ISTITUTO NAZIONALE DI ASTROFISICA
NATIONAL INSTITUTE FOR ASTROPHYSICS

OSSERVATORIO ASTRONOMICO DI PADOVA

News from Ekar
Robotic Schmidt & RoboCop

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M. Fiaschi - MFC Elettronica
(external company)

Mount Ekar, Asiago

Long: 11° 34' 08.397" E - Lat: 45° 50' 54.894" N - Altitude: 1376.2m

Osservatorio Astrofisico e Astronomico di Asiago — DFA

Stazione Osservativa di Cima Ekar — INAF

4,5 ★★★★½ (204)

Osservatorio · ♿

Panoramica | Recensioni | Informazioni

0424 462221

VG8G+G6 Asiago, Provincia di Vicenza

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La tua attività su Maps

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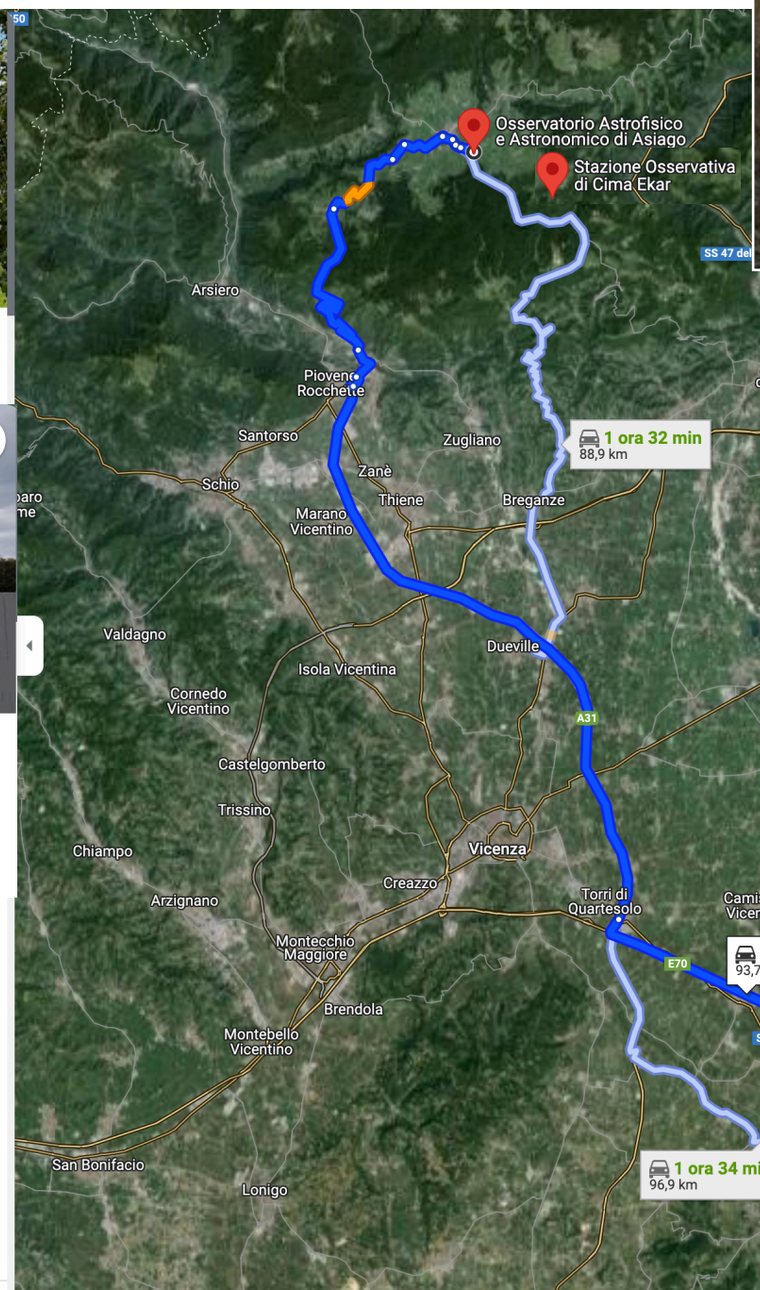


Lina Tomasella 28.06.2024

Mount Ekar, Asiago

Long: 11° 34' 08.397" E - Lat: 45° 50' 54.894" N - Altitude: 1376.2m

Copernico 1.82m (1973):
photometry and spectroscopy
Afosc (FoV=8.8 x 8.8 arcmin, uBVgriz and narrow-band filters; grisms R=200-5000);
Echelle (R~20,000);
Proprietary instruments.
Remote control from 2013;
now upgrading to robotic.

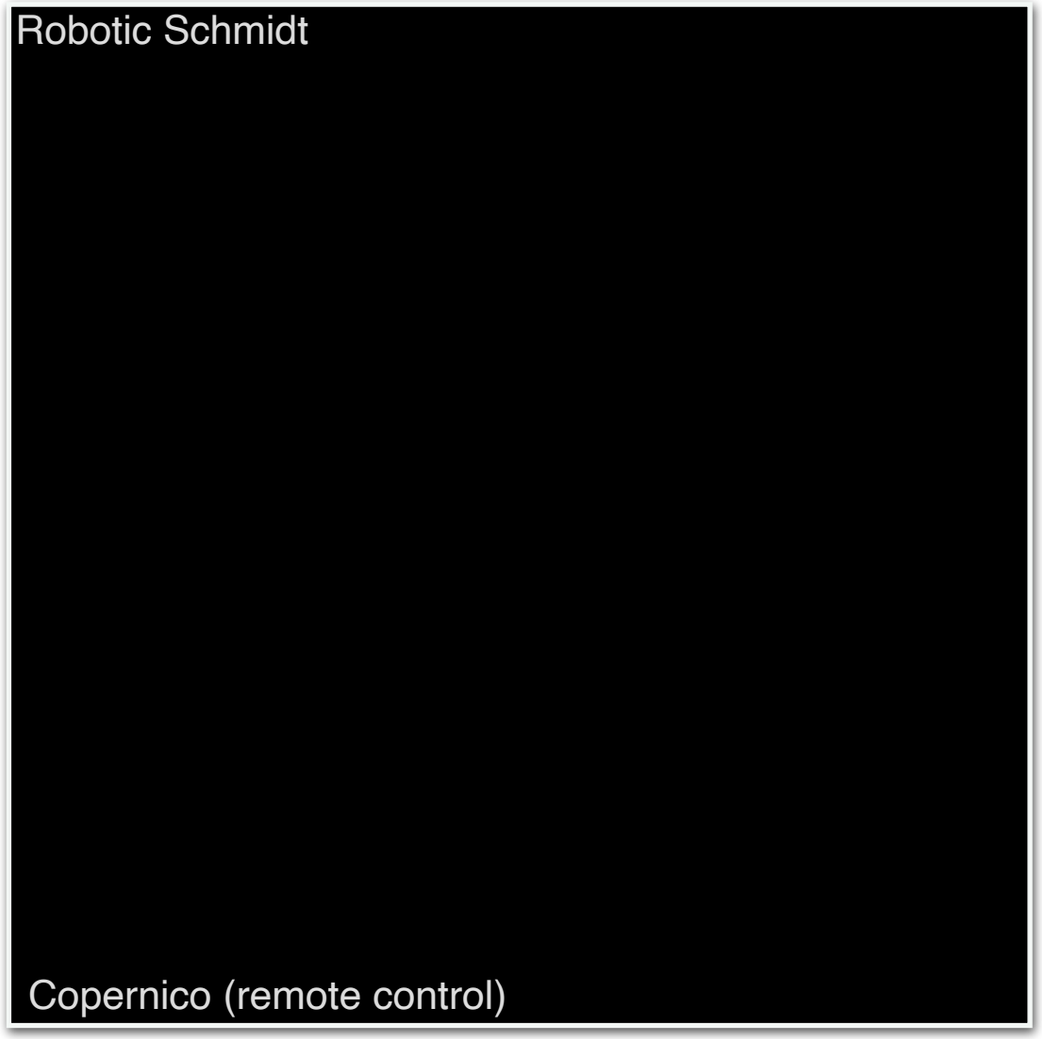
Scheduled time:
65% science and technology;
15% education;
20% maintenance and testing;

Schmidt 67/92 (1967):
uBVgri photometry, FOV~1 deg^2.
No human presence during night-time: robotic control.

Brief history of Schmidt 67/92

- Built in 1965, inaugurated in 1967
- Photographic plates and films till 1998 (FoV=5.1 × 5.1deg)
- Dec. 2000 - Mar. 2002: ADAS Asiago-DLR Asteroid Survey project, using a front illuminated Loral chip (FoV=49’ × 49’)

  […close …]
- 2009: the telescope is refurbished, mainly for outreach, and equipped with SBIG STL-11000MC2 (FoV=58’ × 38’)
- 2017: remote control achieved; purchase of a Moravian CCD camera with a KAF-16803 detector (FoV=59’ × 59’)
- 2020: **Robotic Schmidt** achieved!



Observing night 13 Feb 2024: the dome of the Schmidt telescope is opened/closed under the robotic control of the weather stations.

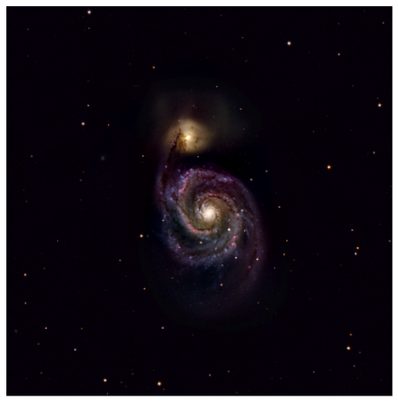
The Schmidt 67/92 Robotic Telescope
RoboSchmidt - User Manual

ver. 2.0 (Feb 2023)

L. Tomasella, E. Cappellaro, S. Benetti

NB: It is mandatory that publications based on Ekar-Asiago proprietary or archive observations include a footnote on the first page of the article or in the Acknowledgments section the following citation:

“Based on observations collected at the Copernico 1.82m telescope [or/and Schmidt 67/9 telescope] (Asiago, Italy) - INAF Osservatorio Astronomico di Padova.”

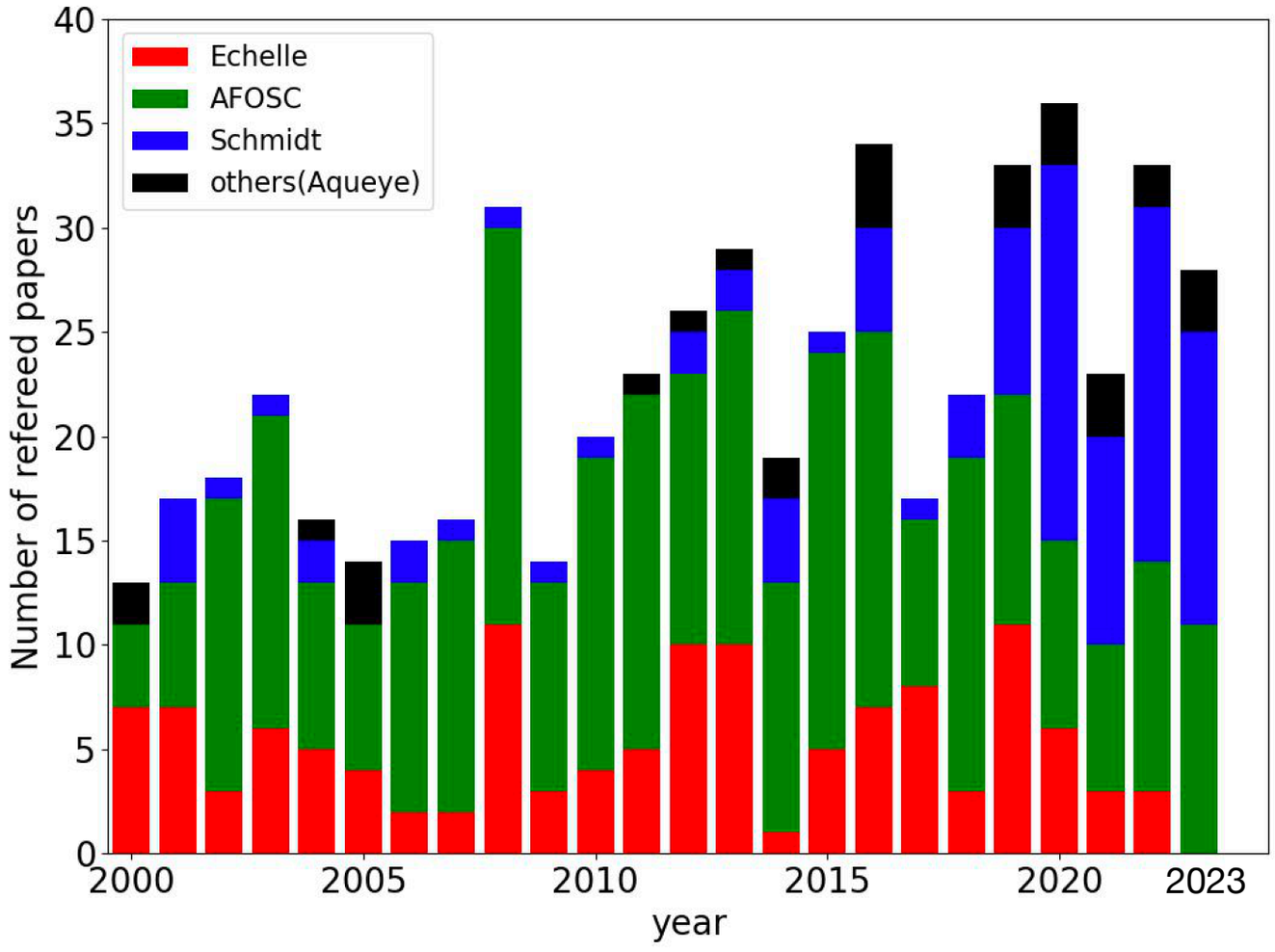


M51@RoboSchmidt, by Giovanni Benetti

Robotic Schmidt: the efficiency leap in numbers

year	number of fits files in archive
2023	32150
2022	56271
2021	46612
2020	29984
2019	9274
2018	12353
2017	12732

Robotic Schmidt



The efficiency has increased **at least by a factor of three** in the volume of collected data.

refereed papers in 2023:

- 11 partially based on Afosc data
- 14 partially based on Schmidt data
- 3 based on Aqueye+ observations

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Highlight

A magnetar giant flare in the nearby starburst galaxy M82

https://doi.org/10.1038/s41586-024-07285-4

Received: 22 December 2023

Accepted: 7 March 2024

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Check for updates

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Magnetar giant flares are rare explosive events releasing up to 10^{47} erg in gamma rays in less than 1 second from young neutron stars with magnetic fields up to $10^{15–16}$ G (refs. 1,2). Only three such flares have been seen from magnetars in our Galaxy[3,4] and in the Large Magellanic Cloud[5] in roughly 50 years. This small sample can be enlarged by the discovery of extragalactic events, as for a fraction of a second giant flares reach luminosities above 10^{46} erg s^{-1}, which makes them visible up to a few tens of megaparsecs. However, at these distances they are difficult to distinguish from short gamma-ray bursts (GRBs); much more distant and energetic ($10^{50–53}$ erg) events, originating in compact binary mergers[6]. A few short GRBs have been proposed[7–11], with different amounts of confidence, as candidate giant magnetar flares in nearby galaxies. Here we report observations of GRB 231115A, positionally coincident with the starburst galaxy M82 (ref. 12). Its spectral properties, along with the length of the burst, the limits on its X-ray and optical counterparts obtained within a few hours, and the lack of a gravitational wave signal, unambiguously qualify this burst as a giant flare from a magnetar in M82.

Optical observations

Multi-filter follow-up optical observations of GRB 231115A were carried out with the wide-field Schmidt telescopes sited in the INAF observatories of Padova (Asiago, Italy), Abruzzo (Campo Imperatore, Italy) and with the 3.6 m Telescopio Nazionale Galileo (TNG, Canary Islands, Spain) between about 5 and 12 h from the event T_0. We also took more images in the V, R, and I bands about 7 h after T_0 with the 120 cm Newton telescope located at the Observatoire de Haute Provence (OHP, France).

Extended Data Table 2 | Log of optical observations of GRB 231115A

UT observation (start - stop)	Exposure (s)	T - T_0 (days)	Telescope	Magnitude	Filter
2023-11-15 20:40:03 - 20:54:15	5 × 180 s	0.211	Asiago	> 19.1(> 20.1)	*g*
2023-11-15 20:54:59 - 21:12:11	5 × 180 s	0.221	Asiago	> 19.0(> 20.1)	*r*
2023-11-15 21:12:45 - 21:27:45	5 × 180 s	0.234	Asiago	> 18.3(> 19.8)	*i*
2023-11-15 21:38:00 - 22:16:30	7 × 300 s	0.251	Campo Imperatore	> 14.8(> 18.9)	*z*
2023-11-15 22:38:25 - 21:31:30	9 × 300 s	0.293	Campo Imperatore	> 16.5(> 19.8)	*i*
2023-11-15 23:33:32 - 21:38:00	7 × 300 s	0.331	Campo Imperatore	> 18.8(> 20.7)	*g*
2023-11-15 22:35:32 - 22:57:23	1 × 1400 s	0.299	OHP	> 17.3(> 21.6)	*r*
2023-11-15 23:04:02 - 23:14:02	1 × 600 s	0.314	OHP	> 18.0(> 22.0)	*g*
2023-11-15 23:14:30 - 23:19:30	1 × 300 s	0.320	OHP	> 17.1(> 20.1)	*i*
2023-11-16 03:25:04 - 03:38:16	5 × 120 s	0.492	TNG	> 20.0(> 24.0)	*r*
2023-11-16 03:40:24 - 03:59:09	7 × 120 s	0.503	TNG	> 18.9(> 23.8)	*i*
2023-11-16 04:00:28 - 04:19:17	7 × 120 s	0.530	TNG	> 18.7(> 22.7)	*z*

Magnitudes are in the AB system, not corrected for Galactic extinction. Upper limits are given at 3-σ confidence level for a source within (outside) the M82 galaxy.

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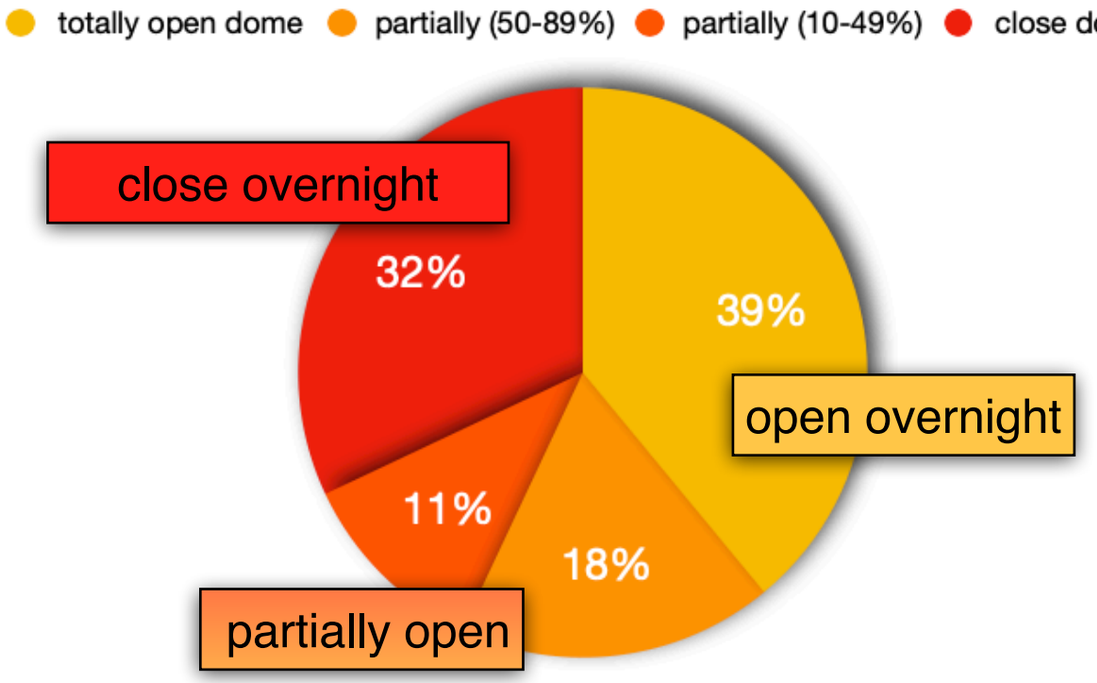
open-dome & open-shutter hours

statistics for February 2024

Copernico telescope % open-close dome for meteo, Feb 2024:



Open-dome (nautical twilight-dawn):

- Robotic Schmidt: **182 h**
- Remote Copernico: **165 h** [ratio = 1.1]

Open-shutter (Σ exptime fits from archive):

- Robotic Schmidt: **114 h**
- Remote Copernico: **89 h** [ratio = 1.3]

Robotic mode achievements:

- better use of (even small) fraction of clear sky;
- reduction of telescope overheads.

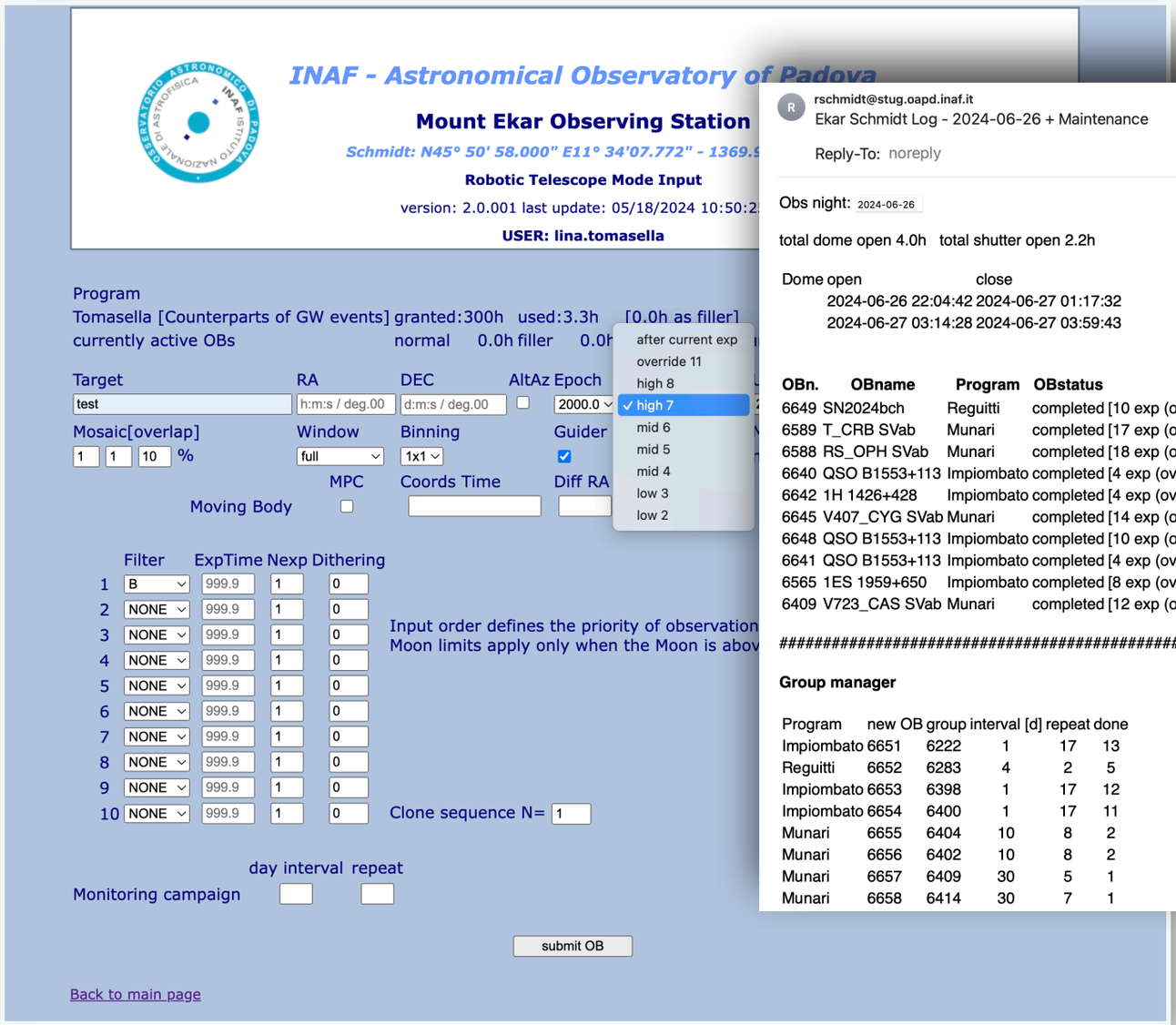
Robotisation in a nutshell

web pages for users (by E. Cappellaro):

- authorised users can insert the Observing Block **OB**.
- the OB are stored in a **Data Base DB**.
- the executed OB is deactivated (an email is sent to the program's PI and telescope managers).
- the incomplete/not executed OB remains in a queue.

telescope control (by MFC - M. Fiaschi):

- check of weather stations for dome open/close.
- check the **DB** once per minute.
- choice of the OB with higher priority; check the temporal observability of the OB (**scheduler**).
- focusing, choice of the guiding star, start observation.



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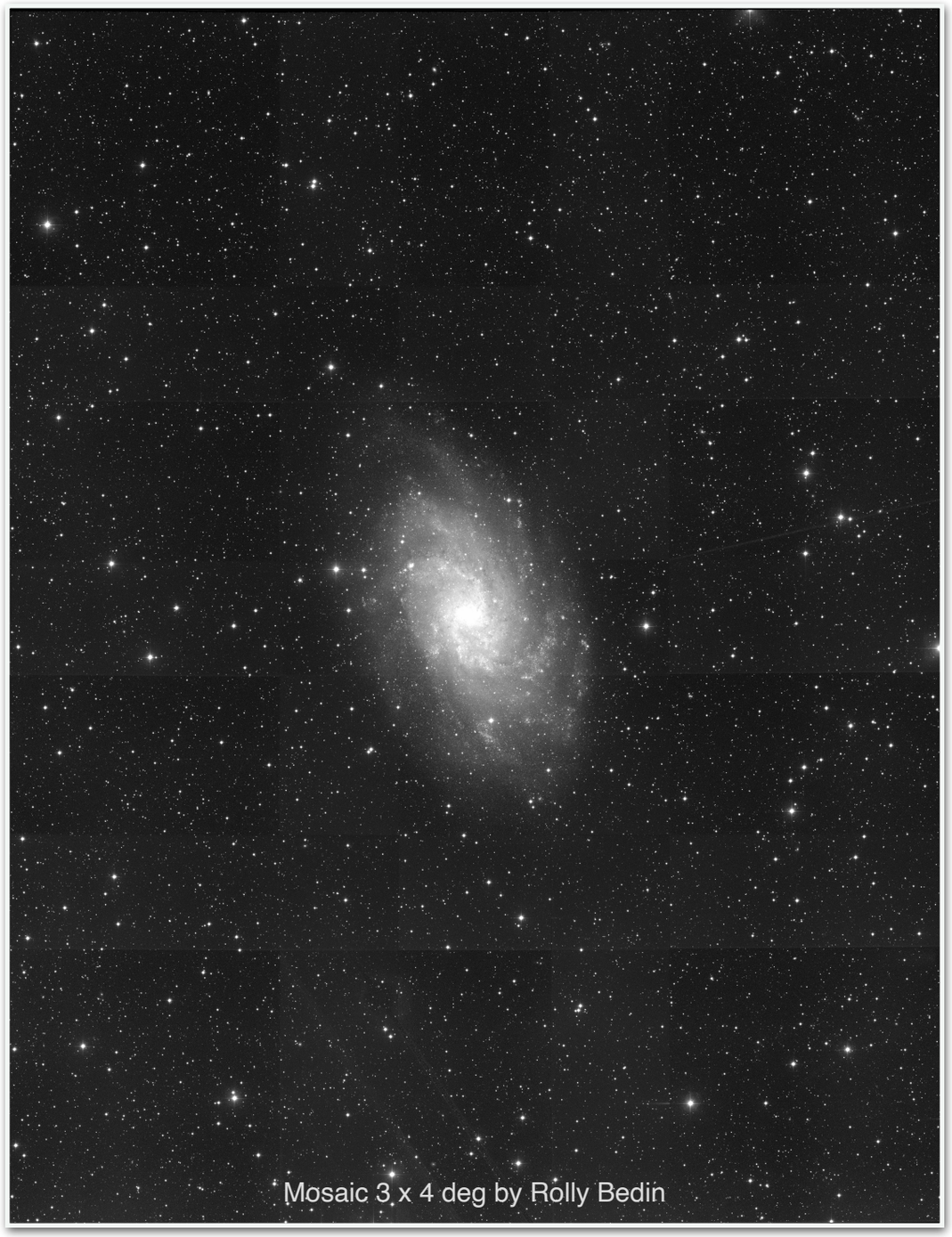
Robotisation in a nutshell

BVr trichrome by Giovanni Benetti



Mosaic 3 x 4 deg by Rolly Bedin

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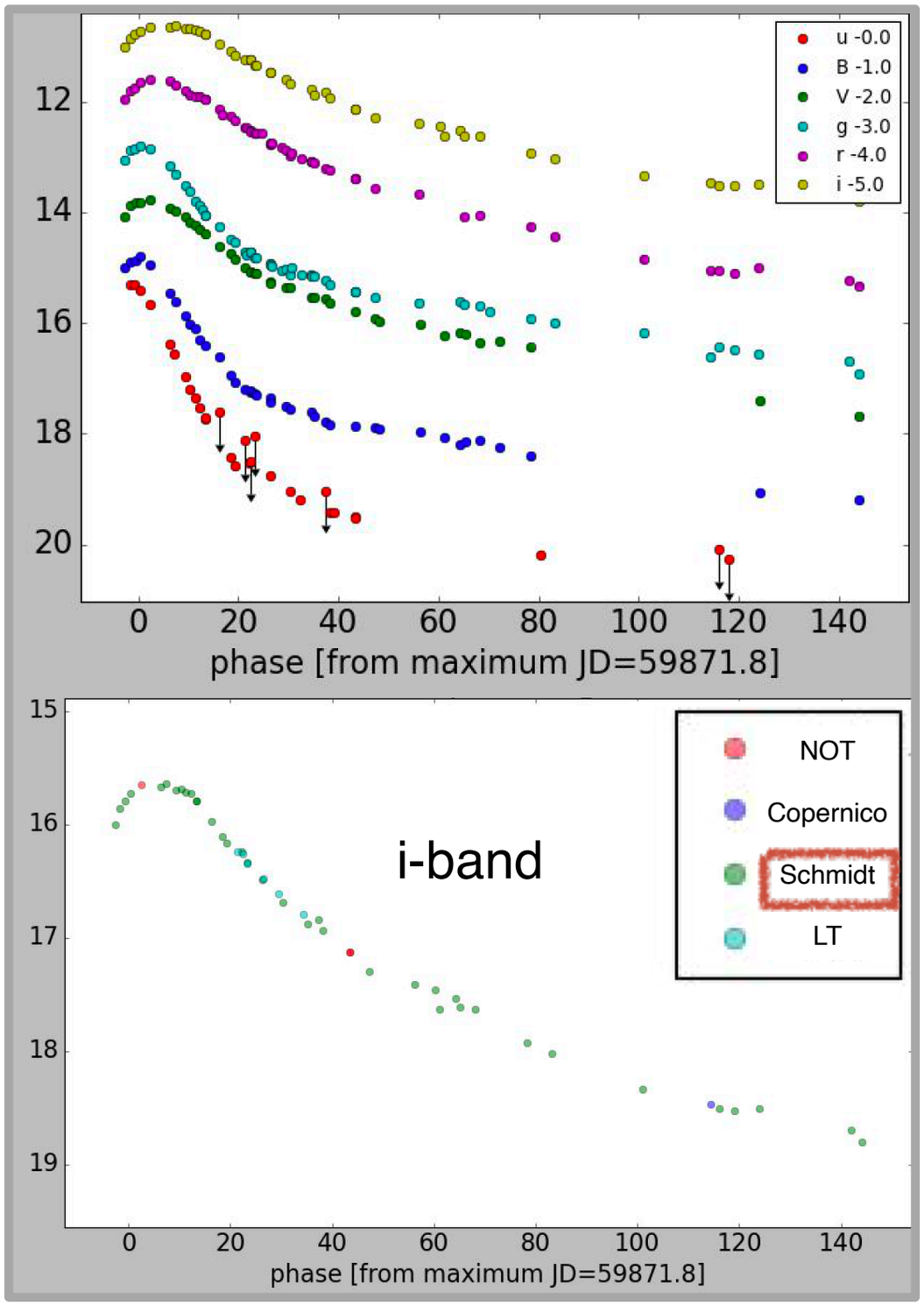
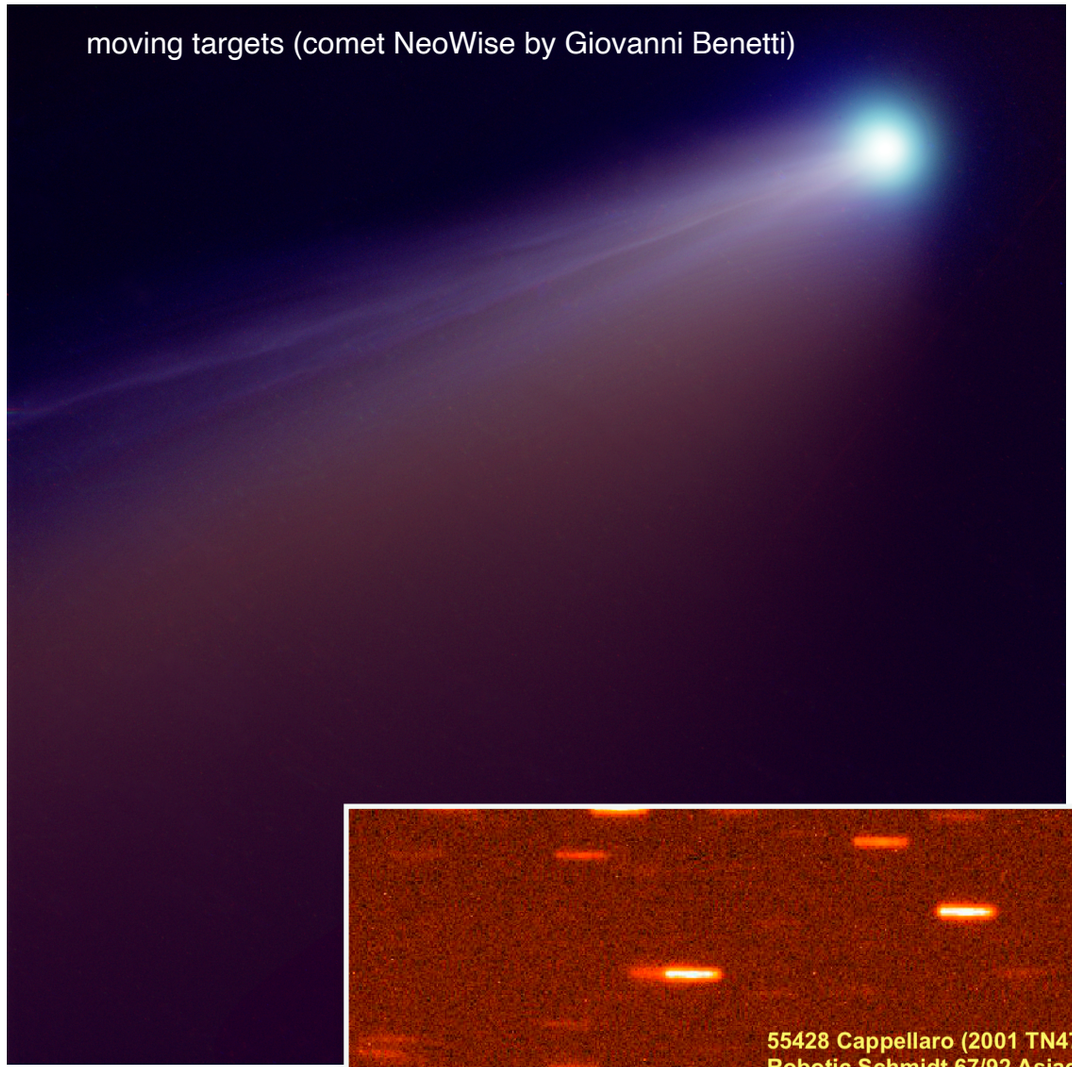
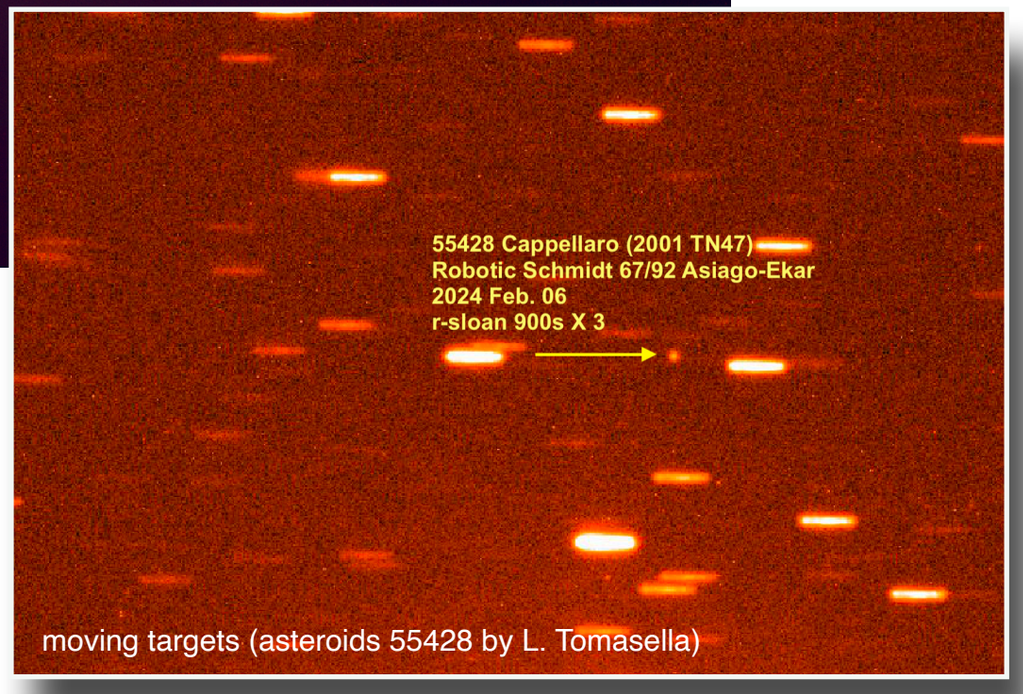
Robotisation in a nutshell



SN 2022xlp light curves in a monitoring campaign by Lina Tomasella





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Robotic 1.82m Copernico (RoboCop)

imaging with Afosc > astrometry > **target to-slit** > spectroscopy

to be sufficiently precise we needed several HW improvements!
(i.e. the resolution of the new encoders is 0.275 arcsec - it was 4.36 arcsec before)

Short Abstract Techno Grant INAF 2022

RoboCop is a low-cost project, aimed at the robotisation of the Copernico 1.82m telescope (Asiago, Mt. Ekar), for obtaining both photometry and spectroscopy (up to mag ~19-21) in fully automatic mode, i.e. without a night-time operator, with the aid of a robotic scheduler. The project is based on the experience we have acquired in the successful robotisation of the Schmidt 67/92 telescope. In the 2 year project, we foresee a number of limited HW and SW upgrades to the Copernico telescope, which is already regularly used remotely, to be implemented while the telescope continue operation. RoboCop can be a valuable experience for the robotisation of other small-to-medium size telescopes still operated manually.

Take-home message:

low-cost project thanks to the work of technical and scientific staff
(and to the previous home-made experience with the Schmidt telescope)

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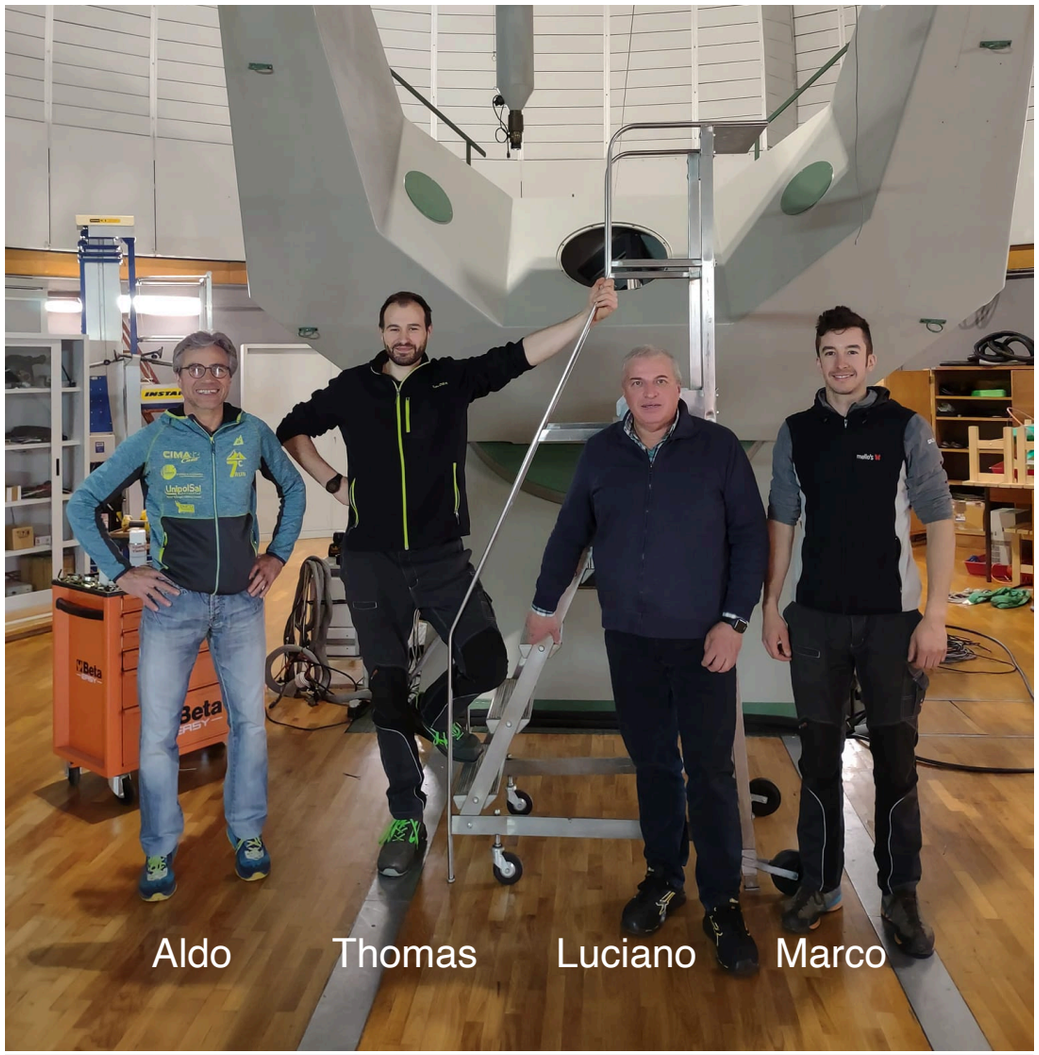
RoboCop project

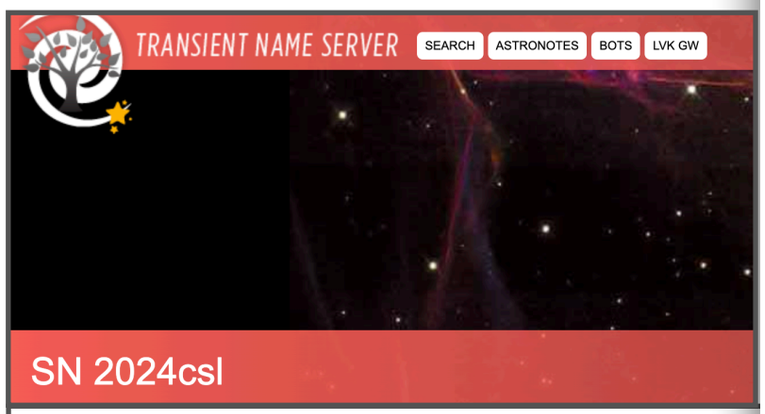
May - Sept. 2023: the technical staff, in collaboration with MFC, has changed about 80% of telescope&dome HW systems (encoders HA&Dec and in M2 for focusing; brushless motors; CanBus cables; electronics, (redundant) weather stations; webcams …), in order to reach the required precision for pointing (target to-slit) and tracking and for a robust meteo parameters control.

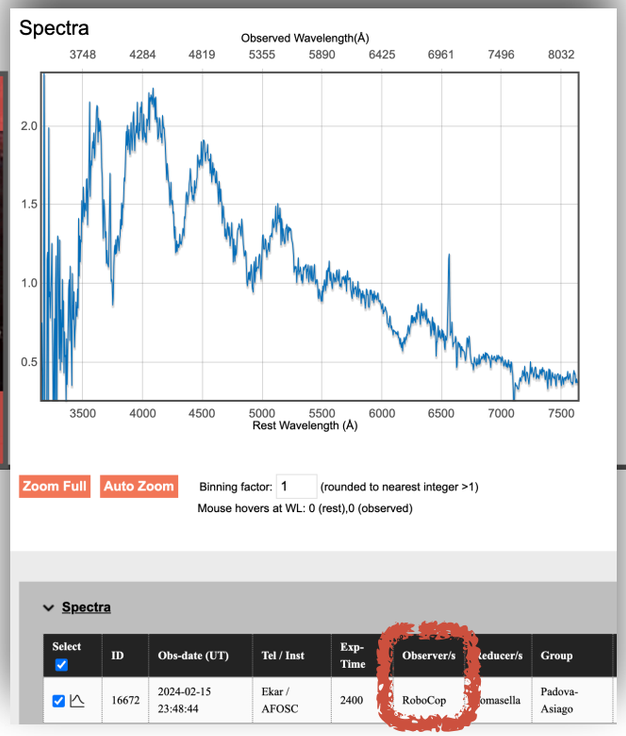


technical staff in Asiago-Ekar and from Padova

RoboCop project

Nov 2023 - ongoing: development of the users web interface for OB data entry and scheduler by Enrico Cappellaro; integration with the telescope control; debugging and overnight testing (commissioning phase). May-June-July maintenance and testing.





The following new AstroNotes were released:

#2024-55

Released: 2024-02-16 10:24:36
Type: Object/s-Discovery/Classification
Keywords: Supernova, Spectroscopy, Optical

Title: Asiago spectroscopic classification of optical transient with RoboCop (Robotic Copernico Telescope)

Authors: L. Tomasella, E. Cappellaro, S. Benetti (INAF OAPd), T. Forte, A. Frigo, M. Mosele, L. Traverso (technical staff at INAF OAPd, Cima Ekar) and M. Fiaschi (MFC Elettronica)

Abstract: The Asiago Transient Classification Program (Tomasella et al. 2014, AN, 335, 841) reports the spectroscopic observations of AT2024csl as a Type Ia-91T like SN obtained with the Asiago 1.82m Copernico Telescope (+ AFOSC; range 340-820 nm; resolution 1.4 nm). The observations were secured exploiting the new fully robotic telescope operation mode (RoboCop project supported by Techno Grant INAF 2022) currently in phase of commissioning.

Click here to see the full text

Related Objects: 2024csl [ZTF24aaejjfw]

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Conclusions:

Ekar is changing a lot!

- robotic mode in Asiago-Ekar simplifies the procedures for telescopes' users.
- improves the rapid response in case of a (outburst, GW, GRB, neutrino …) trigger.
- enhances the data collection capability/telescopes productivity.
- represents a pilot experience for low-cost robotisation of small-to-middle size telescopes.

We need:

- users collaboration (we need to know how you want to use the telescopes).
- users feedback (we need to know if it works as you expect).
- users flexibility (we encourage to understand and exploit all the scheduler possibilities).

Wikipedia list of Robotic Telescopes

List of Robotic Telescopes [edit]

See below for further information on these professional robotic telescopes:

- TRAPPIST, 60 cm, La Silla, Chile.
- T80S, 80 cm, Tololo, Chile.
- Super-LOTIS, 60 cm, Steward Observatory on Kitt Peak, Arizona, USA.
- Liverpool Telescope (robotic telescope), 2.0 m, on La Palma, Canary Islands
  - Faulkes Telescope North, 2.0 m, Haleakala Observatory, Hawaii
  - Faulkes Telescope South, Siding Spring Observatory, New South Wales, Australia
  - RoboNet, multiple locations
- Lick Observatory on Mount Hamilton, California, USA.
  - Automated Planet Finder, 2.4 m,
  - Katzman Automatic Imaging Telescope, 76 cm
- Slooh telescopes, various sizes & locations.
- Rapid Eye Mount telescope, 60 cm, La Silla, Chile
- TAROT-South robotic observatory, 25 cm, La Silla, Chile
- Bradford Robotic Telescope, 35.5 cm, Teide Observatory, Canary Islands
- Warner and Swasey Observatory#Nassau Station Robotic Observatory, 91 cm, Warner and Swasey Observatory, Ohio, USA
- Observatorio Astronómico de La Sagra, 3× 45 cm, Granada, Spain
- ROTSE-IIIb, 45 cm, McDonald Observatory, Texas, USA
- GROWTH,70 cm,
- Indian Astronomical Observatory, Ladakh, India
- MASTER network of small rapid-response robotic telescopes
- Thailand NARIT Thai Robotic Telescope, National Astronomical Research Institute of Thailand (Public Organization) Thailand.
- RAPTOR (telescope), Fenton Hill
- Milutin Milanković, 140 cm, Belgrade Observatory, Astronomical Station of Vidojevica, Mount Vidojevica, Serbia.

Liverpool Telescope Logo

The RCS has a rapid-response capability where it will often automatically interrupt regular observations to slew (shift) to observe short-lived events with higher priority, such as gamma-ray bursts.

The LT is one of the largest robotic telescopes in the world[3] and was built by a subsidiary [b] set up by Liverpool John Moores University who own and masterminded it. It is operated (maintained) by the Astrophysics Research Institute, partly funded by the UK's STFC. It is at the Roque de los Muchachos Observatory on La Palma.

2-m class (like Copernico ...)

Faulkes Telescope North

Article Talk

From Wikipedia, the free encyclopedia

The **Faulkes Telescope North** is a clone of the Liverpool Telescope, and is located at Haleakala Observatory in the U.S. state of Hawaii. It is a 2 m (79 in) f/10 Ritchey-Chrétien telescope.

The telescope is owned and operated by LCOGT. This telescope and its sister telescope Faulkes Telescope South are used by research and education groups around the globe. The Faulkes Telescope Project is one such group which provides observing time (awarded by LCOGT) for educational projects for UK schools and amateur astronomers.

Faulkes Telescope South

Article Talk

From Wikipedia, the free encyclopedia

The **Faulkes Telescope South** is a clone of the Liverpool Telescope and is located at Siding Spring Observatory in New South Wales, Australia. It is a 2 m (79 in) Ritchey-Chrétien telescope. It was

Thanks!

@

Aldo, Luciano, Thomas, Marco, Gigi, Danilo, Amedeo
Enrico, Stefano, Daniela

Lina Tomasella 28.06.2024