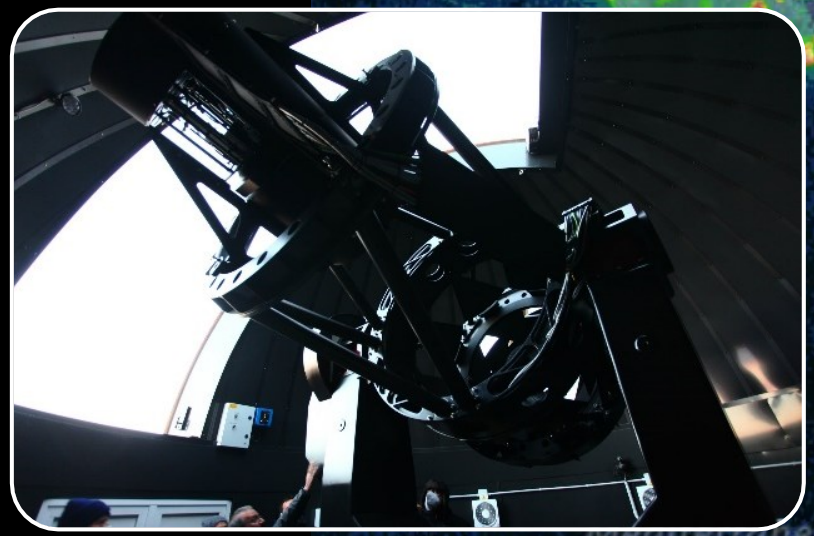
The GAL Hassin Wide-field Mufara Telescope (WMT)

A key facility in the multi-messenger astronomy era



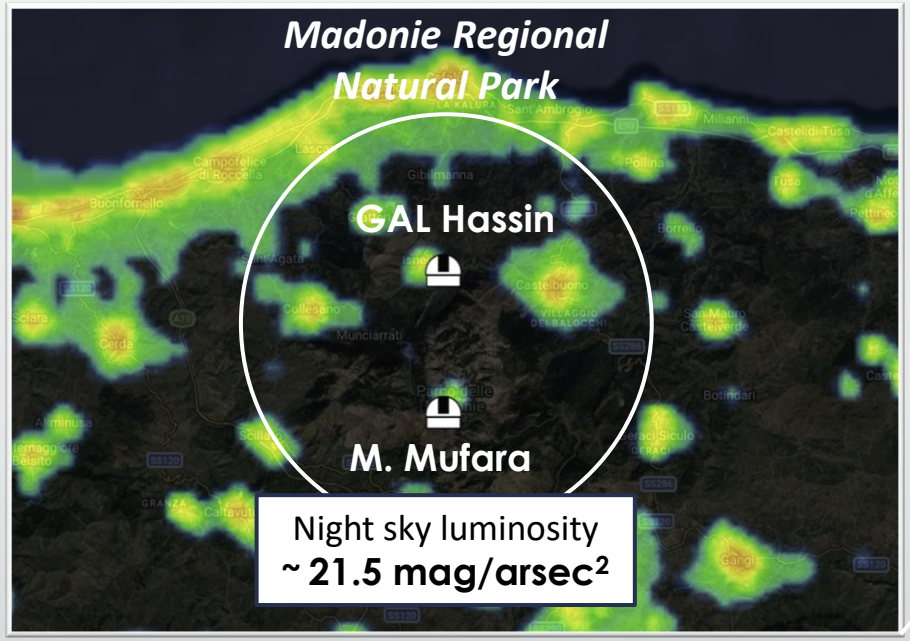
Alessandro Nastasi, Sabrina Masiero | GAL Hassin - Centro Internazionale per le Scienze Astronomiche

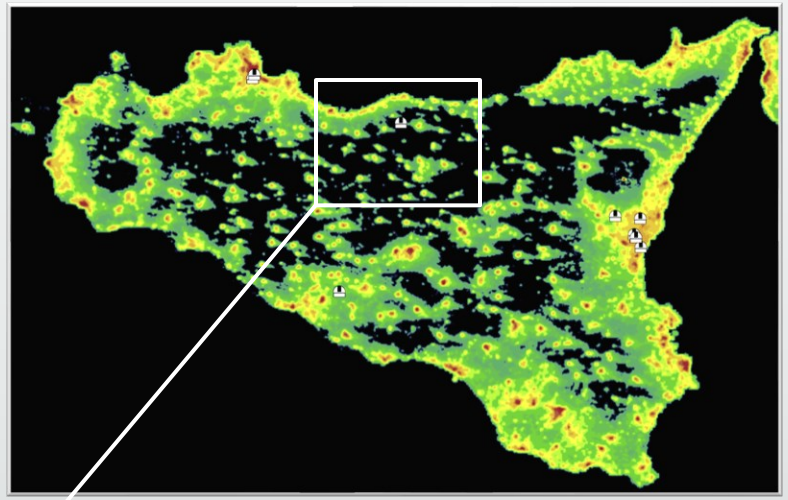
Multimessanger astronomy in the Einstein Telescope era (Padova, 09-12 February, 2026)

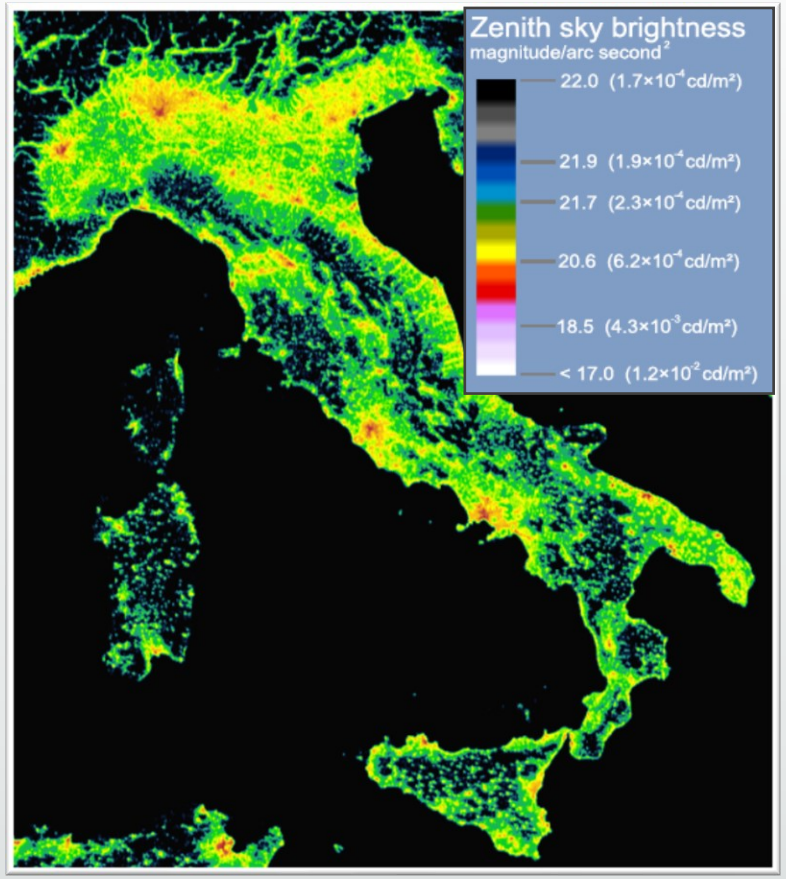
The Madonie park in Sicily: an excellent area for astronomical research

- Excellent night sky conditions, known since the 70's.
- Very low **light pollution.**
- **>200 clear nights**/year (~60%)*.
- Low **latitude** (~38°).

(*) A. Di Cecco, E. Perozzi, C. Marzo, et al. (2019) - *Analysis of Italian sites for NEO and space debris observations with the ESA Fly-Eye telescope.* ESA 1st NEO and Debris Detection Conference.







Sicily light pollution map (2024)
Source: **https://www.lightpollutionmap.info**

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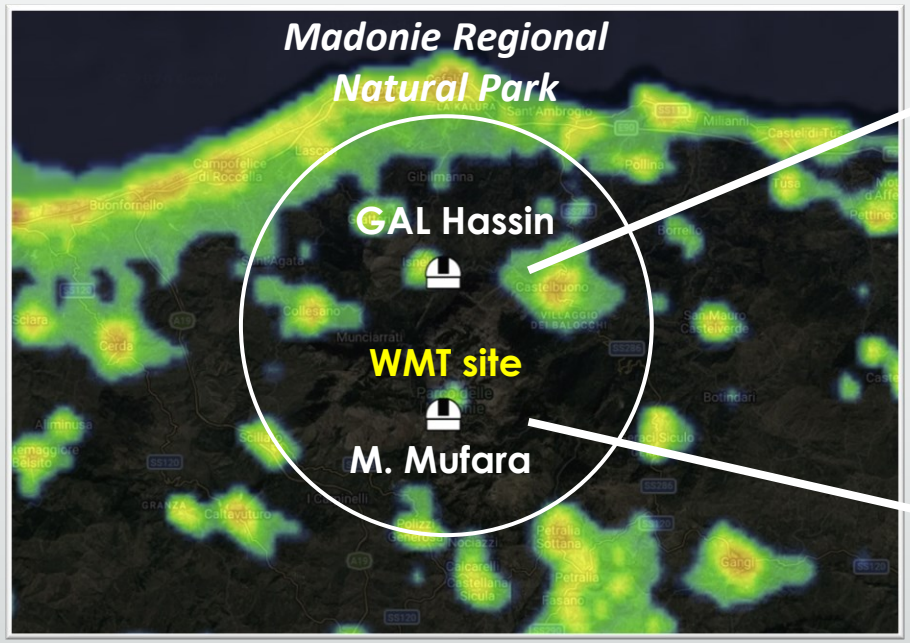
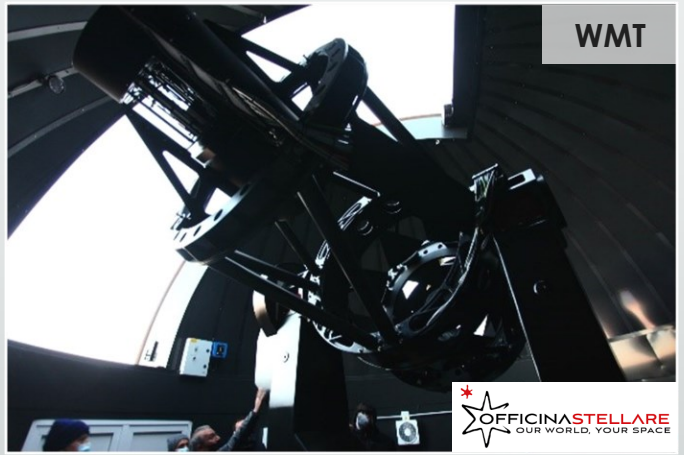


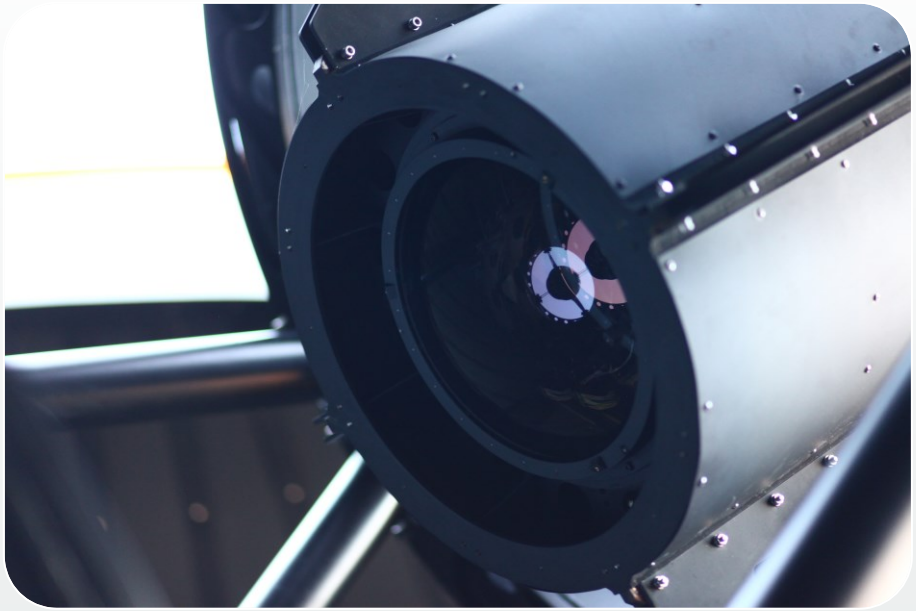
GAL Hassin center for science outreach and education.
Active since 2016

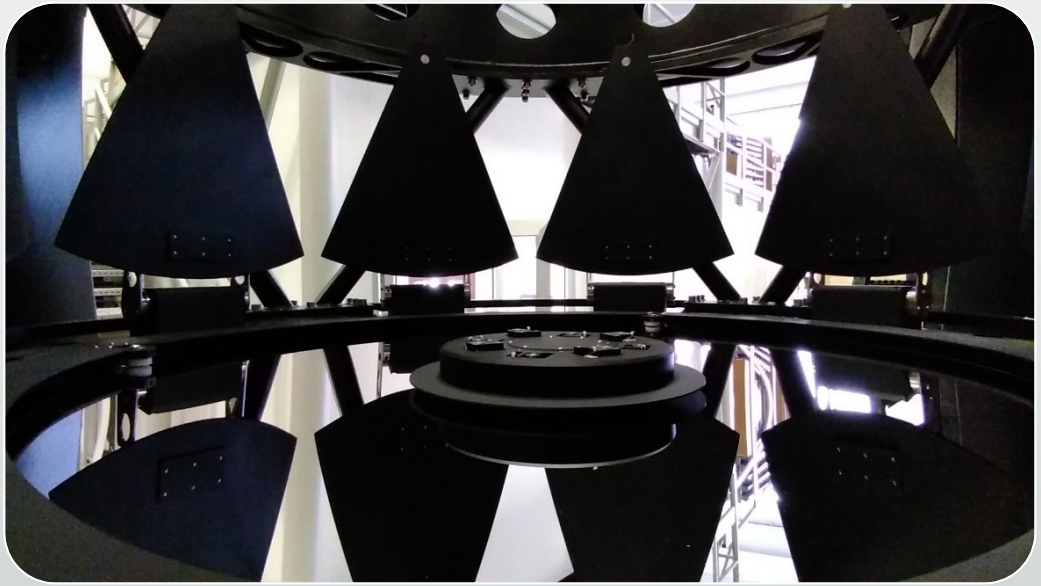
Wide Field Mufara Telescope (WMT)
Started in mid **2023**

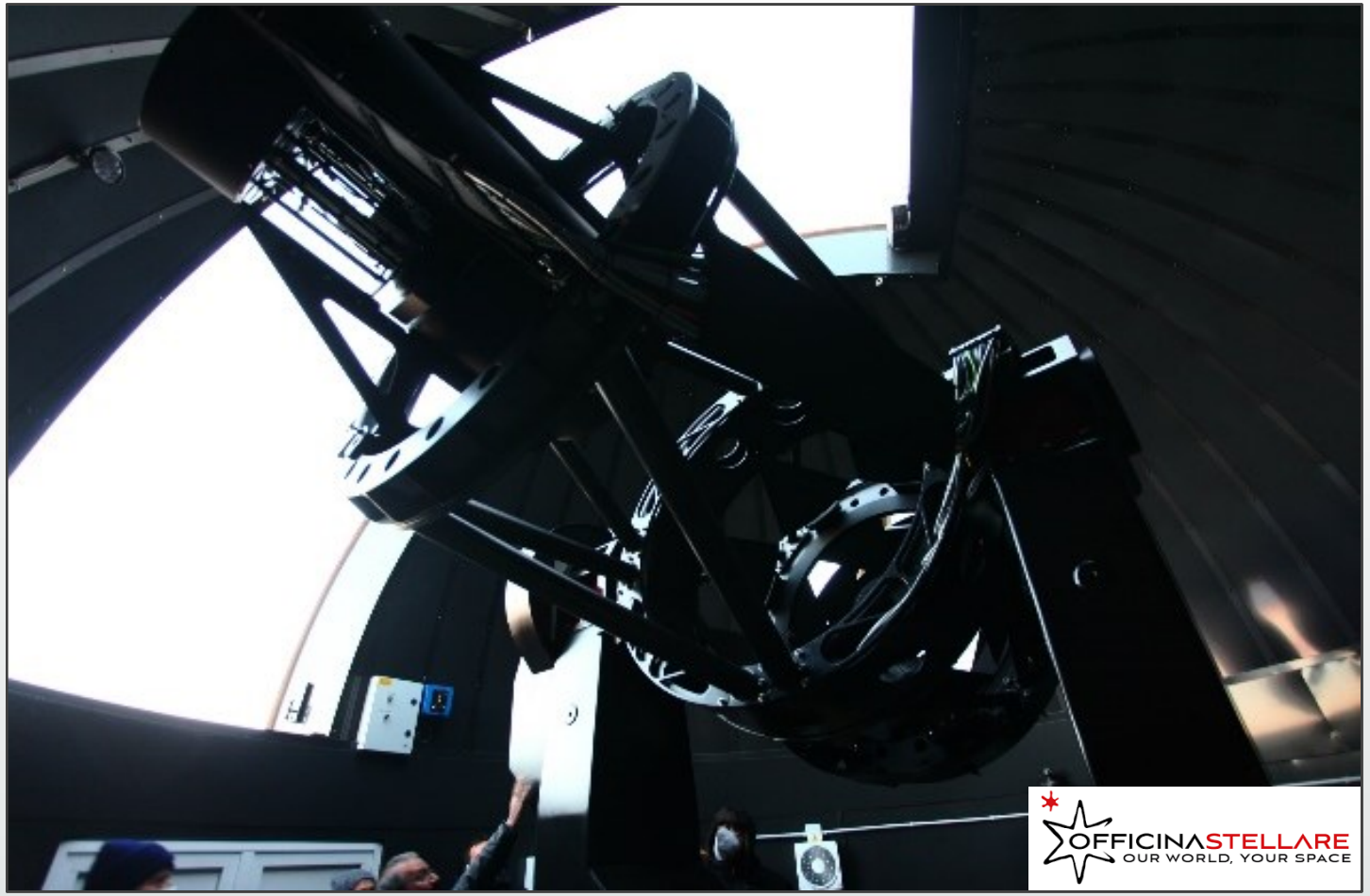


The WMT site – Monte Mufara (1865 m)

The **Wide-field Mufara Telescope** (WMT) – *Main characteristics*



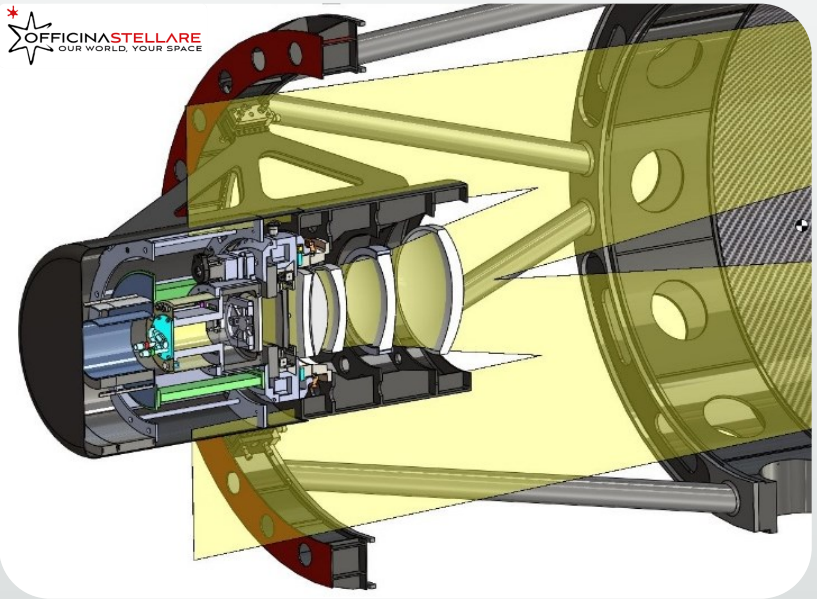




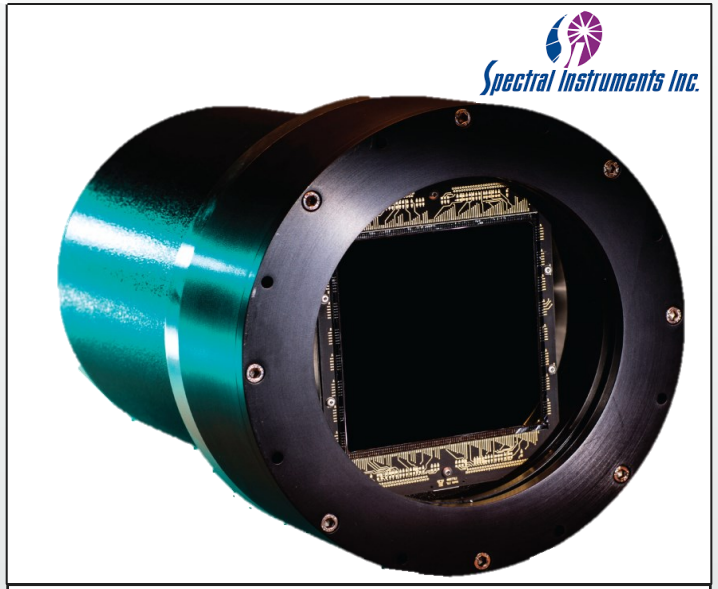
- Commissioning phase completed in June 2023.
- IAU observatory code: **M57** (Aug. 2023).
- **Remotely controlled** since July **2024**.
- **Semi-automated** via Python codes (still in progress...)

The **Wide-field Mufara Telescope** (WMT) – *Main characteristics*

- **Prime-focus** telescope.
- **1 meter** aperture.
- Low focal ratio **f/D = 2.1.**
- Field of view: **2.5 x 2.5 deg**, *corrected* with five lenses.
- **V_{lim} ~ 21** in **60 sec** (with *NoFilter*).



9k x 9k 10μm pixels, cryo cooled to **-110°C**, **>90%** QE **CCD** camera (scale: **1''/px**).



*CCD sensor made by **16 chips***

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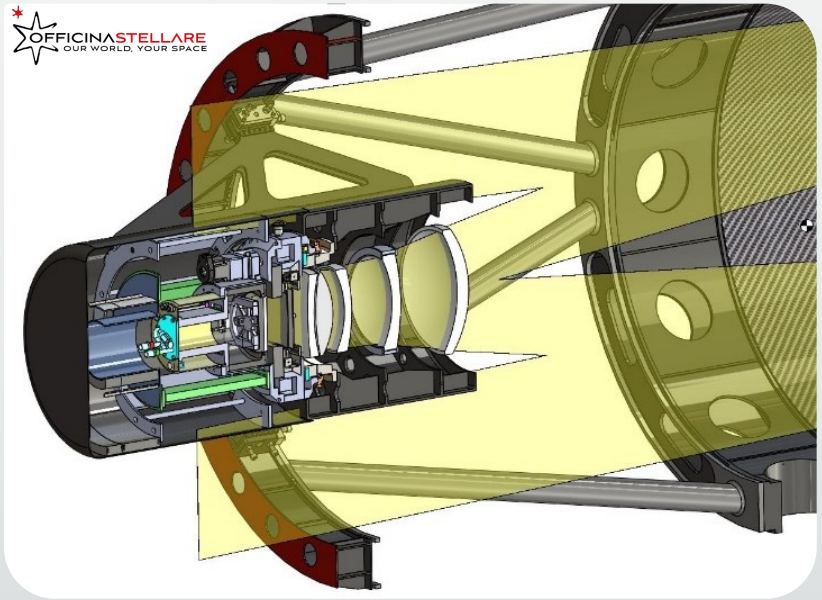

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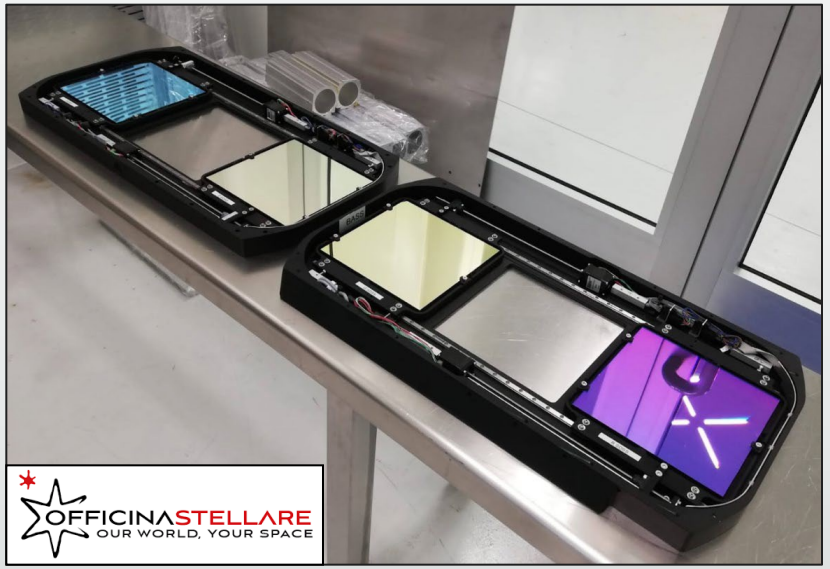
Equipped with **Sloan** (**g'**, **r'**, **i'**, **z'**) and Clear **filters.**



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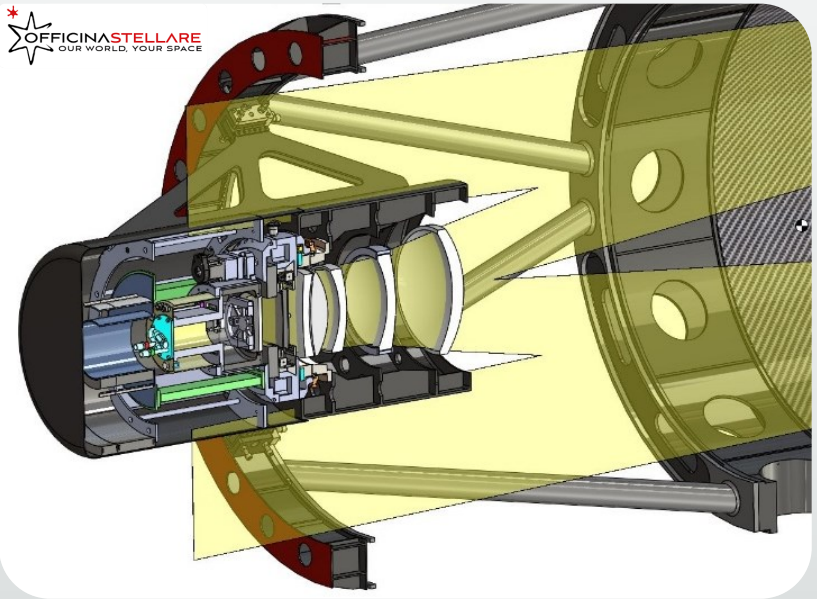

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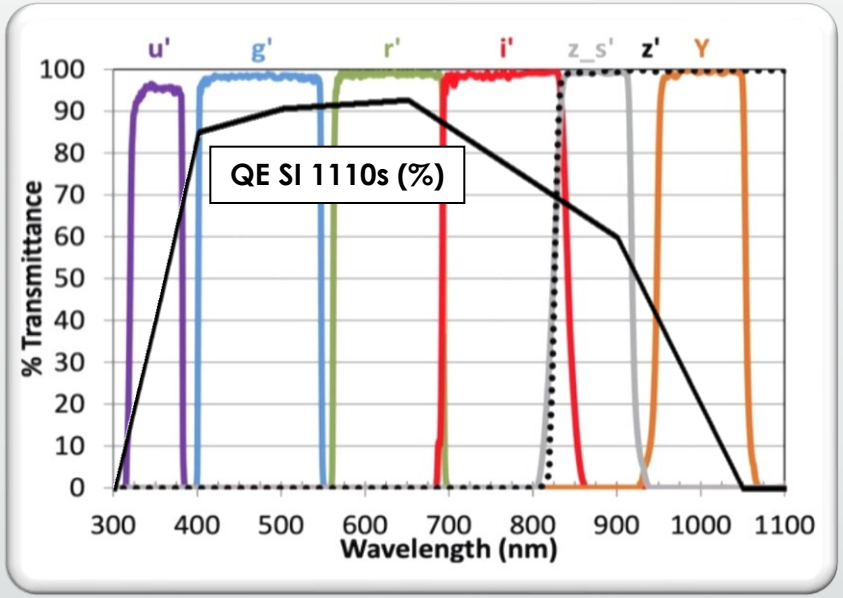
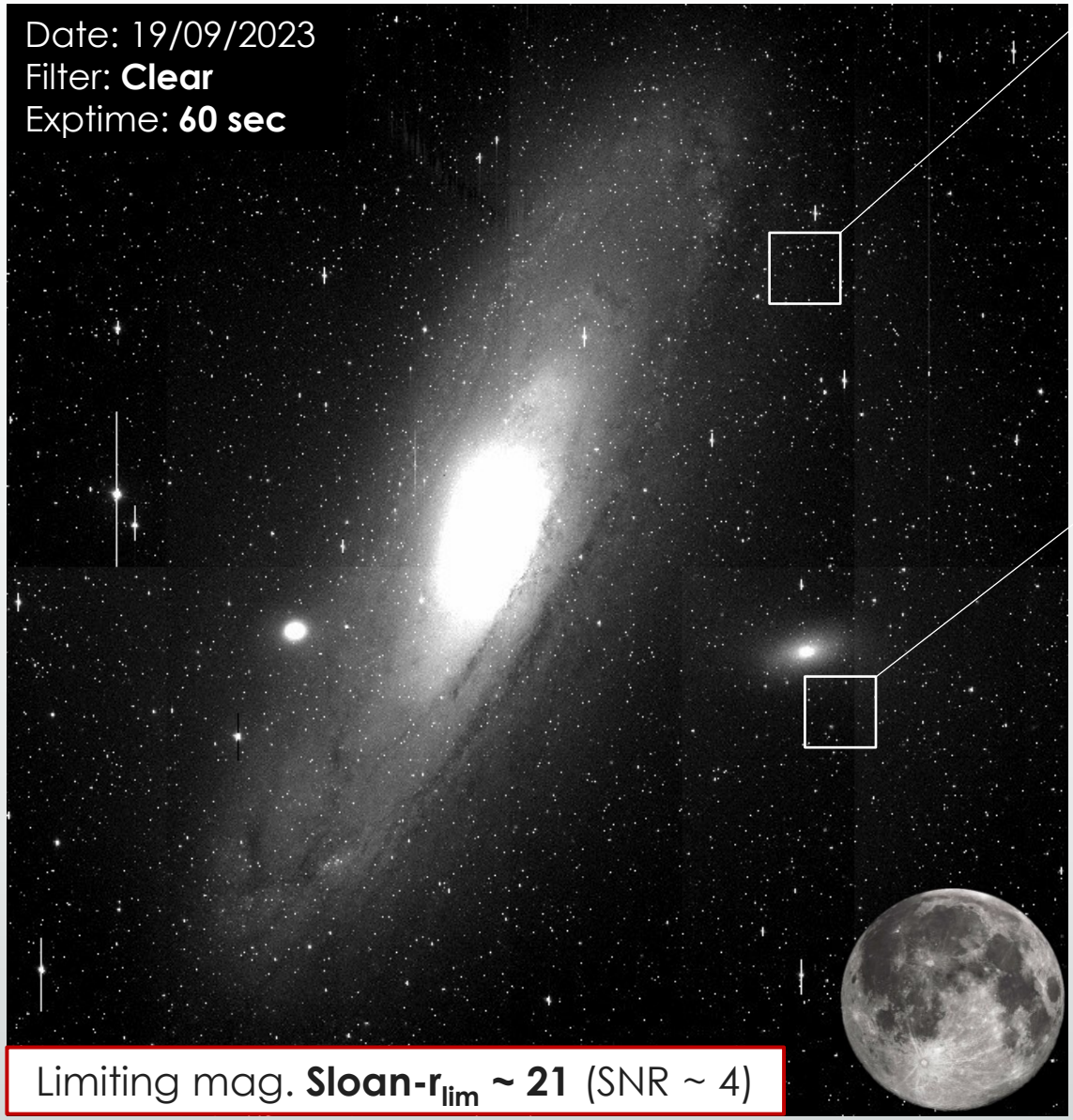
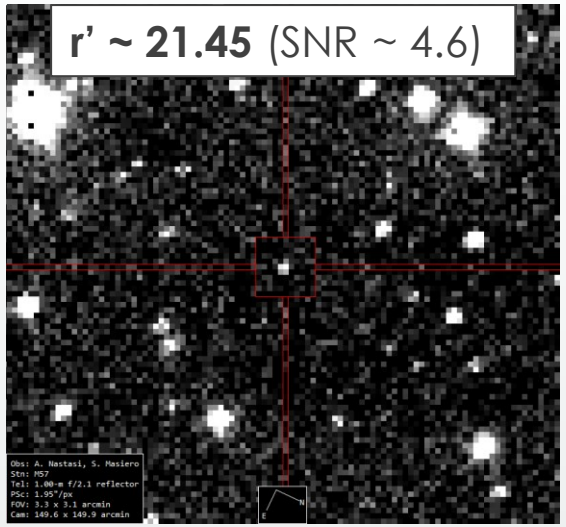
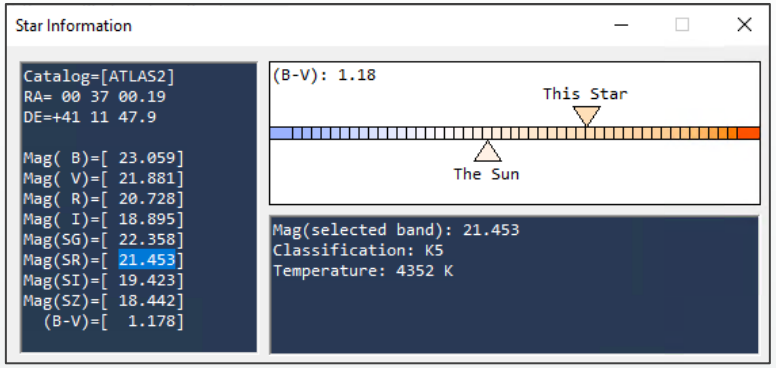
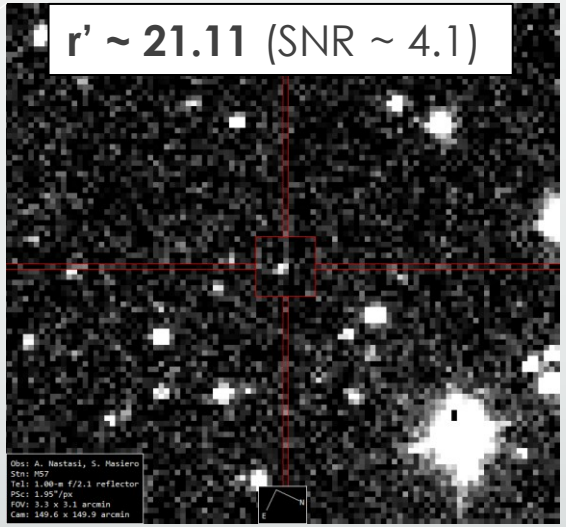


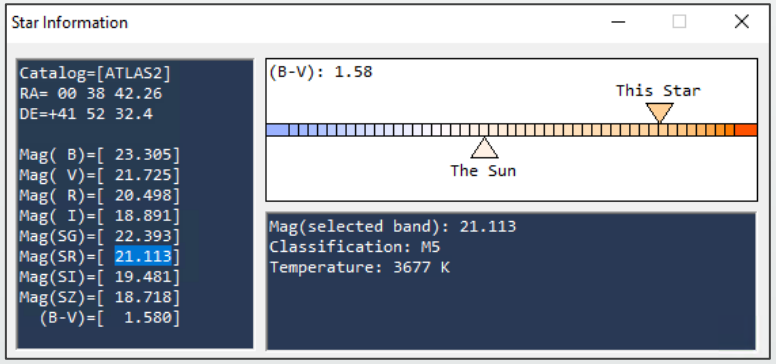
The **Wide-field Mufara Telescope** (WMT) – *Field of view and sensitivity*



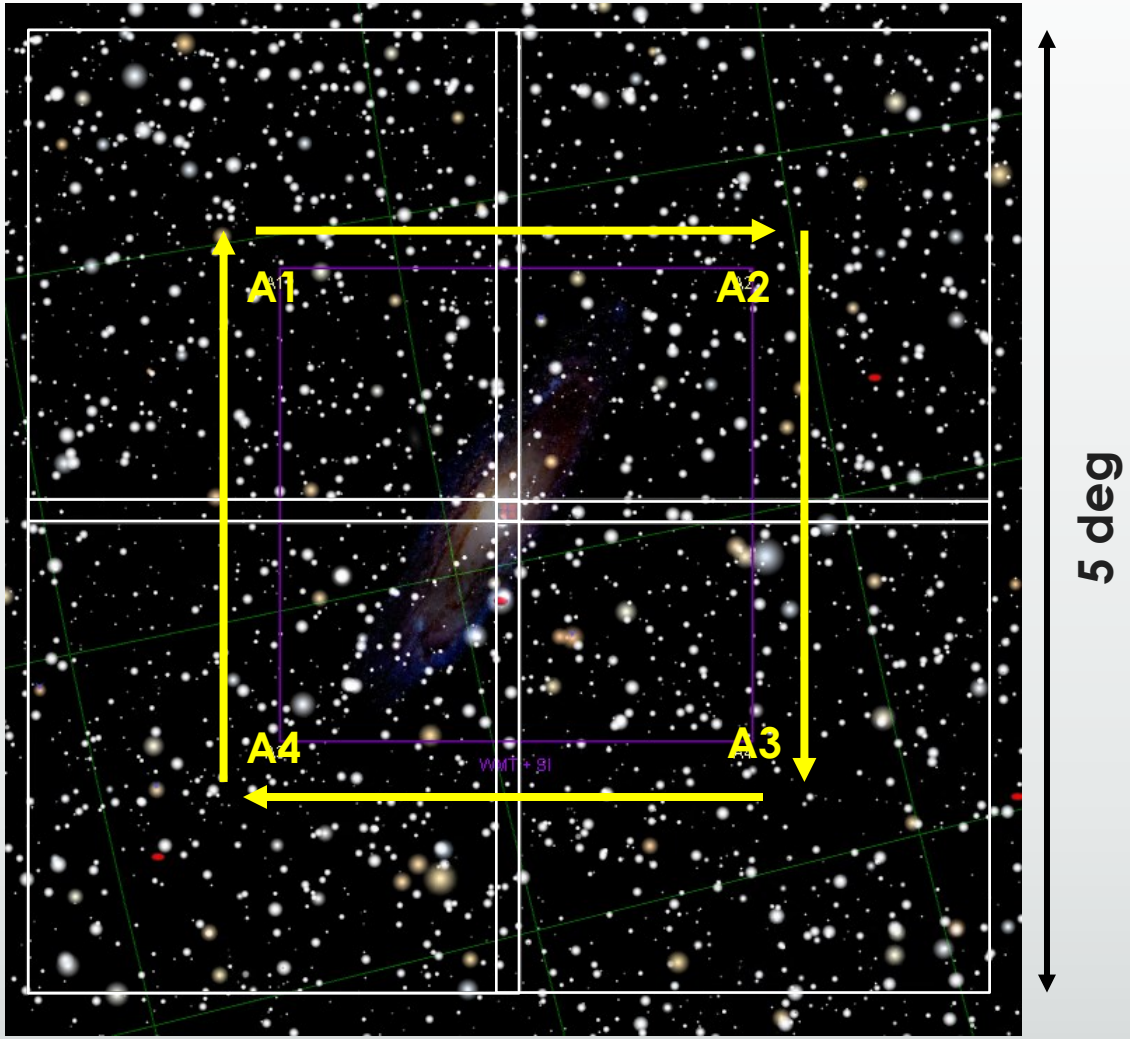








The **Wide-field Mufara Telescope** (WMT) – *Sky scanning velocity*



Survey mode test (100% automatic):

- **4 fields** by 2.5 x 2.5 deg each (total area ~**25 deg²**).
- **60 sec exposure** for each image.
- **3 images** per field.
- **Binning: 2x2** (plate scale ~ 2''/px).

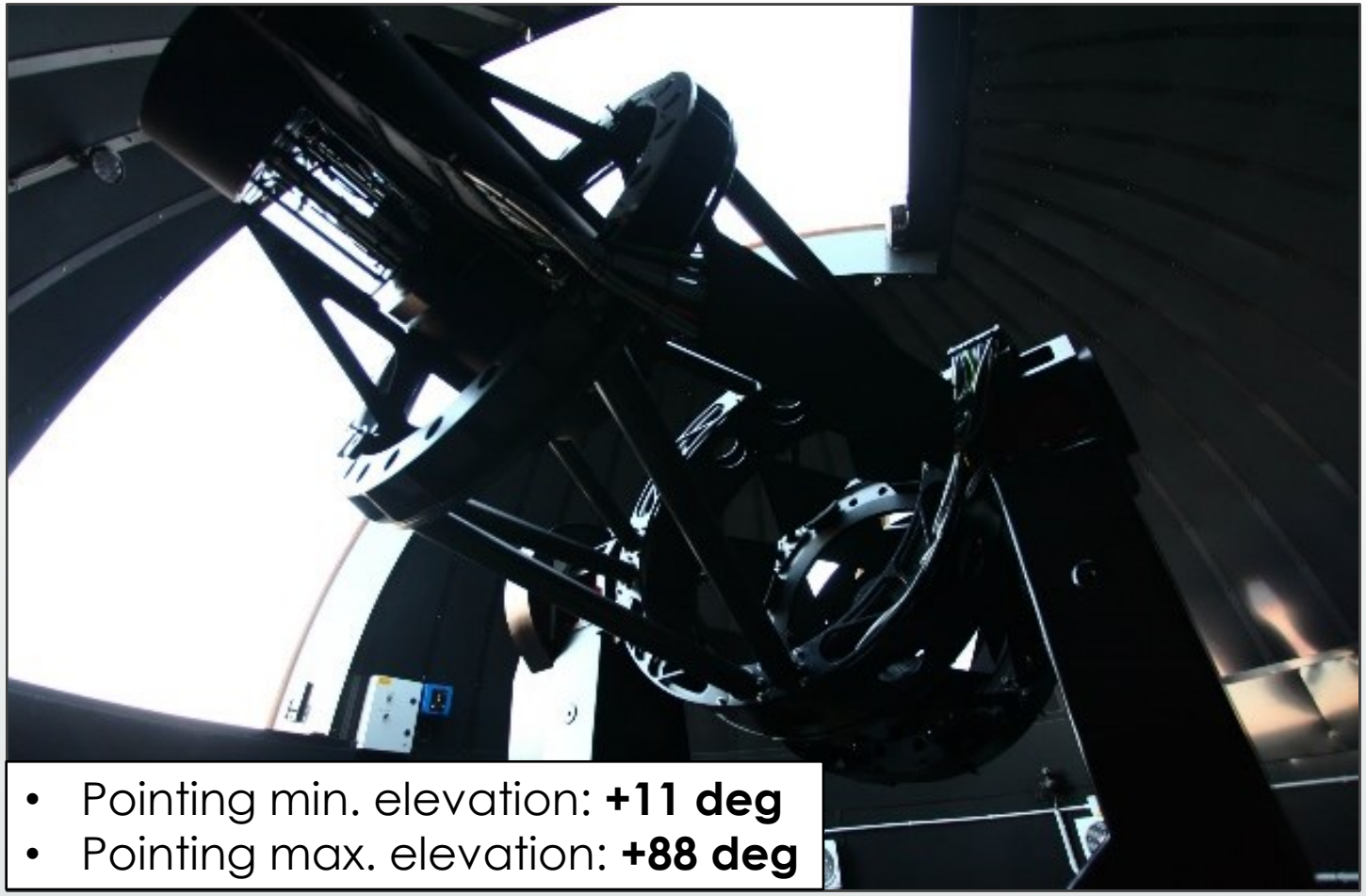
Result:

- **25 deg²** area scanned in **~15 minutes** (*3 min overhead* in total).

A sky area of **100 deg²** can be scanned **within 1 hour**, with a $\mathbf{r_{lim}}$ **~ 21**

The **Wide-field Mufara Telescope** (WMT) – *Pointing limits*

- Horizon free over **360 deg**
- **Latitude**: +**38°**



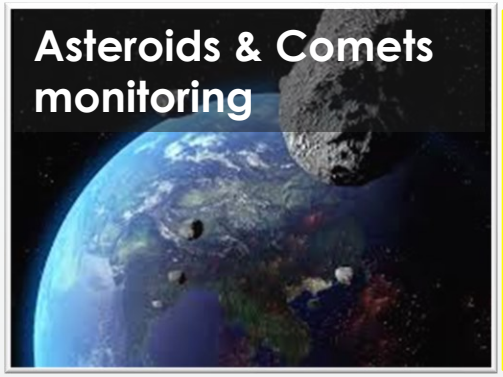
- Pointing min. elevation: **+11 deg**
- Pointing max. elevation: **+88 deg**

Observational limits:

Min. declination: **-40 deg**

Min. solar elongation: ***30 deg***

The **Wide-field Mufara Telescope** (WMT) – *Science cases*

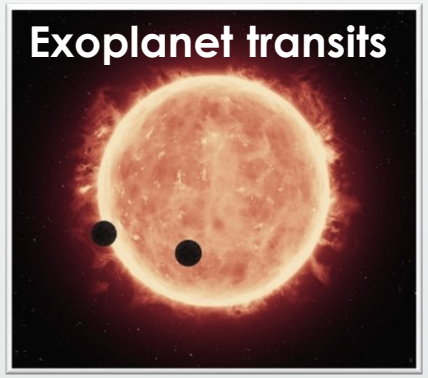


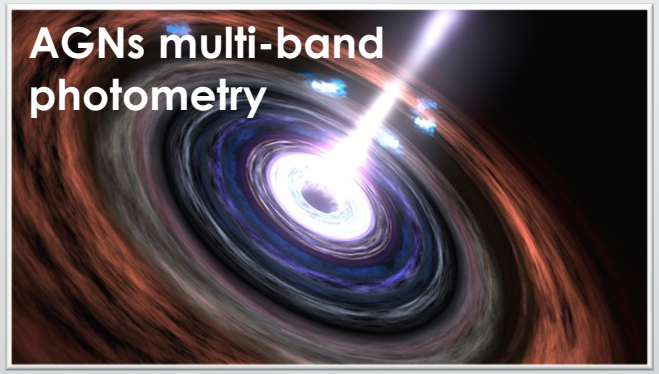
Two NEW near-Earth asteroids discovered in 2025:

2025 QK3
(Aug. 21, 2025)

2025 VA3
(Nov. 13, 2025)

A multi-purpose telescope for the **discovery** and **multi-wavelength characterization** of astrophysical optical transients





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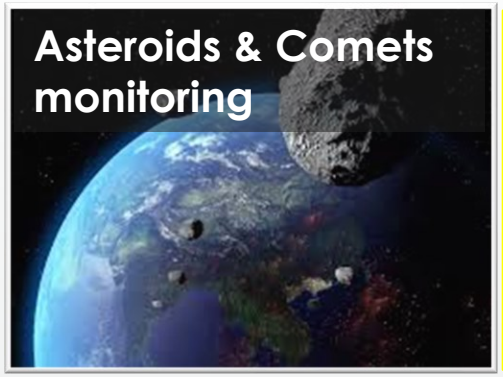

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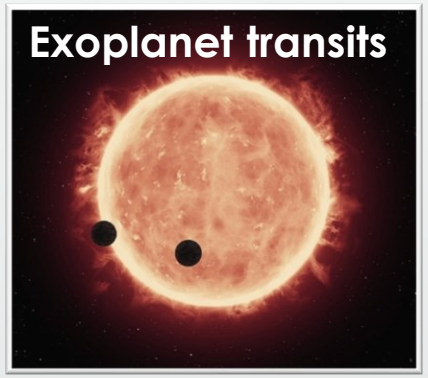
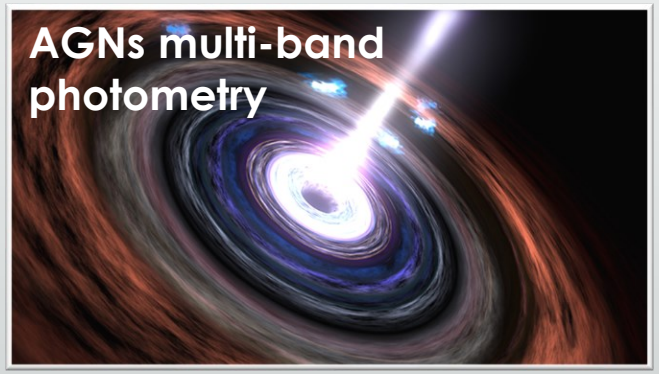
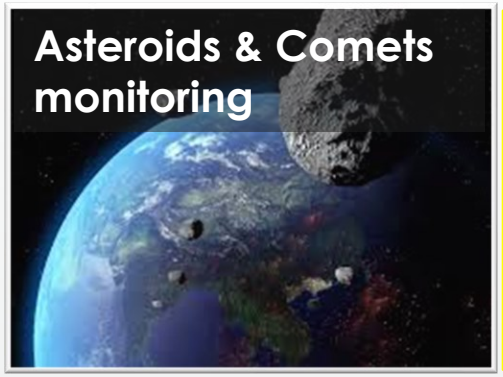




FAST
WIDE
DEEP

The **Wide-field Mufara Telescope** (WMT) – *Science cases*



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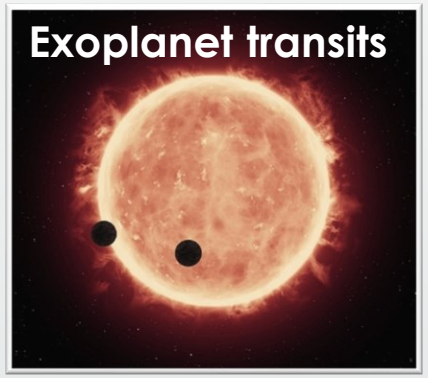
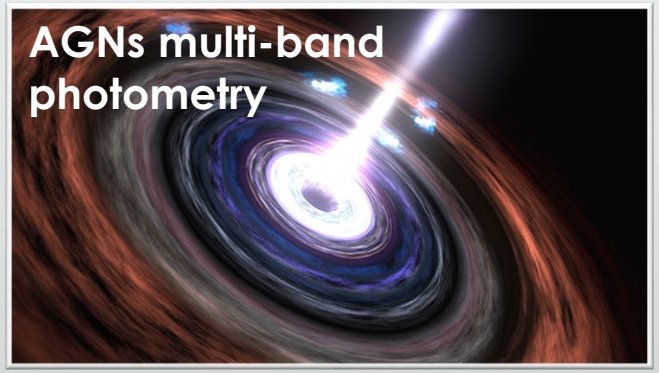




FAST
WIDE
DEEP

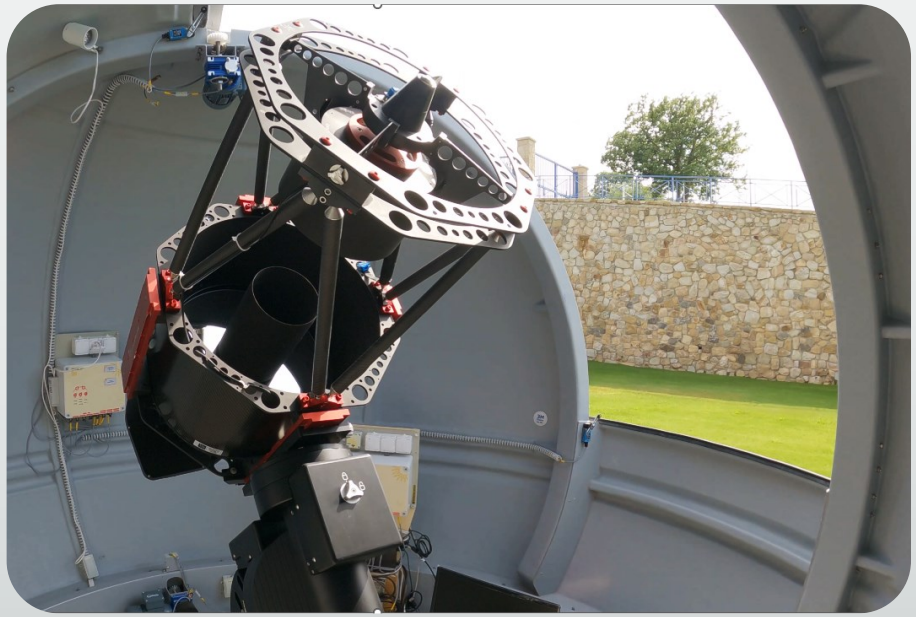
- alessandro.nastasi@galhassin.it
- info@galhassin.it
- https://galhassin.it

Thank you

Additional information

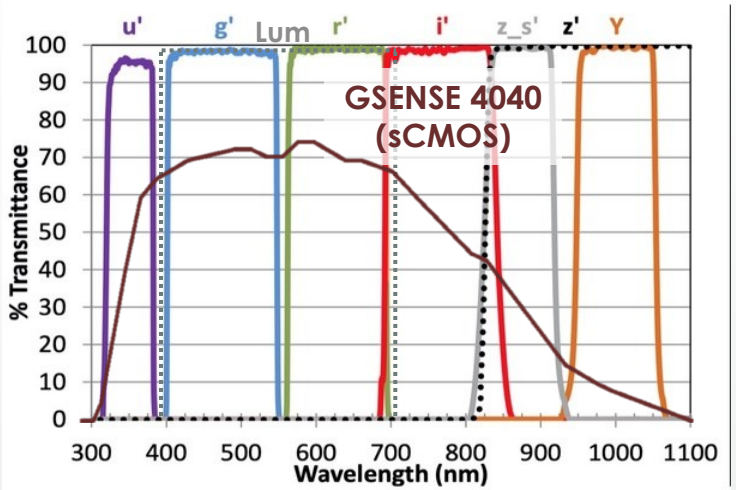
The Galhassin Robotic Telescope (GRT)

- OfficinaStellare RC telescope, **0.4 m** aperture, **f/D=3.8**.
- Camera: **sCMOS** Moravian C4-16000, 4096 x 4096 pixels (Ø = 52.1 mm, **1.22"/px**).
- 10-slots filter wheel: L-RGB, **Sloan u', g', r', i', z_2s**, OIII e Ha (+y' optional).
- Wide field of view (FoV) of **1.2 x 1.2 deg**.
- Equatorial mount 10micron GM3000 HPS, able to track up to **2 deg/sec**.
- PC clock synchronized with UTC via **TimeBox UTC** GPS system (accuracy: +/- 2ms)
- **Fully remotely controlled & 100% automated.**

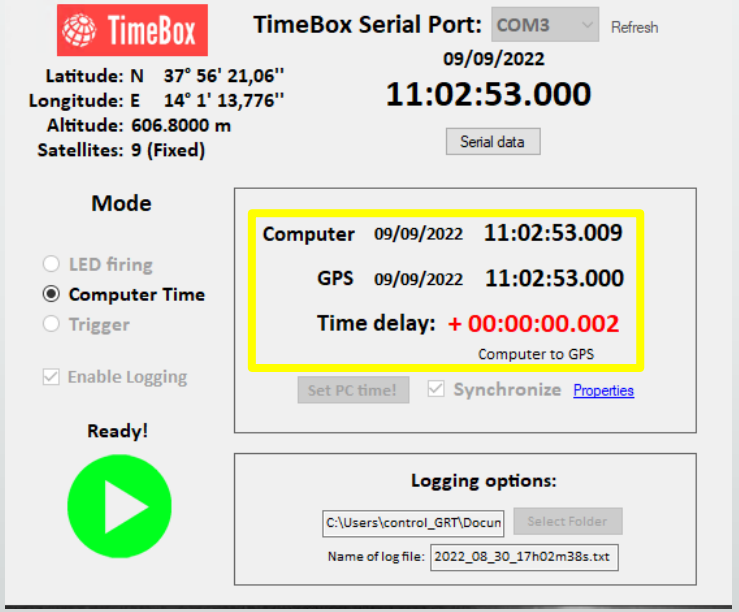


Operative since **2019** on NEOs confirmation & characterization, MPC Code: **L34**

Astrodon Photometrics Sloan Filters



TimeBox UTC synchronization system



The Wide-field Mufara Telescope (**WMT**) site

Night sky conditions on M. Mufara (as measured in 2017):

- 1/3 of photometric nights, with **seeing of ~1 arcsec** for more than 6 hrs per night;
- 1/3 of quasi-photometric nights;
- 1/3 not clear nights.