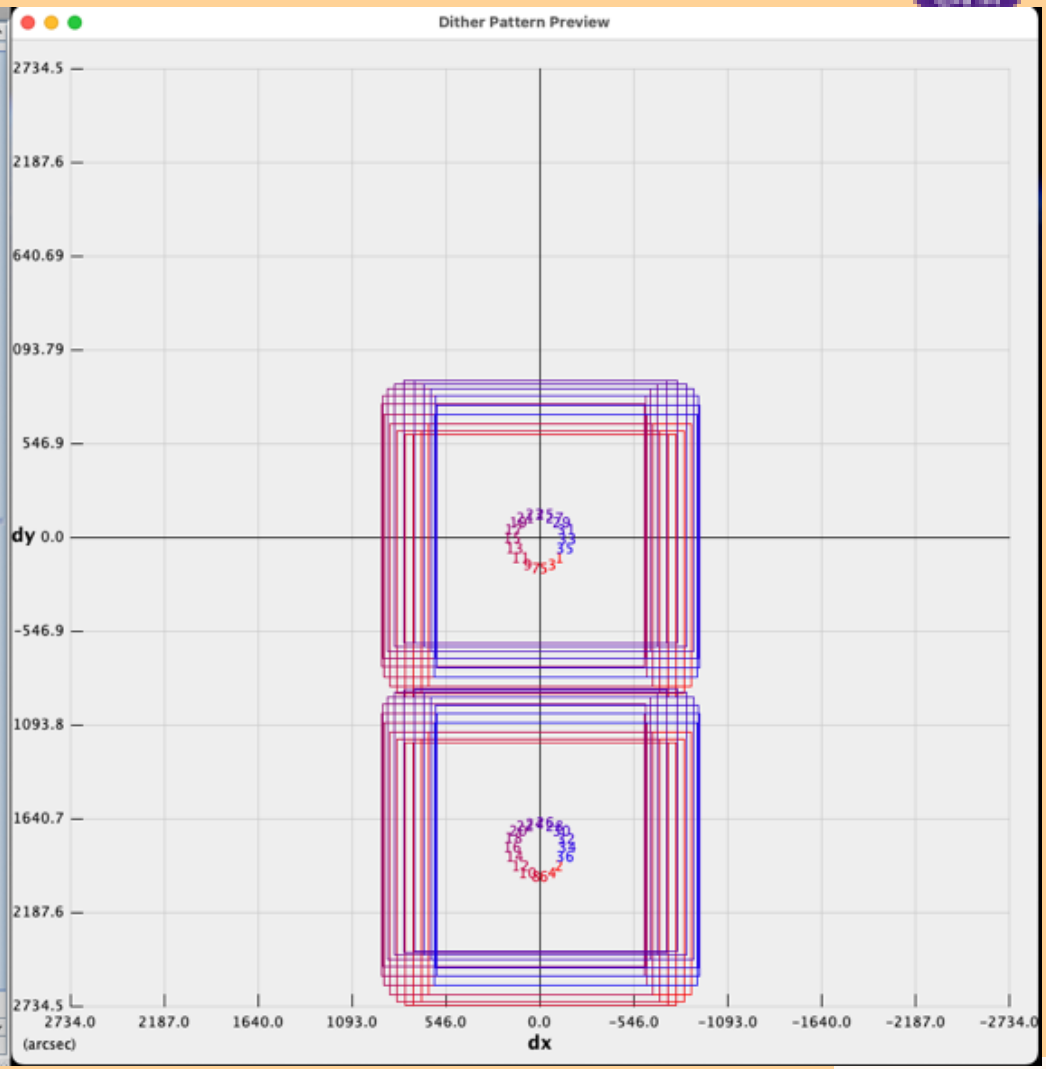
Sesión especial de PANIC 4K: cómo sacar el mayor partido a tu tiempo asignado de observación

PANIC Observation Tool → Dither pattern → Predefined Pattern (18-point Reuleaux) → Extended object T-S & Preview





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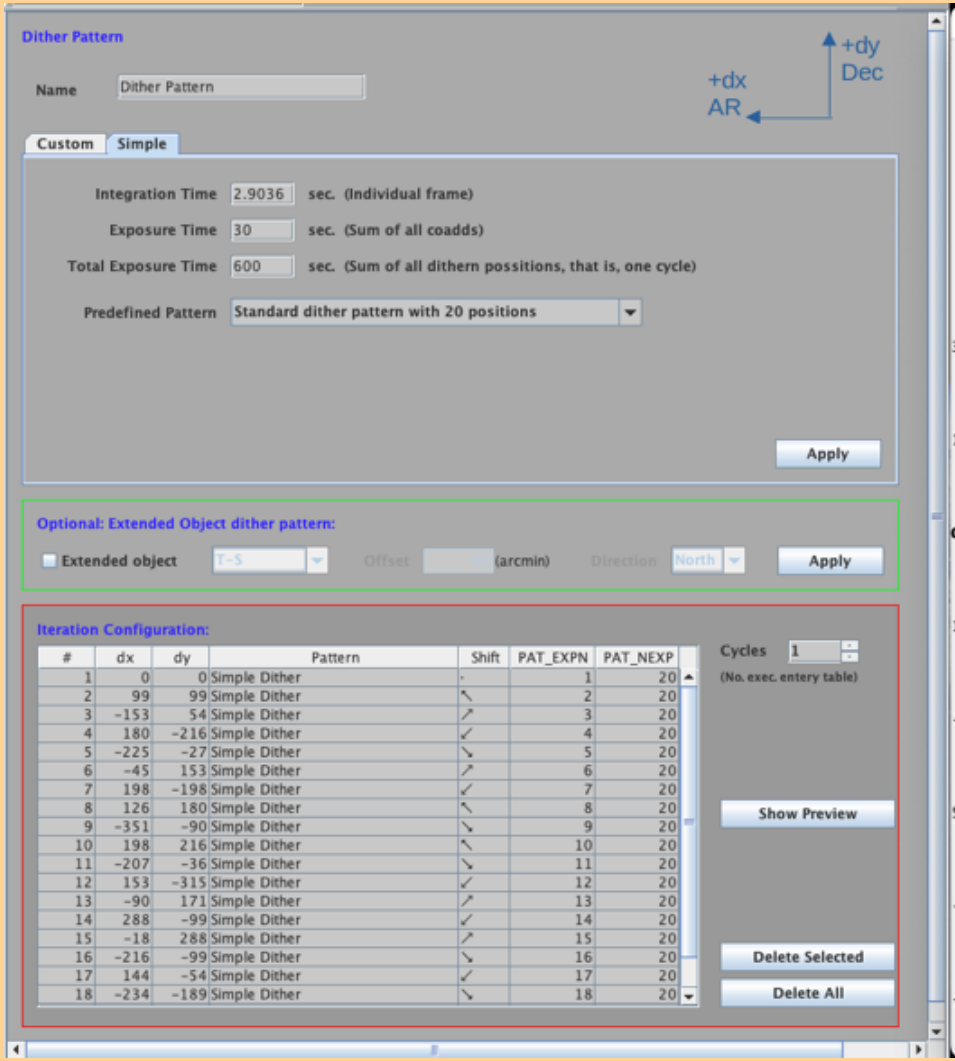
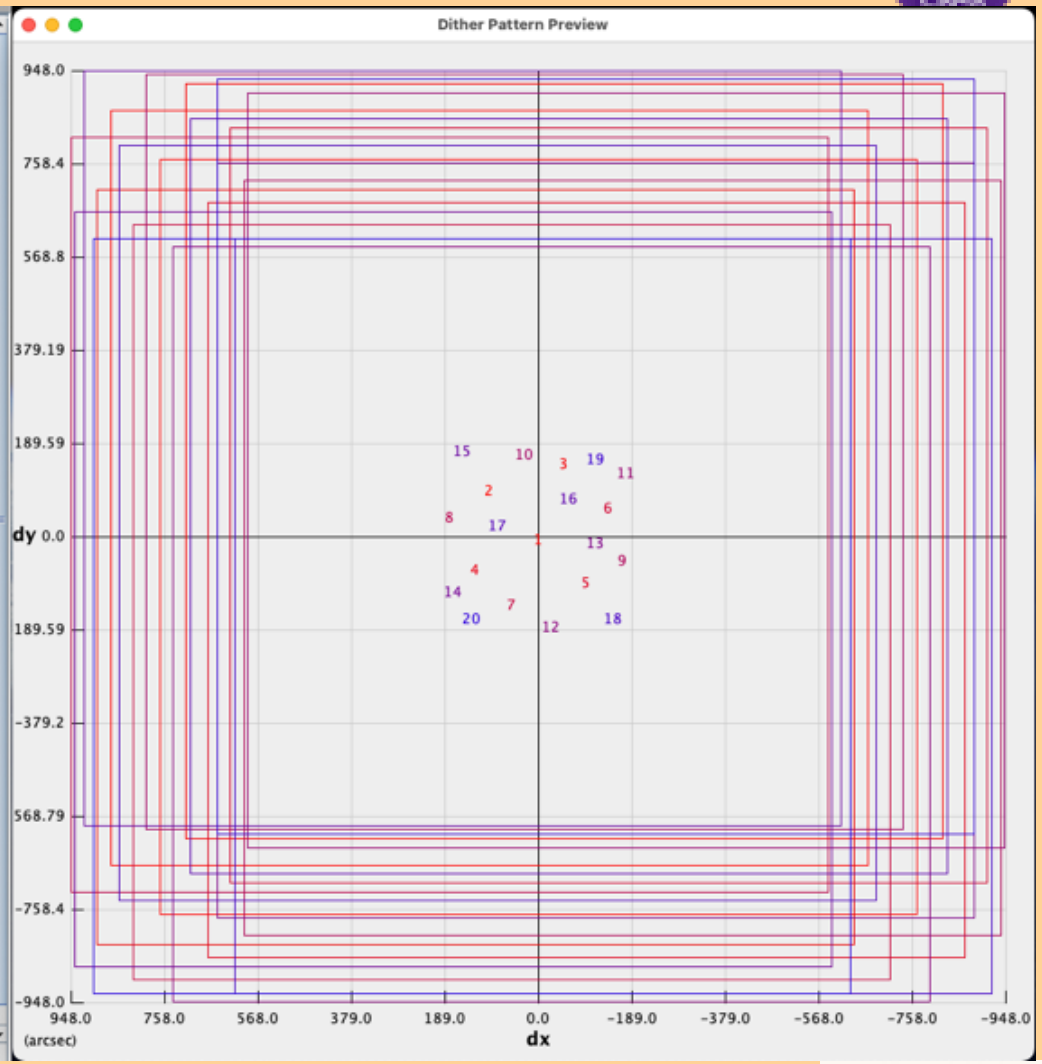
Sesión especial de PANIC 4K: cómo sacar el mayor partido a tu tiempo asignado de observación

PANIC Observation Tool → Dither pattern → Simple → Standard dither pattern with 20 positions & Preview





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

PANIC Observation Tool

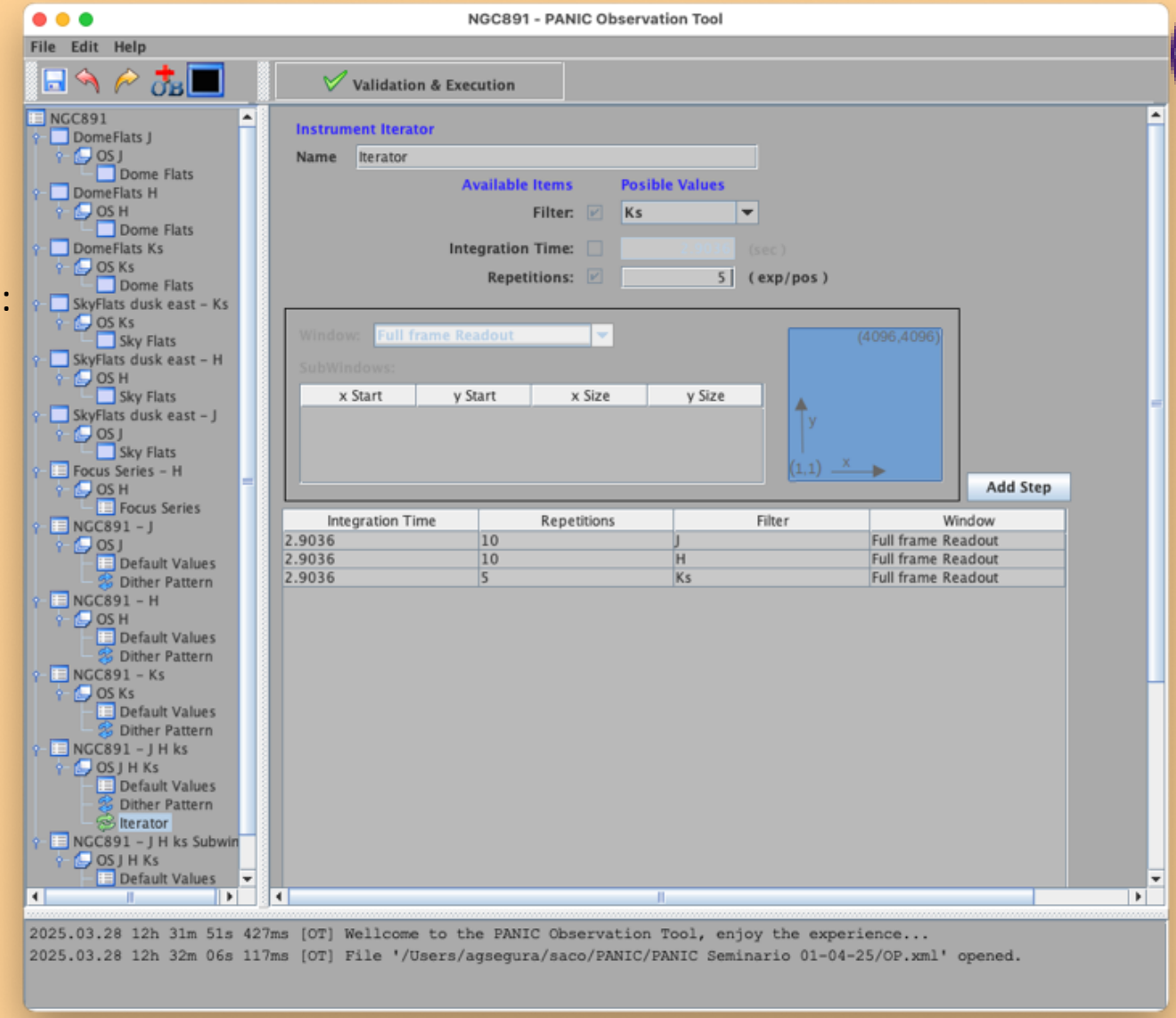
- Types of OB Iterators: Instrument Iterator

Elements to iterate with:

- ❑ Filter
- ❑ Integration time
- ❑ Repetitions
- ❑ Window

Iteration example:

- ✓ Filter
- ✓ Repetitions



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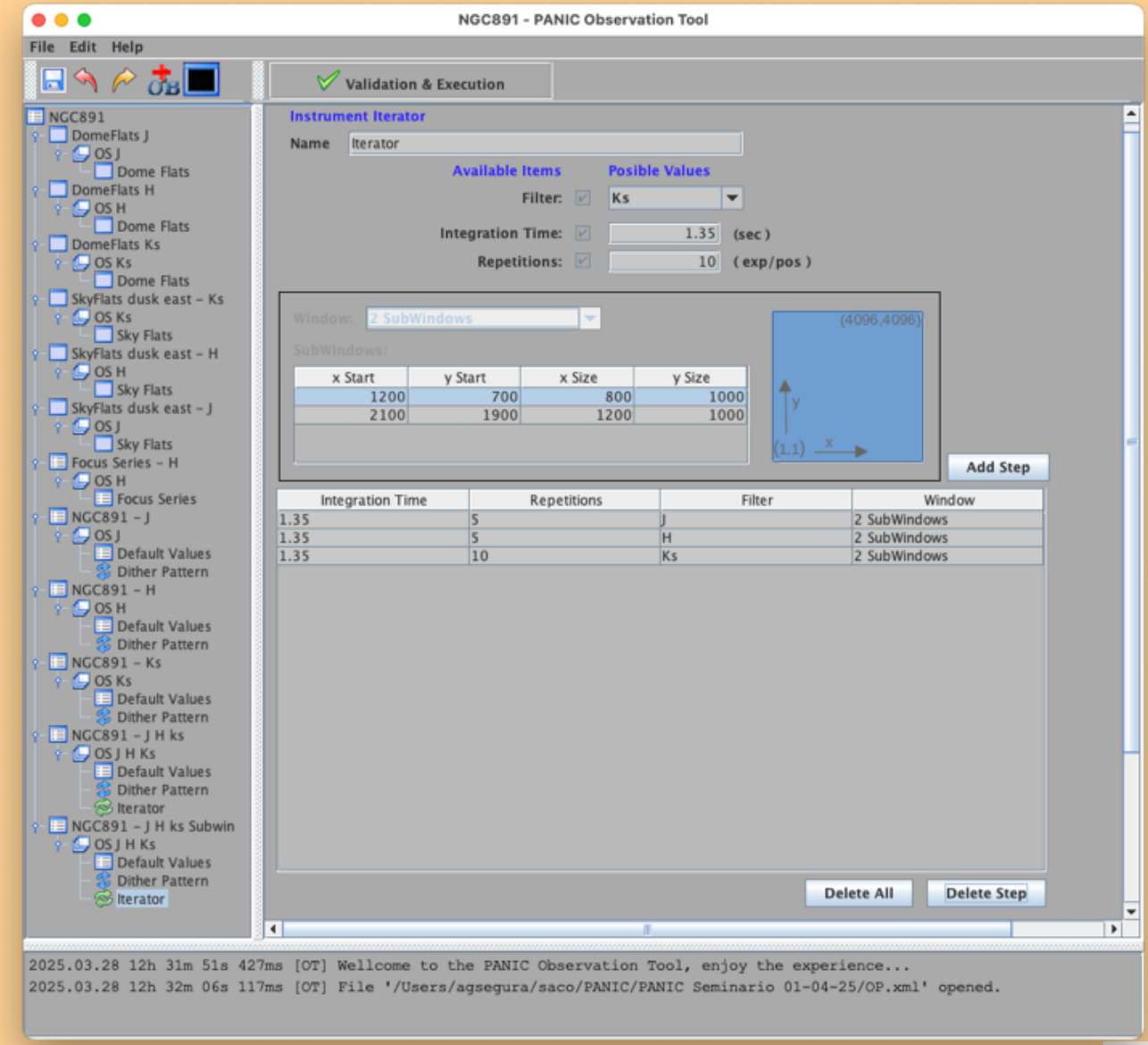
Sesión especial de PANIC 4K: cómo sacar el mayor partido a tu tiempo asignado de observación

PANIC Observation Tool

- Types of OB Iterators: InstrumentIterator

Iteration example:

- ✓ Filter
- ✓ Integration Time
- ✓ Repetitions
- ✓ Window:
  - 2 subwindows which allow us to reduce the Integration Time



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

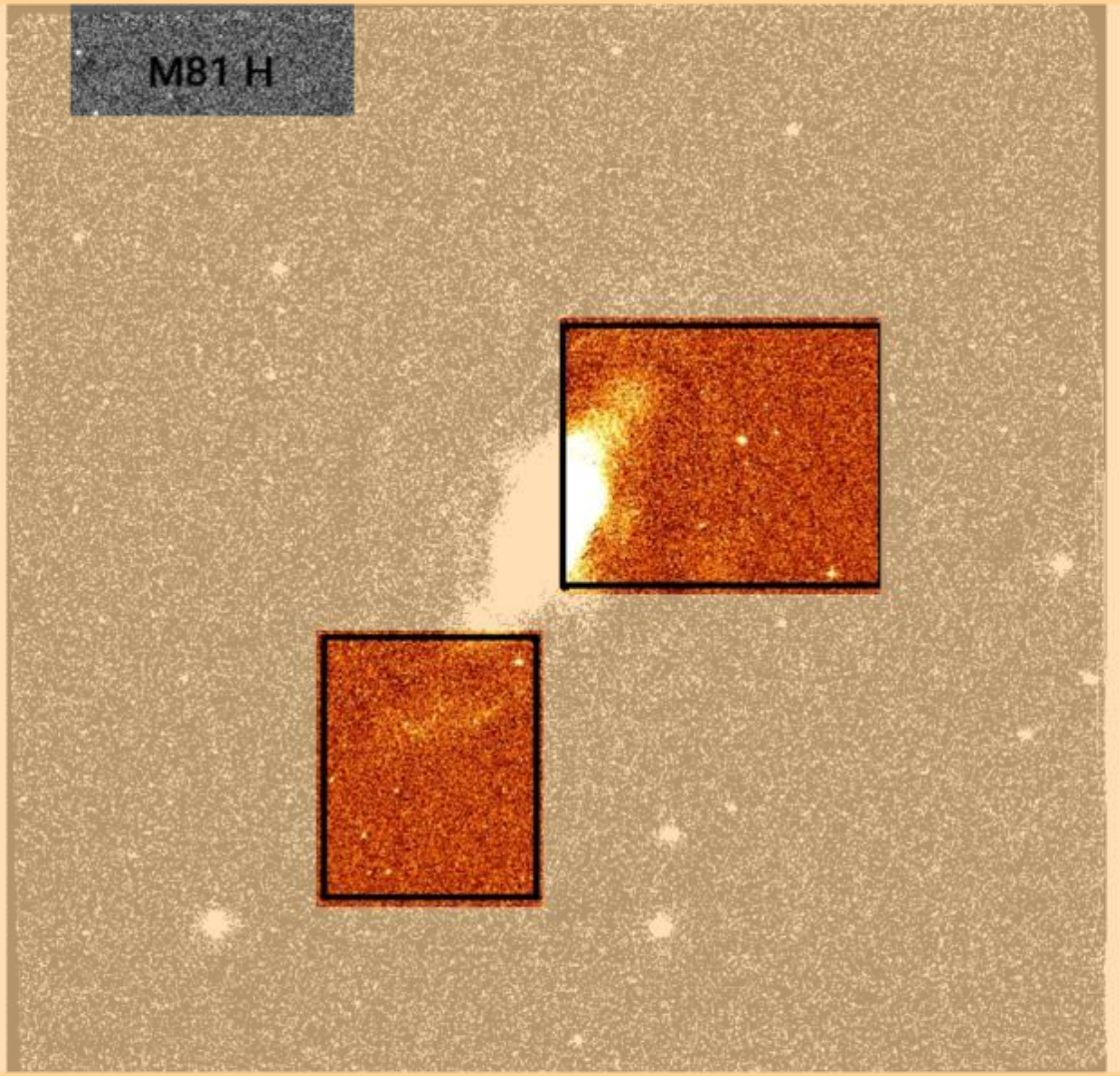
PANIC Observation Tool

- Types of OB Iterators:
  Instrument Iterator

Iteration example:

- ✓ Filter
- ✓ Integration Time
- ✓ Repetitions
- ✓ Window:
  - 2 subwindows

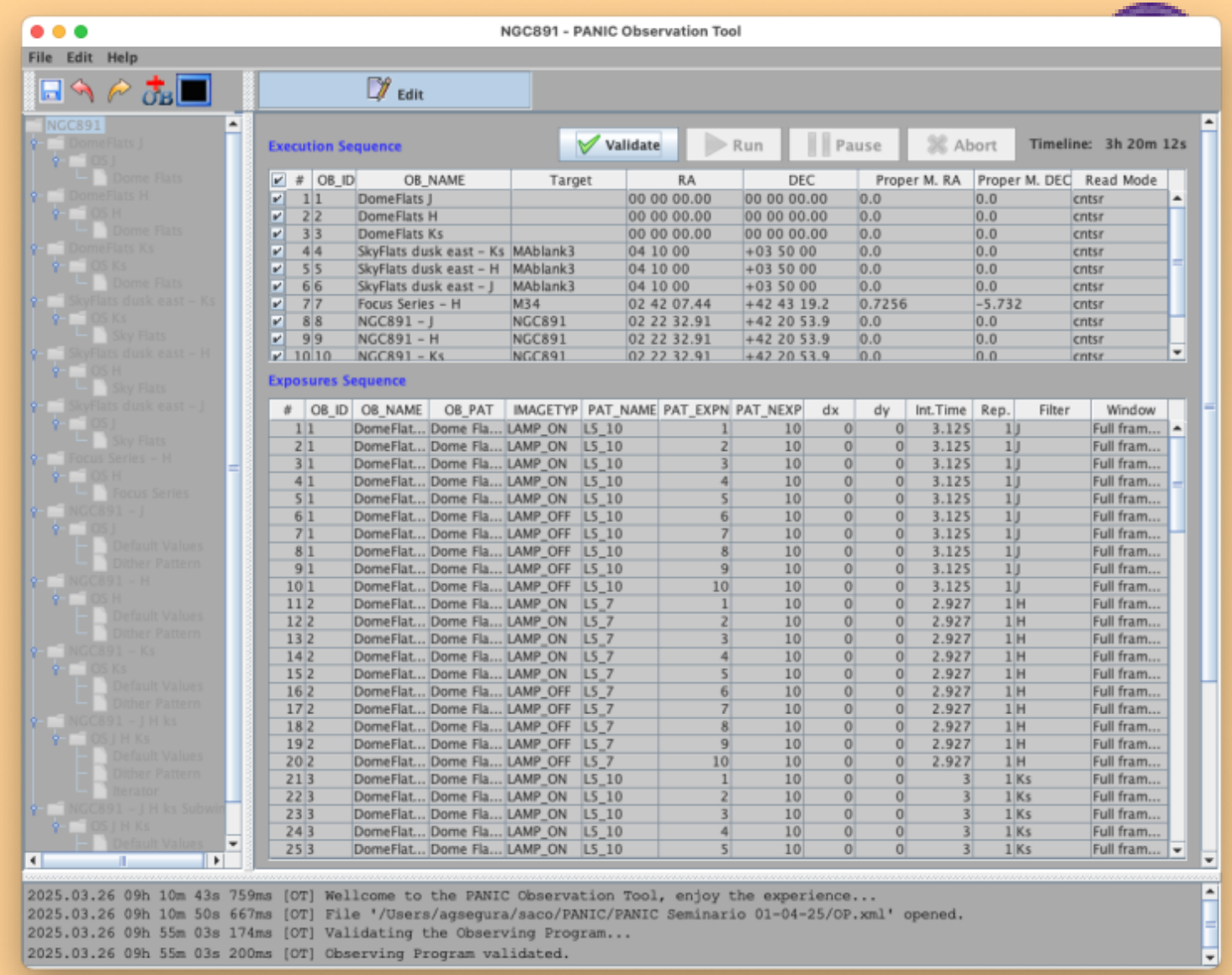
In this example, due to the size of the two subwindows, we obtain a minimum integration time of 1,35 seconds.



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

PANIC Observation Tool

- Validation&Execution
- Timeline calculator
- Execution Sequence
- Exposures Sequence



#	OB_ID	OB_NAME	Target	RA	DEC	Proper M. RA	Proper M. DEC	Read Mode
1	1	DomeFlats J		00 00 00.00	00 00 00.00	0.0	0.0	cntsr
2	2	DomeFlats H		00 00 00.00	00 00 00.00	0.0	0.0	cntsr
3	3	DomeFlats Ks		00 00 00.00	00 00 00.00	0.0	0.0	cntsr
4	4	SkyFlats dusk east - Ks	MAblank3	04 10 00	+03 50 00	0.0	0.0	cntsr
5	5	SkyFlats dusk east - H	MAblank3	04 10 00	+03 50 00	0.0	0.0	cntsr
6	6	SkyFlats dusk east - J	MAblank3	04 10 00	+03 50 00	0.0	0.0	cntsr
7	7	Focus Series - H	M34	02 42 07.44	+42 43 19.2	0.7256	-5.732	cntsr
8	8	NGC891 - J	NGC891	02 22 32.91	+42 20 53.9	0.0	0.0	cntsr
9	9	NGC891 - H	NGC891	02 22 32.91	+42 20 53.9	0.0	0.0	cntsr
10	10	NGC891 - Ks	NGC891	02 22 32.91	+42 20 53.9	0.0	0.0	cntsr

#	OB_ID	OB_NAME	OB_PAT	IMAGETYP	PAT_NAME	PAT_EXPN	PAT_NEXP	dx	dy	Int.Time	Rep.	Filter	Window
1	1	DomeFlat...	Dome Fla...	LAMP_ON	L5_10	1	10	0	0	3.125	1	J	Full fram...
2	1	DomeFlat...	Dome Fla...	LAMP_ON	L5_10	2	10	0	0	3.125	1	J	Full fram...
3	1	DomeFlat...	Dome Fla...	LAMP_ON	L5_10	3	10	0	0	3.125	1	J	Full fram...
4	1	DomeFlat...	Dome Fla...	LAMP_ON	L5_10	4	10	0	0	3.125	1	J	Full fram...
5	1	DomeFlat...	Dome Fla...	LAMP_ON	L5_10	5	10	0	0	3.125	1	J	Full fram...
6	1	DomeFlat...	Dome Fla...	LAMP_OFF	L5_10	6	10	0	0	3.125	1	J	Full fram...
7	1	DomeFlat...	Dome Fla...	LAMP_OFF	L5_10	7	10	0	0	3.125	1	J	Full fram...
8	1	DomeFlat...	Dome Fla...	LAMP_OFF	L5_10	8	10	0	0	3.125	1	J	Full fram...
9	1	DomeFlat...	Dome Fla...	LAMP_OFF	L5_10	9	10	0	0	3.125	1	J	Full fram...
10	1	DomeFlat...	Dome Fla...	LAMP_OFF	L5_10	10	10	0	0	3.125	1	J	Full fram...
11	2	DomeFlat...	Dome Fla...	LAMP_ON	L5_7	1	10	0	0	2.927	1	H	Full fram...
12	2	DomeFlat...	Dome Fla...	LAMP_ON	L5_7	2	10	0	0	2.927	1	H	Full fram...
13	2	DomeFlat...	Dome Fla...	LAMP_ON	L5_7	3	10	0	0	2.927	1	H	Full fram...
14	2	DomeFlat...	Dome Fla...	LAMP_ON	L5_7	4	10	0	0	2.927	1	H	Full fram...
15	2	DomeFlat...	Dome Fla...	LAMP_ON	L5_7	5	10	0	0	2.927	1	H	Full fram...
16	2	DomeFlat...	Dome Fla...	LAMP_OFF	L5_7	6	10	0	0	2.927	1	H	Full fram...
17	2	DomeFlat...	Dome Fla...	LAMP_OFF	L5_7	7	10	0	0	2.927	1	H	Full fram...
18	2	DomeFlat...	Dome Fla...	LAMP_OFF	L5_7	8	10	0	0	2.927	1	H	Full fram...
19	2	DomeFlat...	Dome Fla...	LAMP_OFF	L5_7	9	10	0	0	2.927	1	H	Full fram...
20	2	DomeFlat...	Dome Fla...	LAMP_OFF	L5_7	10	10	0	0	2.927	1	H	Full fram...
21	3	DomeFlat...	Dome Fla...	LAMP_ON	L5_10	1	10	0	0	3	1	Ks	Full fram...
22	3	DomeFlat...	Dome Fla...	LAMP_ON	L5_10	2	10	0	0	3	1	Ks	Full fram...
23	3	DomeFlat...	Dome Fla...	LAMP_ON	L5_10	3	10	0	0	3	1	Ks	Full fram...
24	3	DomeFlat...	Dome Fla...	LAMP_ON	L5_10	4	10	0	0	3	1	Ks	Full fram...
25	3	DomeFlat...	Dome Fla...	LAMP_ON	L5_10	5	10	0	0	3	1	Ks	Full fram...

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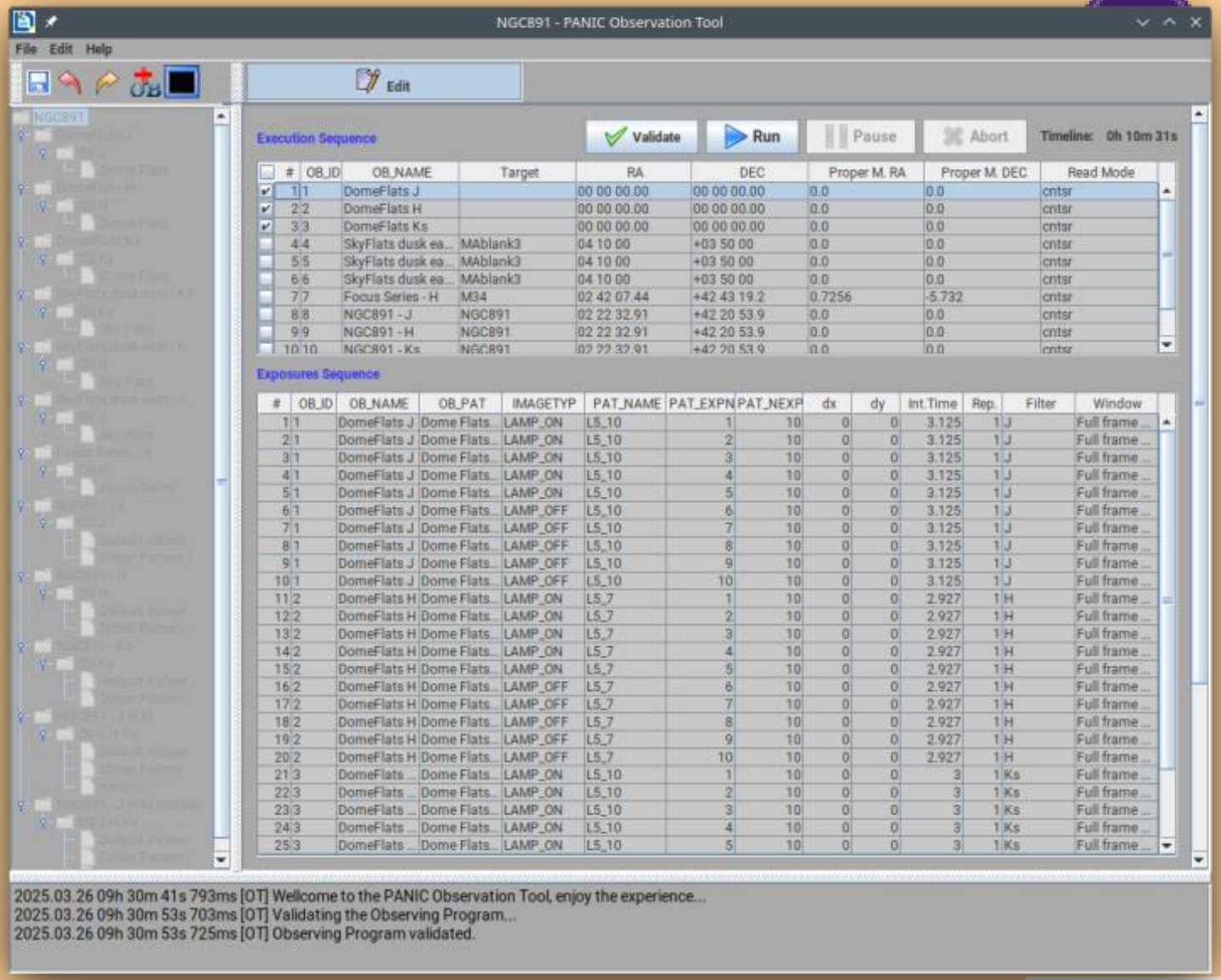
Sesión especial de PANIC 4K: cómo sacar el mayor partido a tu tiempo asignado de observación

PANIC Observation Tool

- Validation&Execution
- OB's selection to run
- Timeline recalculated
- Run enabled at CAHA

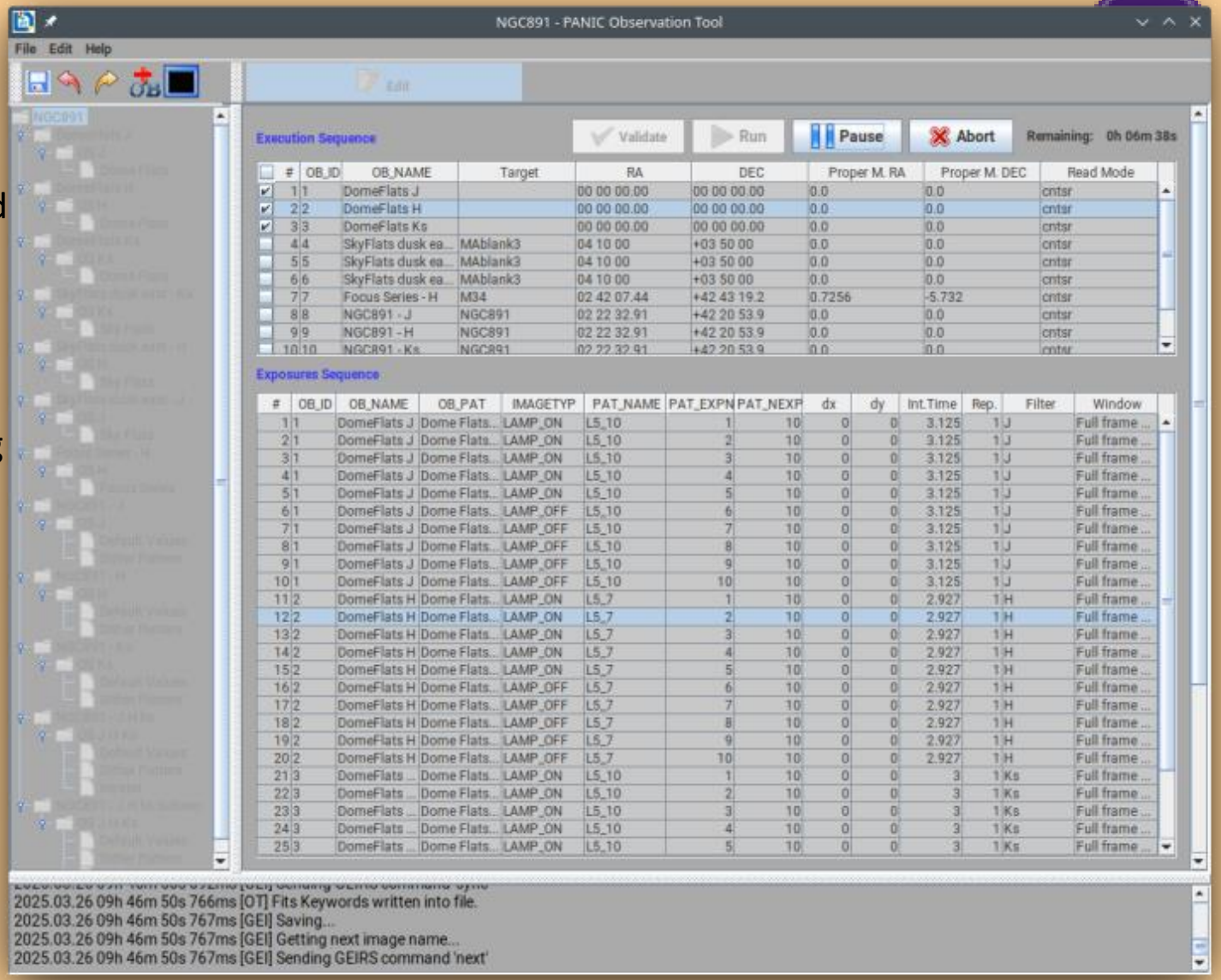


Sesión especial de PANIC 4K: cómo sacar el mayor partido a tu tiempo asignado de observación

PANIC Observation Tool

- Running

  Pause & abort enabled
- Time Remaining
- Execution highlighted
- Activity is shown at log



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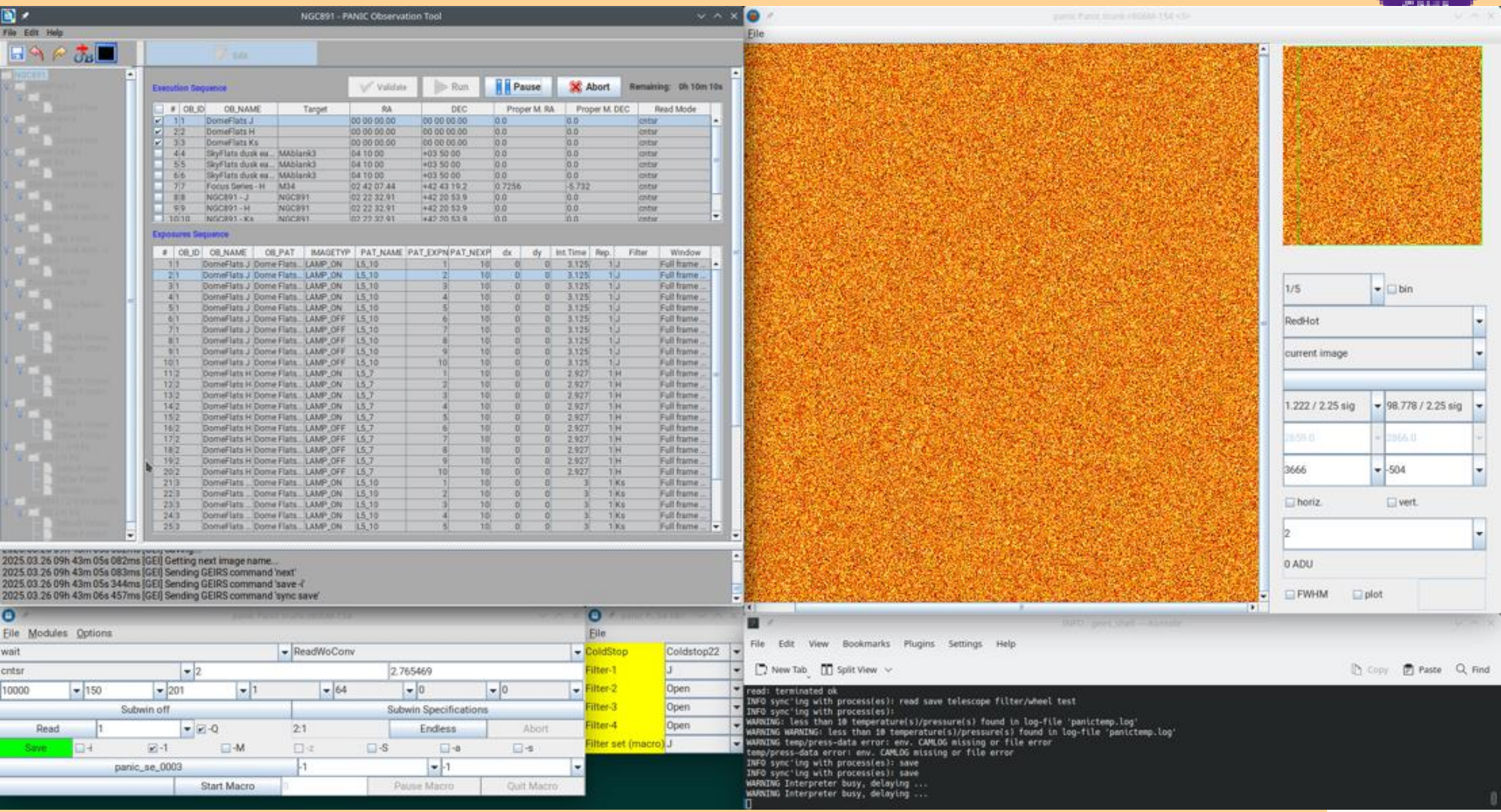
Sesión especial de PANIC 4K: cómo sacar el mayor partido a tu tiempo asignado de observación

PANIC Observation Tool running with GEIRS



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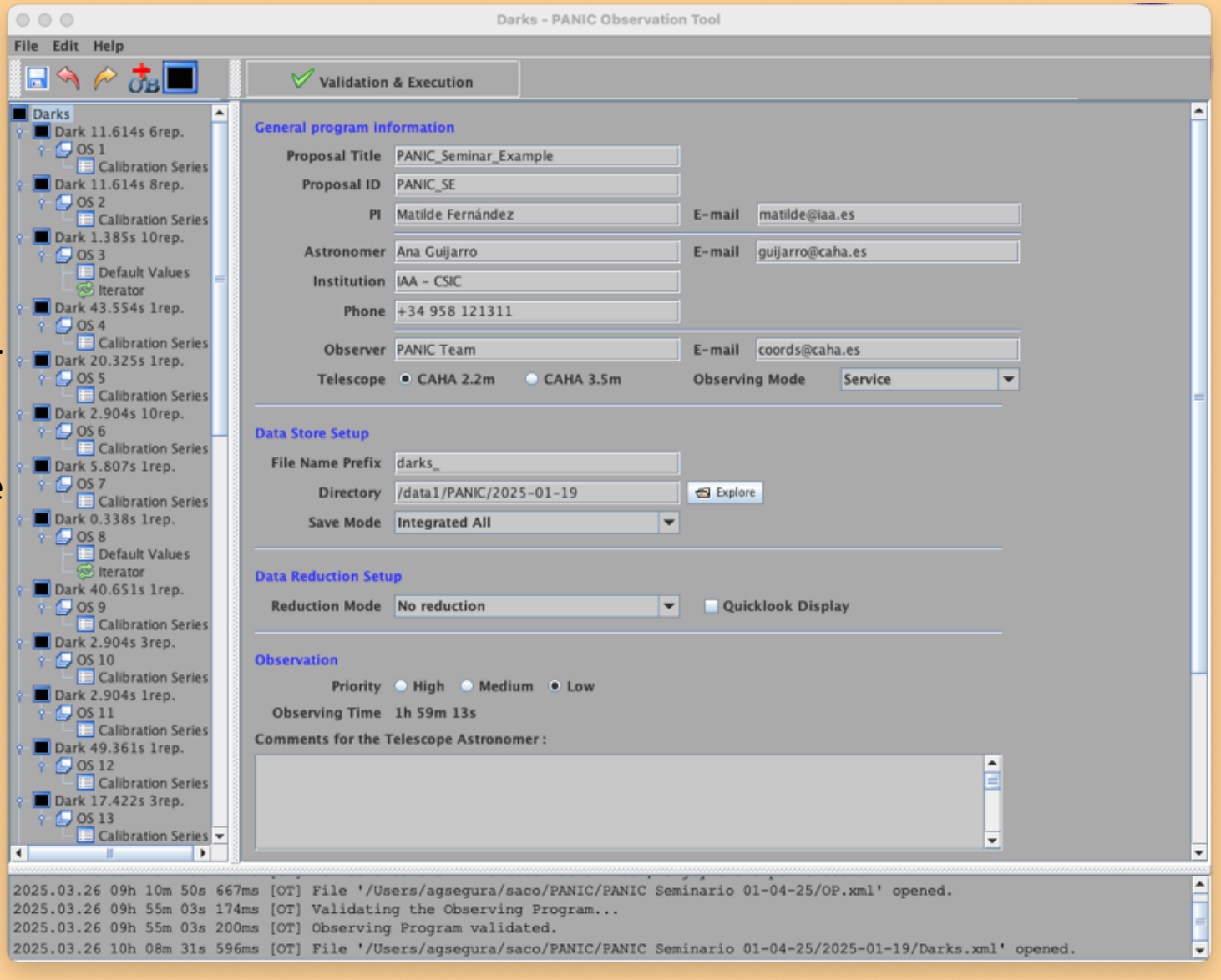
Sesión especial de PANIC 4K: cómo sacar el mayor partido a tu tiempo asignado de observación

PANIC Observation Tool

- Darks automatically generated

The script ask for a images folder to inspect.

Generates a dark for every different exposure time found.



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

PANIC Observation Tool

Thank you for your attention!

More info available at PANIC Web Page: https://www.caha.es/panic

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