

An Overview of the Kottamia Astronomical Observatory

(KAO): Advancements in instrumentation, international collaboration and future prospects.

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BYURAKAN ASTROPHYSICAL OBSERVATORY (BAO),

17 April 2025

Outlines

- ① Introduction about NRIAG.
- ② KAO Telescopes and imaging detectors
- ③ Auxiliary Instruments.
- ④ National Projects and International Collaboration.
- ⑤ Development toward robotic operation.
- ⑥ Future Aspects for astronomy in Egypt.

Introduction to NRIAG.

Introduction about NRIAG

NRIAG is the National Research Institute of Astronomy and Geophysics which is establishment in Egypt with more than **120 years** of accumulated Experience, making it the oldest scientific research institute in Africa and Middle East. Serving as international consulting firm in its fields of specialization to support Industry, Educations and Research.

Scientific Departments

1- Astronomy

2- Solar and space research

3- Seismology

4- Geodynamics

5 -Geomagnetism and Geo-electricity

Astronomy Section

Theoretical
astronomy
and high-
energy Lab.

Galactic
and Extra
Galactic
Lab.

Stellar Lab.

Solar
Research
Lab.

Space
Research
Lab.

Astronomical
OBSERVATORY
(Kottamia)

Laser
Station for
Observing
Satellites
(Helwan)

Solar
Observatory
(Helwan)

KAO Telescopes

Kottamia Astronomical Observatory(KAO)

Kottamia Astronomical Observatory is the largest telescope in the Arab world, including the Middle East and North Africa. The telescope, which is located 80 km and 480 m above the sea level from the center of [Cairo](#), has a main mirror diameter of about 1.88 meters



74 - inch telescope



74 - inch telescope

The main mirror has an aperture of 74 inch and a paraboloidal surface of 360 inch focal length (F/4.9). The Cassegrain secondary has an aperture of 19 inch and a hyperbolic section giving a focal ratio of F/18.

A second Newtonian hyperbolic mirror similar to the Cassegrain has a focal ratio of F/28.9.

74 - inch telescope Main Mirror



74 - inch telescope Motion Control System

Pointing and tracking is performed based on stepper motors and absolute encoders through computer, wireless hand paddle and classical buttons



74 - inch telescope Software

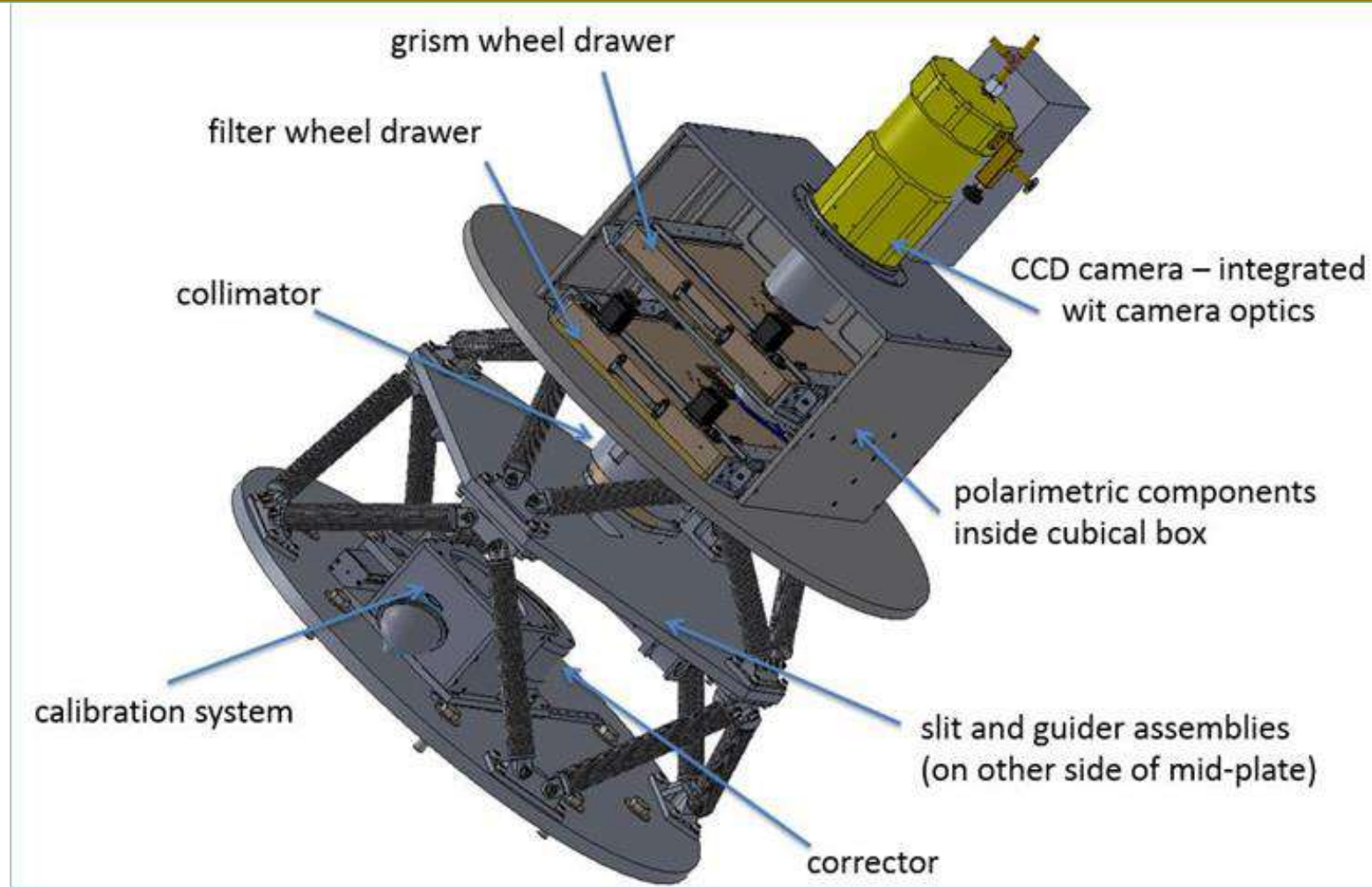


ACE software for controlling the telescope and the dome whereas there is another software to control the CCD camera **WINOWL**. **Maxim DL** controls the Guider camera

74 - inch telescope Imaging system



CCD camera 4K



Kottamia Faint Imaging Spectro-Polarimeter (KFISP)

74 - inch telescope CCD Cooling



Tanks of liquid Nitrogen

Charging process of the CCD camera



74 - inch telescope

Evacuating The CCD Camera



Evacuation pump of CCD camera



74 - inch telescope Smart Dome



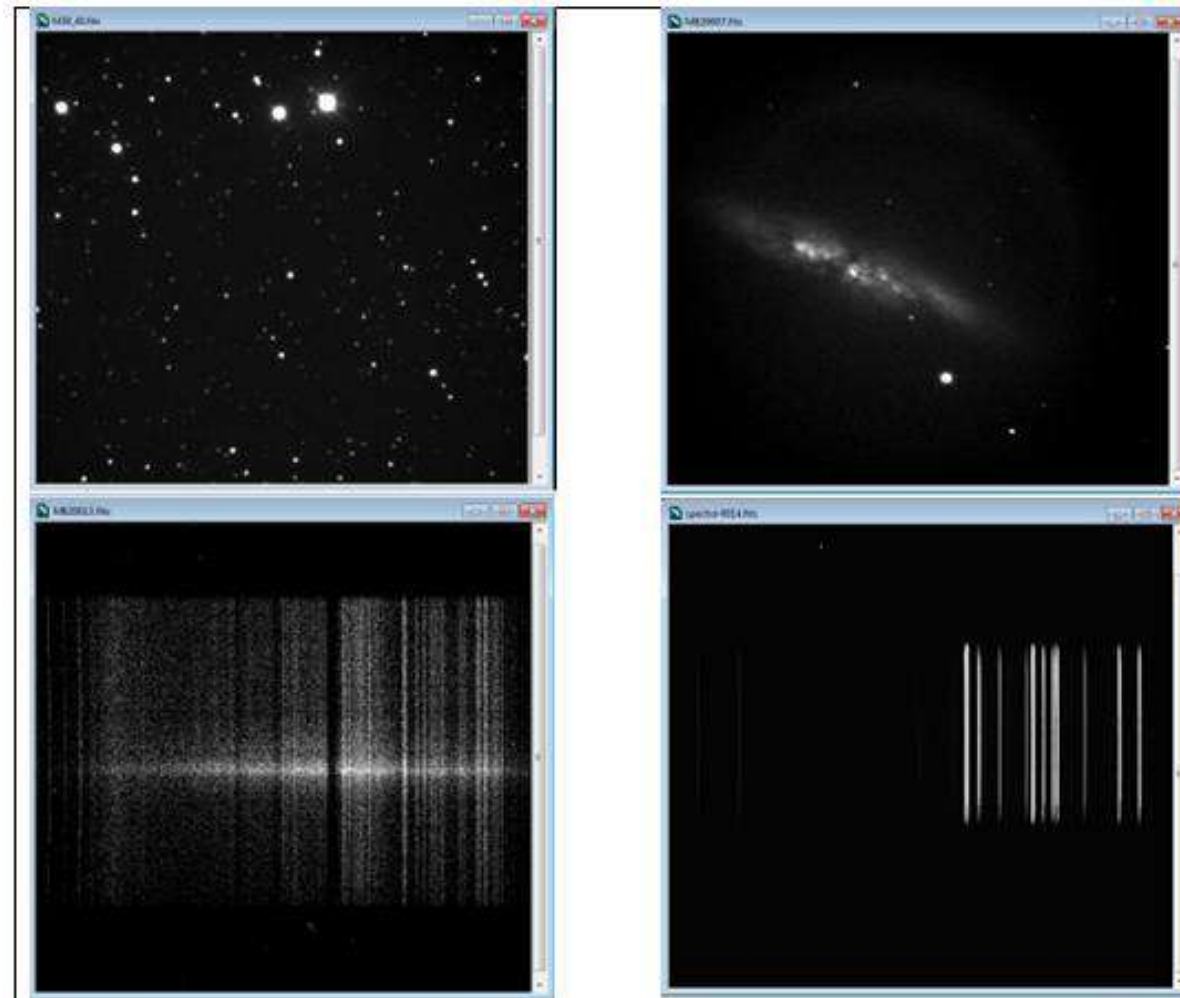
18m in diameter with an outer shell of galvanized steel plate painted externally with aluminium

The upper shutter is of the “up and over” type whereas the lower shutter is in two parts each opening to the side.

The dome can be rotated at a speed of one revolution in 3 minutes by means of six three phase motors

74-inch telescope: Observed frames

Samples of first-light observations obtained from KFISP. The figure shows various images for different observing modes. The upper two images display **Messier M39** open star cluster (left) and **messier 82 cigar galaxy** (right) in direct imaging mode. The two bottom images display the image of the spectroscopic mode of **M82 galaxy** in red high grism (left) and its comparison (right)

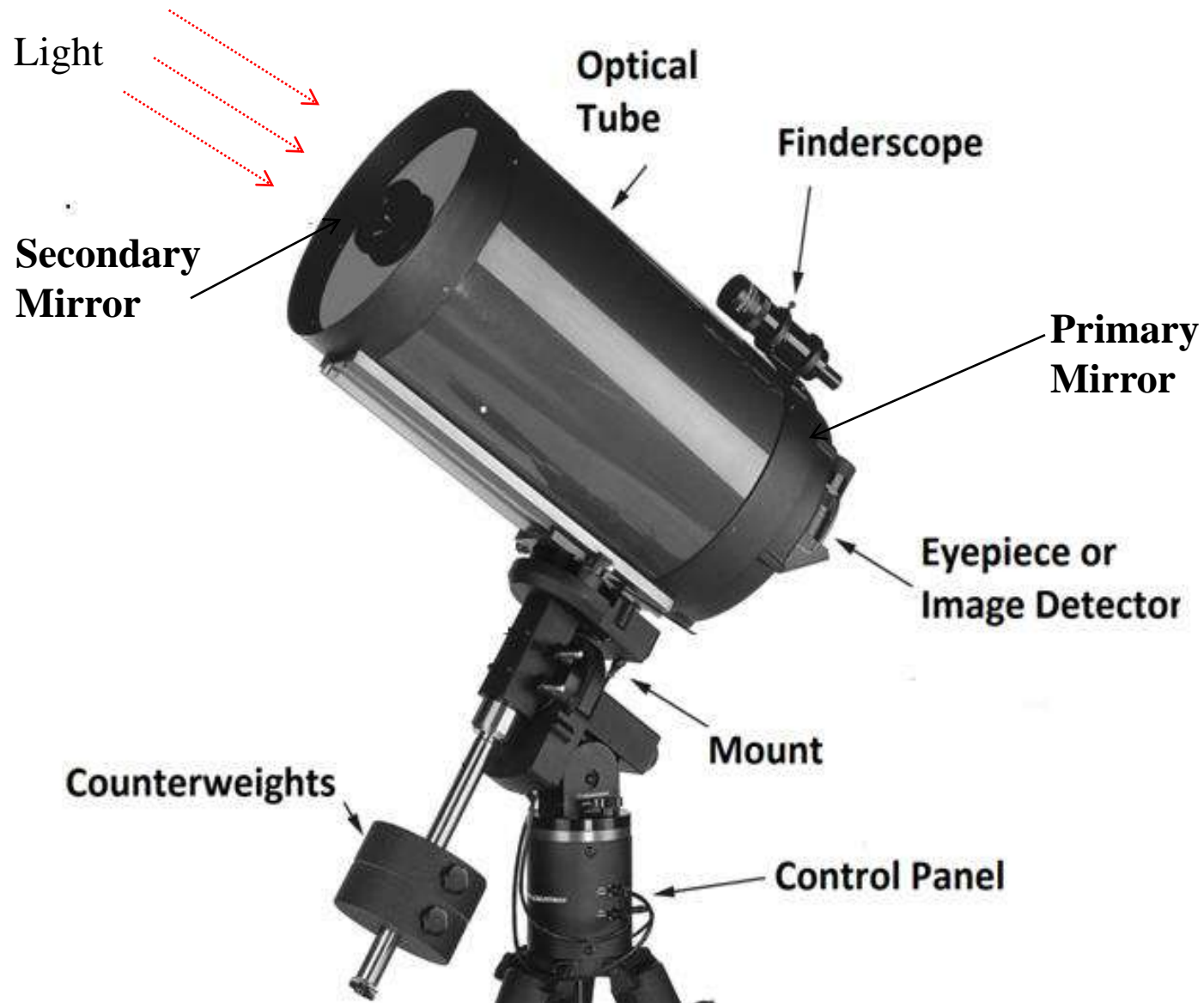


14- Inch CGE Telescope

14-Inch
Observatory



14- Inch CGE Telescope



The Hand control



PC

14- Inch CGE Telescope CCD Camera



It captures a still image of the night sky in user-specified exposure lengths.

Important Specification :

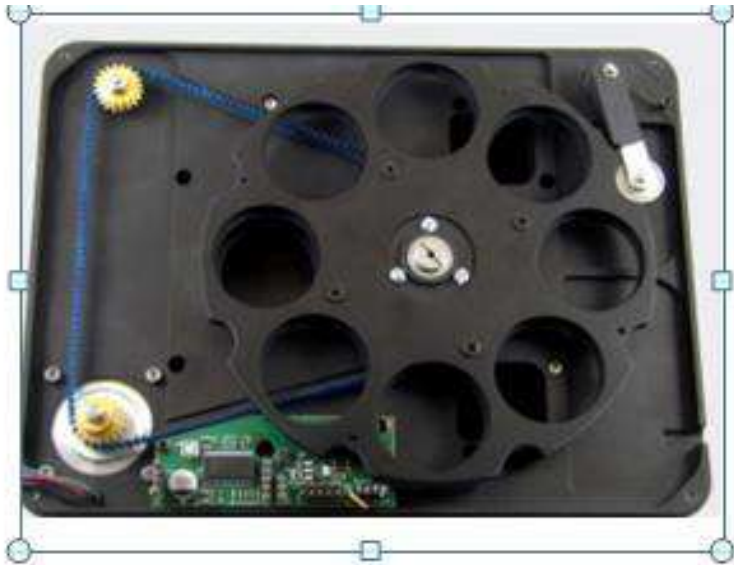
- **STX 16803 SBIG**
- **4096 x 4096 Resolution**
- **Separately focusable Guiding.**
- **USB and ETHERNET Interface.**
- **Fan and Water Cooling.**



14- Inch CGE Telescope **Astronomical Filters**

Various bandpass filters are utilized for photometry on telescopes, to obtain measurements which reveal objects' astrophysical properties, such as stellar classification.

“Filters with different wavelength width”



FW7-STX and equipped with STX 16803 CCD camera

Astronomical Dome Function & Construction

Upper Shutter

Dome Slit

Bottom Shutter

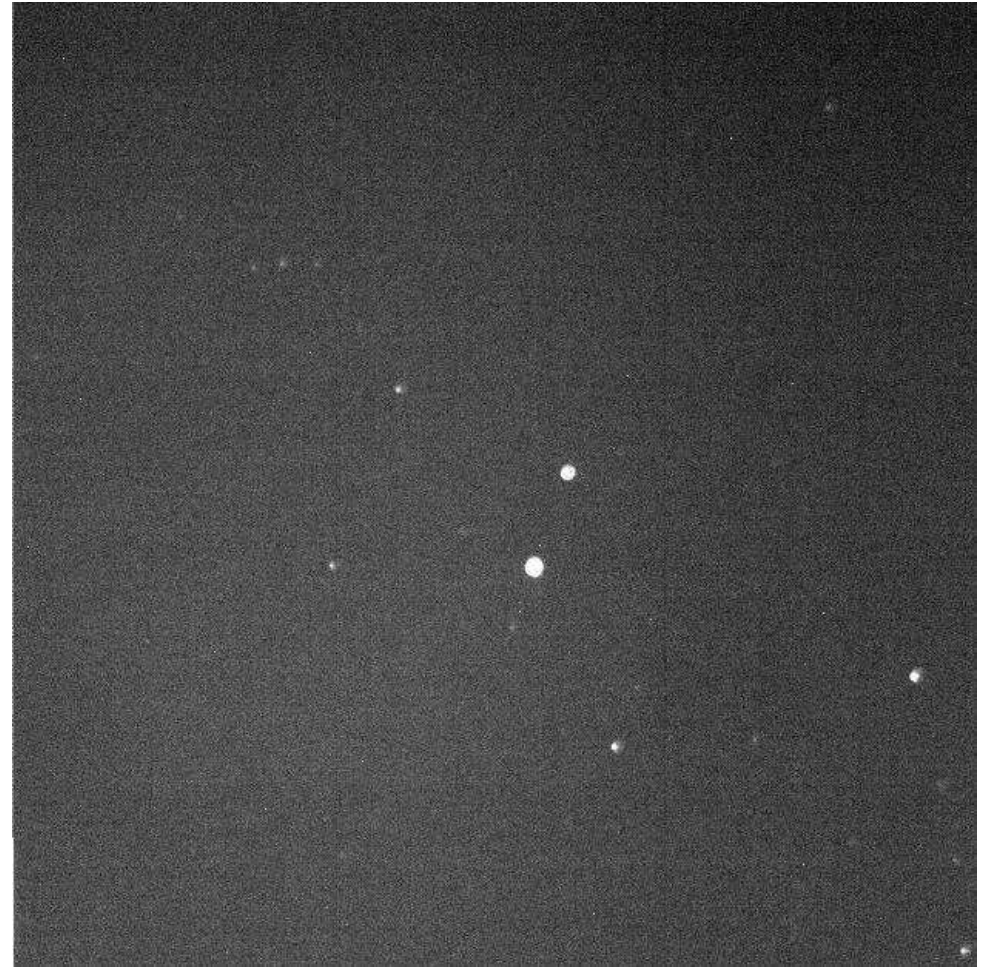
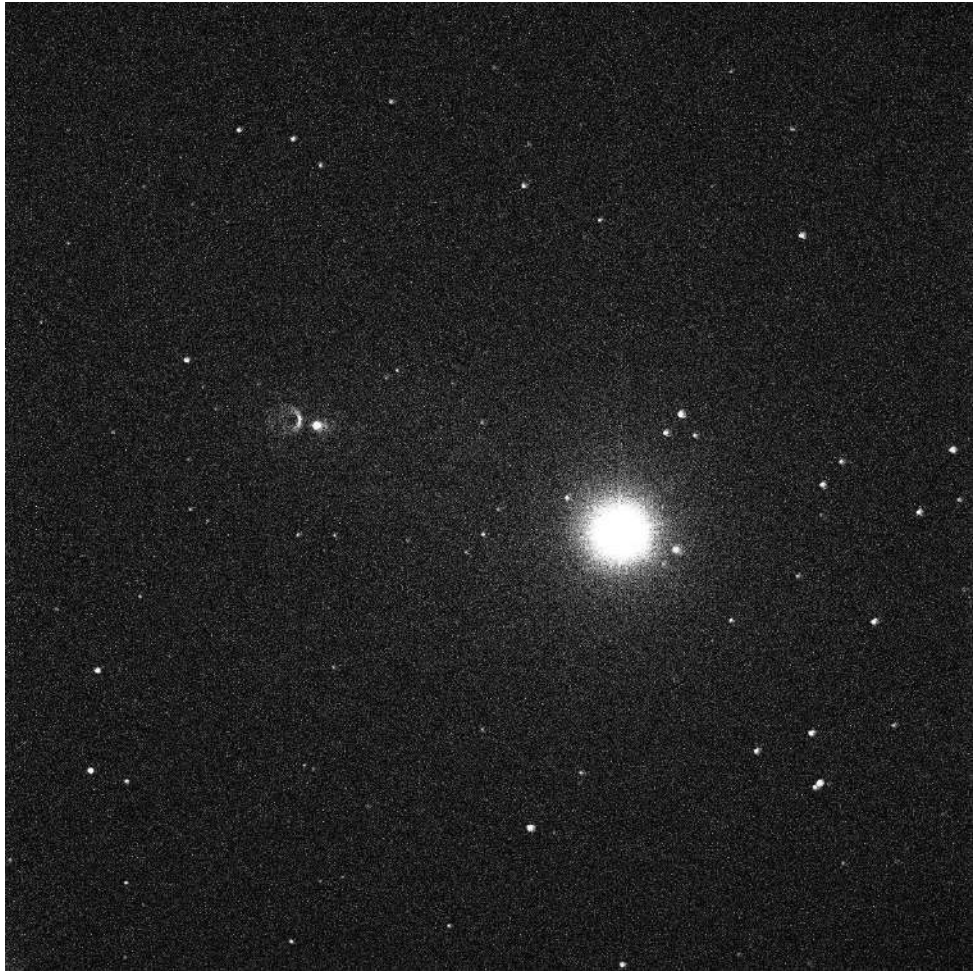
Observing Room



Rotated Dome

Fixed Wall

14- Inch CGE Telescope Frames



Observed Stars

11-Inch CGE Telescope

Items	Characteristics
Telescope Series	Celestron 11" Rowe-Ackermann Schmidt Astrograph with CGE Pro Mount
Telescope Aperture	11"
Telescope Focal Ratio	f/2.2
Telescope Focal Length	620 (mm)
Telescope Mount Type	Equatorial
CCD device	FLI MicroLine ML11002 Monochrome Camera Grade 2
Pixels	4072 x 2720 pixels
Pixel Size (μm)	9.0 x 9.0
System (FOV)	3.4°x2.3° (7.81) degree square
Pixel scale	2.98"/pixel
Limited magnitude	14.9 mag

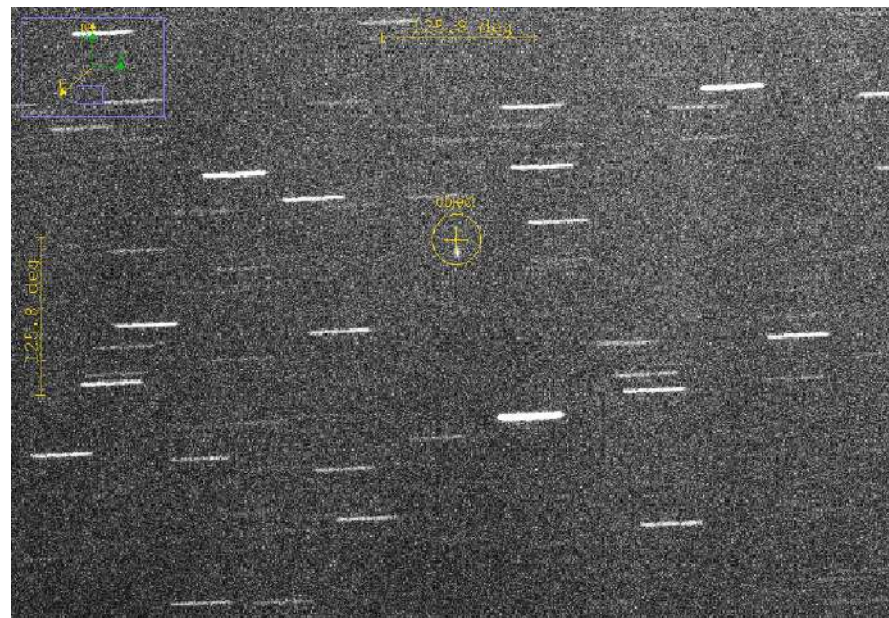
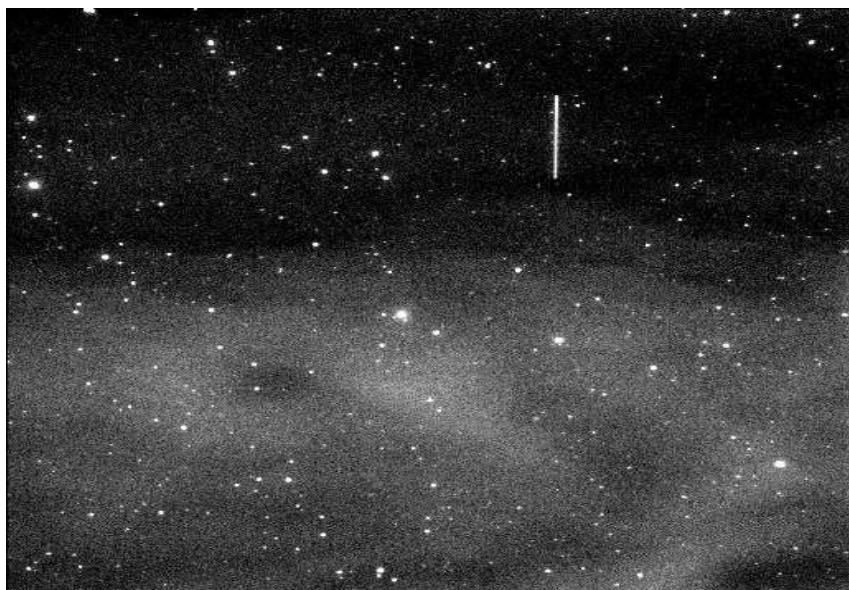


Optical Satellite Tracking Station (OSTS)

11-Inch CGE Telescope

Known objects tracking techniques

- ◉ Leap frog tracking: the stars appear as points while the **tracked object produces an arc**, whose length is determined by the angular velocity of the object and the exposure time
- ◉ Continuous Tracking: Images taken in this mode show the **object as small point** and the stars as arcs



Auxiliary instruments

Aluminizing Plant



Output view of the Aluminizing Plant

Aluminizing Plant



Internal view of the Aluminizing Plant

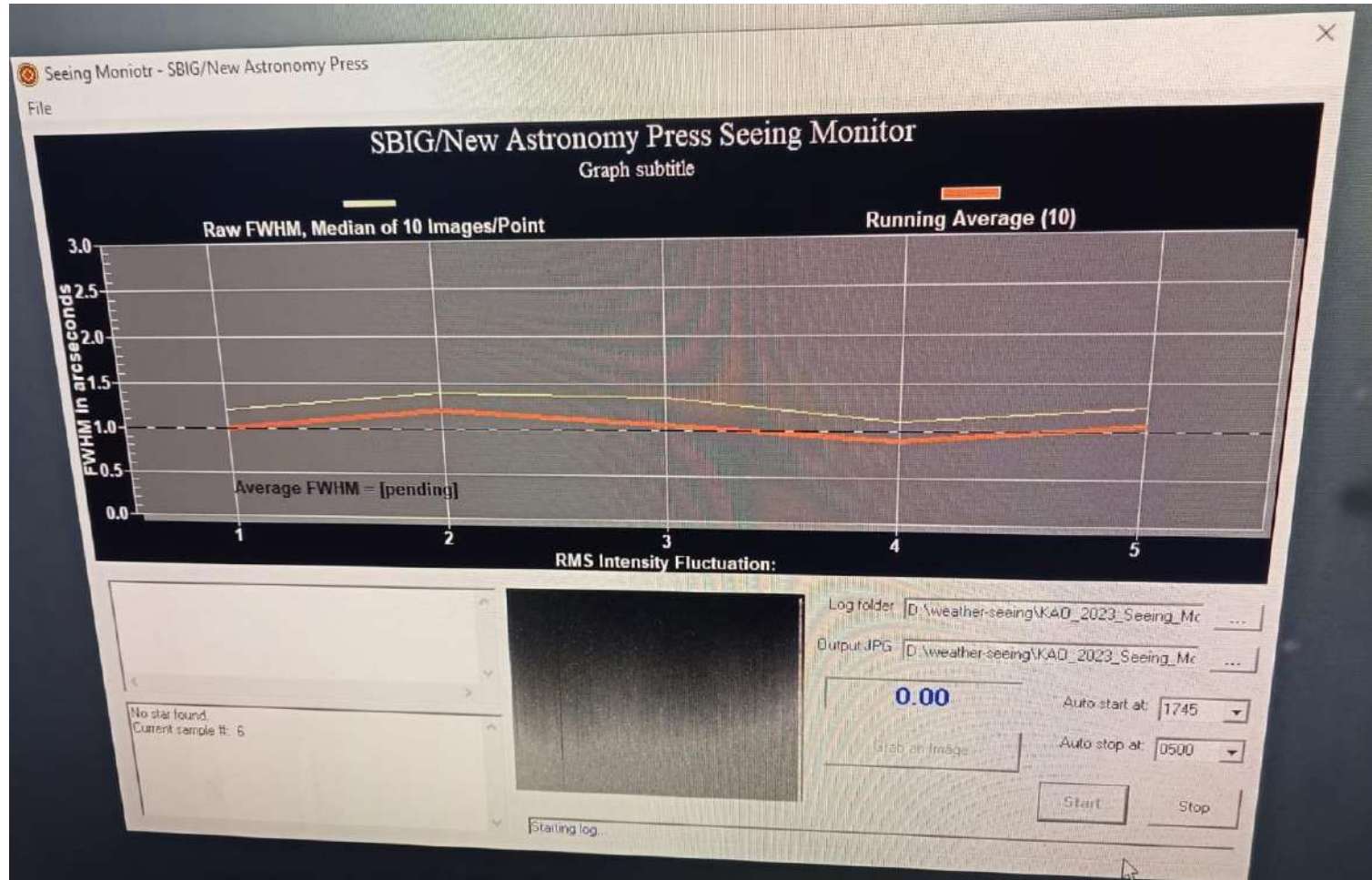


Seeing Monitor



The **Seeing Monitor** is SBIG camera constantly **monitors** the **seeing** for any 12 hour period and displays the measurement on the computer **monitor**, logging the **data** to a text file

Seeing Monitor software

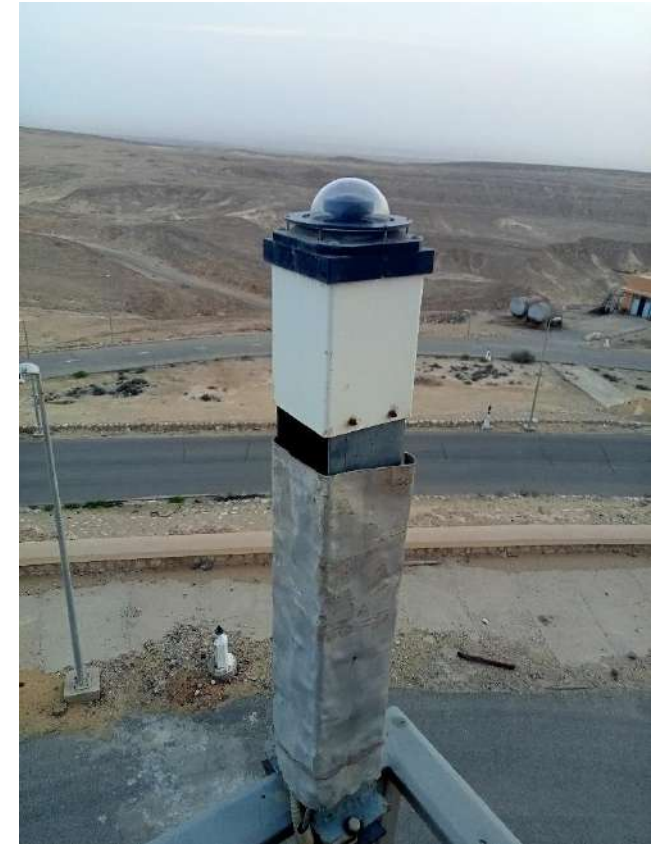


All Sky camera

An all sky camera is a device designed to take pictures of the entire sky over a certain amount of time, usually to monitor meteor showers or other astronomical phenomena.



Image of sky



All Sky Camera

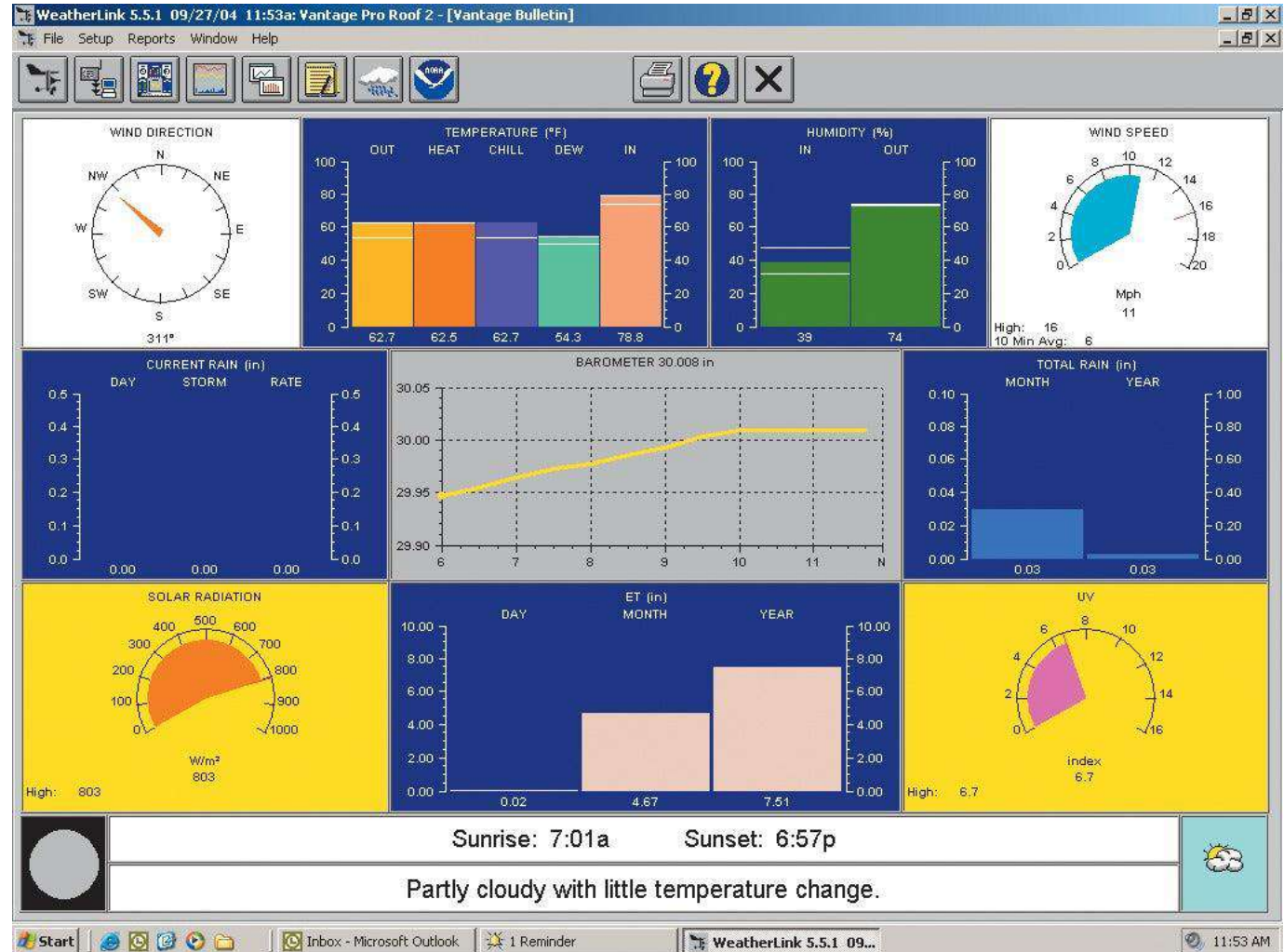
Weather Station



Utilized Sensor:

- Temperature
- Humidity
- Wind Speed
- Wind Direction
- Rain rate

Weather Station window



**National Projects &
International Collaboration.**

National Projects

Time-Domain Astronomy (TDA): I. Physical Changes

- Physical Changes:

Counterparts of gravitational waves (GWs), novae, supernovae (SNe), Gamma-ray bursts (GRBs), active galactic nuclei (AGNs), binary stars, pulsars, and many more.

- STDF project at Kottamia Astronomical Observatory (KAO)

Duration: 3 years (2021 – 2024) + 3 months extension

PI: Ali Takey

Title: Observing and studying astronomical transient phenomena using the Kottamia Astronomical Telescope

Ali Takey¹; Hamed Ismail¹; Yosry A. Azzam¹; M. Abdel-Sabour¹; F. I. Y. Elnagahy¹; I. Zead¹; T. M. Kamel¹; A. Shokry¹; M. A. El-Sadek¹; G. M. Hamed¹; Mohamed Ismail¹; A. M. Fouad¹; M. Soliman²; Ali, Ola¹; E. Elhosseiny¹; Saad Ata¹

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2- Department of Astronomy and Meteorology, Faculty of Science, Al-Azhar University, 11884 Nasr City, Cairo, Egypt

National Projects

Time-Domain Astronomy (TDA): II. Dynamical Changes

- Dynamical Changes:

Observational study of two kinds of near-Earth space objects: I. natural objects (asteroids and comets), II. artificial objects (man-made satellites and space debris)

- STDF project at Kottamia Astronomical Observatory (KAO)

Duration: 3 years (2023 - 2026)

PI: Dr. Ahmed Moursi

Co-PI: Ali Takey

Title:

Discovery and study of near-Earth space objects using Kottamia astronomical observatory telescopes

International Projects

Institute of Astronomy of the Russian Academy of Science (INASAN) , 10 Feb. 2025

Astroclimate:

Developing and mounting special instruments for studying both climatic and astroclimatic conditions at different sites on the territory of Egypt and Russia including modernization and improvement such of instruments. Implementation of long-term climatic and astroclimatic observations using the above instruments to seek perspective astronomical sites in Egypt and Russia.

Near-Earth/Space Research:

Developing, improving, and modernizing instruments and technologies for studying Near-Earth and Space Research astronomy including the study of the separate fragments and the accumulations of space debris using ground-based optical, radar, and other instruments located in the territory of Egypt and Russia. Positional, photometric, and spectroscopic observations of the Near Earth and the Solar system objects including satellites, space debris, asteroids, comets, and meteoroids. Researching population of high orbital space objects. Studying ballistic evolution, source of origin of space debris fragments in geostationary (GEO) region, high-elliptical (HEO) and low Earth (LEO) orbits. Conjunction assessment analysis.

Astronomy/Astrophysics:

Developing, mounting, and improving instruments and technologies for studying in Astronomy and Astrophysics. Positional, photometric, and spectroscopic observations of deep space objects such as exoplanets, variable stars, star clusters, supernova stars, gamma-ray optical afterglows, active galactic nuclei, and some other types of astrophysical transients using the above instruments and technologies at the territory of Egypt and Russia.



International Projects

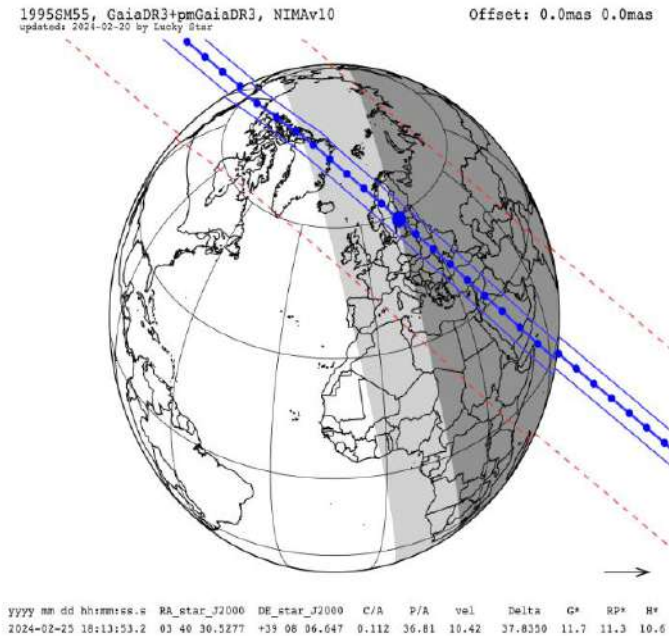
National Astronomical Observatories, Chinese Academy of Sciences (NAOC), Beijing, China



International Contribution

- Stellar Occultation by 1995SM55 on 2024-02-25:

This is an occultation of a bright star (G=12.4) with ID 224489389287197184 in GaiaDR3 by the Trans Neptunian (TNO) Object with designation 1995SM55.



Archival images in r-band from PanSTARRS-1

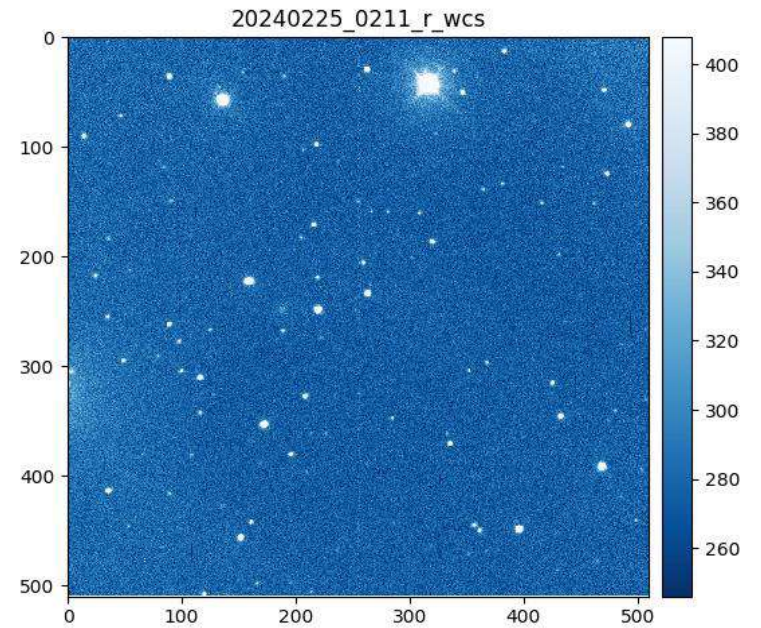


Image in r-band from Kottamia

International Contribution

International collaborations: Follow-up of gravitational waves (GWs) The GRANDMA network in preparation for the fourth gravitational-wave observing run

ABSTRACT

GRANDMA is a world-wide collaboration with the primary scientific goal of studying gravitational-wave sources, discovering their electromagnetic counterparts and characterizing their emission. GRANDMA involves astronomers, astrophysicists, gravitational-wave physicists, and theorists. GRANDMA is now a truly global network of telescopes, with (so far) 30 telescopes in both hemispheres. It incorporates a citizen science programme (Kilonova-Catcher) which constitutes an opportunity to spread the interest in time-domain astronomy. The telescope network is an heterogeneous set of already-existing observing facilities that operate coordinated as a single observatory. Within the network there are wide-field imagers that can observe large areas of the sky to search for optical counterparts, narrow-field instruments that do targeted searches within a predefined list of host-galaxy candidates, and larger telescopes that are devoted to characterization and follow-up of the identified counterparts. Here we present an overview of GRANDMA after the third observing run of the LIGO/VIRGO gravitational-wave observatories in 2019 – 2020 and its ongoing preparation for the forthcoming fourth observational campaign (O4). Additionally, we review the potential of GRANDMA for the discovery and follow-up of other types of astronomical transients.

Agayeva et al. 2022 ([Conference paper](#))
2 co-authors from NRIAG



World map showing the current distribution of GRANDMA observing facilities, not including the Kilonova-Catcher amateur telescopes.

International Projects

THE ASTROPHYSICAL JOURNAL LETTERS, 948:L12 (34pp), 2023 May 10

<https://doi.org/10.3847/2041-8213/acc8d0>

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OPEN ACCESS



GRANDMA and HXMT Observations of GRB 221009A: The Standard Luminosity Afterglow of a Hyperluminous Gamma-Ray Burst—In Gedenken an David Alexander Kann

D. A. Kann¹ , S. Agayeva² , V. Aivazyan^{3,4}, S. Alishov², C. M. Andrade⁵ , S. Antier⁶ , A. Baransky⁷ , P. Bendjoya⁸ ,

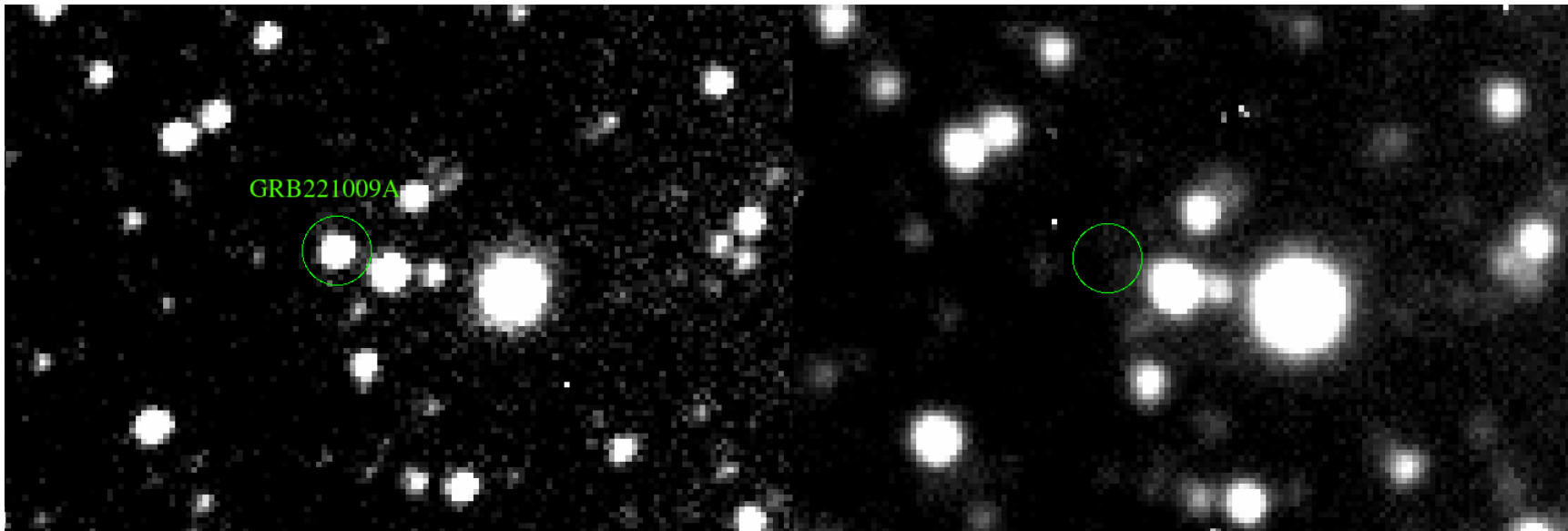
Abstract

Object GRB 221009A is the brightest gamma-ray burst (GRB) detected in more than 50 yr of study. In this paper, we present observations in the X-ray and optical domains obtained by the GRANDMA Collaboration and the Insight Collaboration. We study the optical afterglow with empirical fitting using the GRANDMA+HXMT-LE data sets augmented with data from the literature up to 60 days. We then model numerically using a Bayesian approach, and we find that the GRB afterglow, extinguished by a large dust column, is most likely behind a combination of a large Milky Way dust column and moderate low-metallicity dust in the host galaxy. Using the GRANDMA+HXMT-LE+XRT data set, we find that the simplest model, where the observed afterglow is produced by synchrotron radiation at the forward external shock during the deceleration of a top-hat relativistic jet by a uniform medium, fits the multiwavelength observations only moderately well, with a tension between the observed temporal and spectral evolution. This tension is confirmed when using the augmented data set. We find that the consideration of a jet structure (Gaussian or power law), the inclusion of synchrotron self-Compton emission, or the presence of an underlying supernova do not improve the predictions. Placed in the global context of GRB optical afterglows, we find that the afterglow of GRB 221009A is luminous but not extraordinarily so, highlighting that some aspects of this GRB do not deviate from the global known sample despite its extreme energetics and the peculiar afterglow evolution.

International Contribution

Follow-up of GRBs

GRB 221009A: The brightest GRB ever detected



KAO 1.88 meter telescope observations of the GRB 221009A

Ready for O4 II: GRANDMA observations of *Swift* GRBs over eight weeks in spring 2022

I. Tosta e Melo¹, J.-G. Ducoin², Z. Vidadi³, C. Andrade⁴, V. Rupchandani⁵, S. Agayeva³, J. Abdelhadi⁶, L. Abe⁷,

ABSTRACT

Aims. We present a campaign designed to train the Global Rapid Advanced Network Devoted to the Multi-messenger Addicts (GRANDMA) network and its infrastructure to follow up on transient alerts and detect their early afterglows. In preparation for O4 II campaign, we focused on gamma-ray burst (GRB) alerts since they are expected to serve as the electromagnetic counterpart of gravitational-wave events. Our goal was to improve our response to the alerts and to start prompt observations as soon as possible, so that we may better prepare the GRANDMA network for the fourth observational run of LIGO-Virgo-Kagra (launched at the end of May 2023) and future missions such as SM.

Methods. We set up a dedicated infrastructure and organized a rota of follow-up advocates (FAs) to guarantee round-the-clock assistance to our telescope teams, with an aim to receive, manage, and send out observational plans to our partner telescopes. To ensure a large number of observations, we focused on *Swift* GRBs whose localization errors were generally smaller than the GRANDMA telescopes' field of view. This allowed us to bypass the transient identification process and focus on the reaction time and efficiency of the network.

Results. During the 'Ready for O4 II' phase, 11 *Swift*/INTEGRAL GRB triggers were selected. Of these, nine fields had been observed and three afterglows had been detected (GRB 220403B, GRB 220427A, GRB 220514A) with 17 GRANDMA telescopes and 17 amateur astronomers from the citizen science project Kilonova-Catcher. Here, we highlight the GRB 220427A analysis, where our long-term follow-up of the host galaxy allowed us to obtain a photometric redshift of $z = 0.82 \pm 0.09$ and its lightcurve evolution, as well as to fit the decay slope of the afterglows and study the properties of the host galaxy.

Conclusions. During this eight-week-long GRB follow-up campaign, we successfully fulfilled our goal of training telescope teams for O4 and improving the associated technical toolkits. For seven of the GRB alerts, our network was able to start the first observations less than one hour after the GRB trigger time. We also characterized the network efficiency to observe GRB afterglow given the resulting time delay and limiting magnitude, and to its light curve evolution based on the observation of GRB 220427A.

International Contribution

Monthly Notices

of the

ROYAL ASTRONOMICAL SOCIETY



MNRAS **530**, 1–19 (2024)

Advance Access publication 2024 March 18

<https://doi.org/10.1093/mnras/stae503>

Multiband analyses of the bright GRB 230812B and the associated SN2023pel

T. Hussenot-Desenonges,^{1★} T. Wouters,^{2,3} N. Guessoum ,^{4★} I. Abdi,⁴ A. Abulwfa,⁵ C. Adami,⁶ J. F. Agüí

ABSTRACT

GRB 230812B is a bright and relatively nearby ($z = 0.36$) long gamma-ray burst (GRB) that has generated significant interest in the community and has thus been observed over the entire electromagnetic spectrum. We report over 80 observations in X-ray, ultraviolet, optical, infrared, and submillimetre bands from the GRANDMA (Global Rapid Advanced Network for Multimessenger Addicts) network of observatories and from observational partners. Adding complementary data from the literature, we then derive essential physical parameters associated with the ejecta and external properties (i.e. the geometry and environment) of the GRB and compare with other analyses of this event. We spectroscopically confirm the presence of an associated supernova, SN2023pel, and we derive a photospheric expansion velocity of $v \sim 17 \times 10^3 \text{ km s}^{-1}$. We analyse the photometric data first using empirical fits of the flux and then with full Bayesian inference. We again strongly establish the presence of a supernova in the data, with a maximum (pseudo-)bolometric luminosity of $5.75 \times 10^{42} \text{ erg s}^{-1}$, at $15.76_{-1.21}^{+0.81} \text{ d}$ (in the observer frame) after the trigger, with a half-max time width of 22.0 d. We compare these values with those of SN1998bw, SN2006aj, and SN2013dx. Our best-fitting model favours a very low density environment ($\log_{10}(n_{\text{ISM}}/\text{cm}^{-3}) = -2.38_{-1.60}^{+1.45}$) and small values for the jet's core angle $\theta_{\text{core}} = 1.54_{-0.81}^{+1.02} \text{ deg}$ and viewing angle $\theta_{\text{obs}} = 0.76_{-0.76}^{+1.29} \text{ deg}$. GRB 230812B is thus one of the best observed afterglows with a distinctive supernova hump.

International Contribution

Non-referred publications

- GRB 231024A: GRANDMA observations of AT2023vuc/GOTO23baj candidate •
- GRB 230812B: Optical observaions from Rozhen Observatory •
- GRB 230812B: GRANDMA further observations of ZTF23aaxeacr candidate afterglow •
- GRB 230812B: GRANDMA further observations of ZTF23aaxeacr candidate afterglow •
-
- GRB 221110A: GRANDMA observations •
- GRB 221009A: GRANDMA observations •
- GRB 220325A: GRANDMA observations •
- GRB 220101A: KAO optical-R observation •
- GRB 211221A: No V & R detection, KAO telescope •

International Contribution

Recent Discoveries

<https://www.aavso.org/vsx>

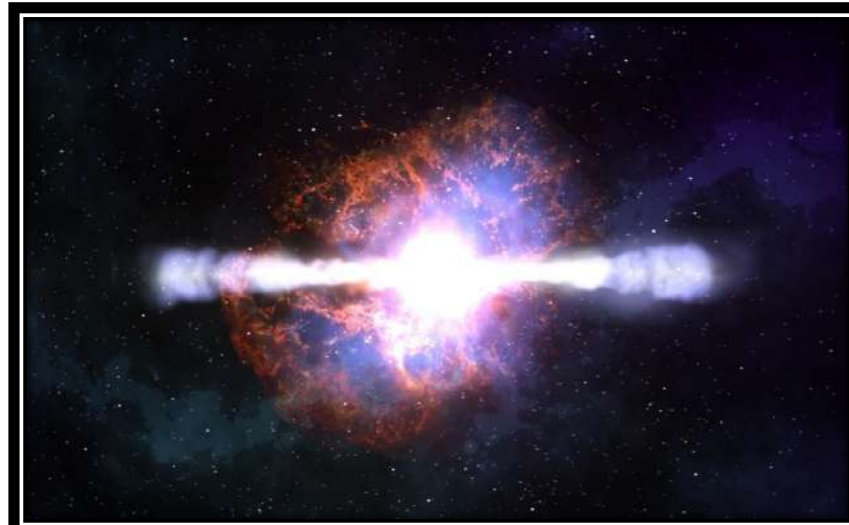
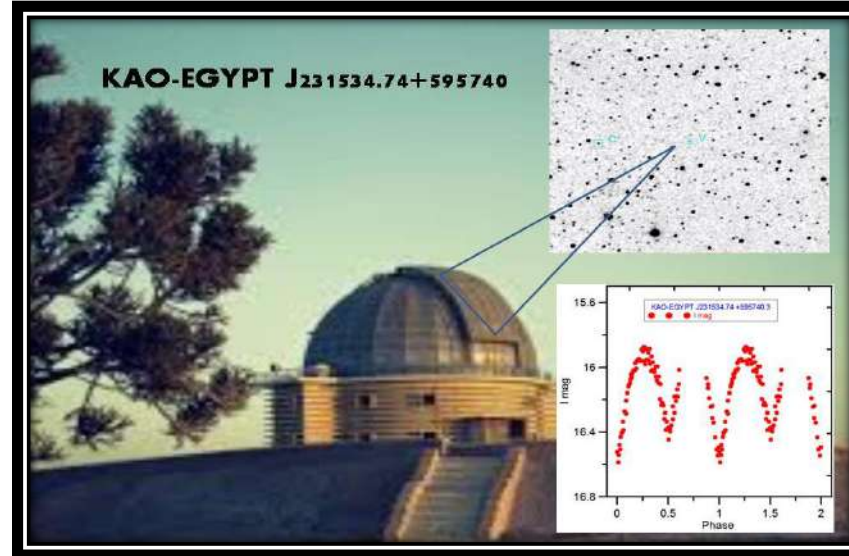
Variable stars

- 1- KAO-EGYPT J064512.06+341749
- 2- KAO-EGYPT J155828.08- 025753
- 3- KAO-EGYPT J200046.39+054747
- 4- KAO-EGYPT J200107.70+054221
- 5- KAO-EGYPT J214258.21+440520
- 6- KAO-EGYPT J225702.44+523222
- 7- KAO-EGYPT J222516.76+362017
- 8- KAO-EGYPT J214216.38+440015
- 9- KAO-EGYPT J231534.74+595740
- 10- KAO-EGYPT J231639.27+595223

<http://gcn.gsfc.nasa.gov>

Gamma ray bursts

- 1- GRB 140311A
- 2- GRB 160925A
- 3- GRB 170728B



Follow-up of GRBs at Kottamia Astronomical Observatory (KAO)

Ali Takey

Associate Professor, Galaxies laboratory
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International Contribution

Space debris works at NRIAG with OSTs

Observations:

- Global surveying of whole GEO orbit;
- Tracking of bright GEO, HEO MEO and LEO objects;
- Searching and follow up of faint debris objects

Goals:

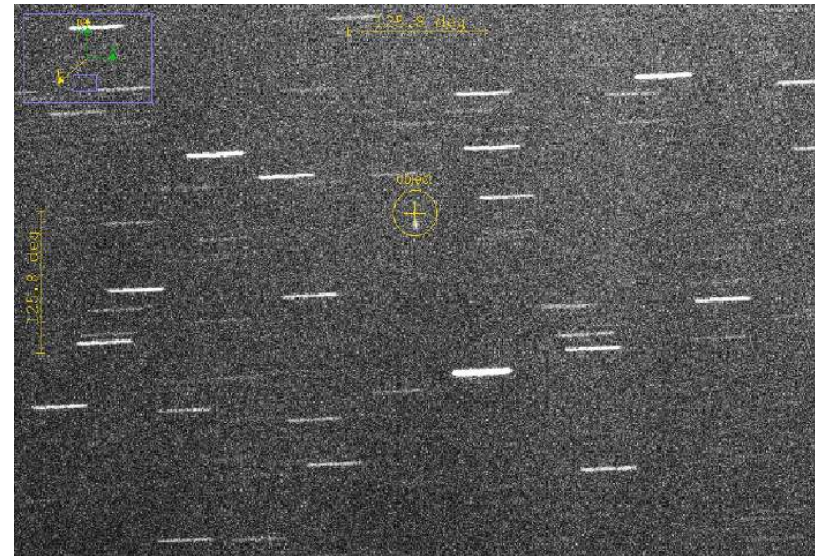
- Maintenance of the **space debris database**;
- Support of the daily updated list of orbits of space objects to provide the **conjunction assessment analysis**;
- Develop the space debris **population model** at high orbits;
- Observation service under commercial requests

Known objects tracking techniques

Leap frog tracking: the stars appear as points while the tracked object produces an arc, whose length is determined by the angular velocity of the object and the exposure time



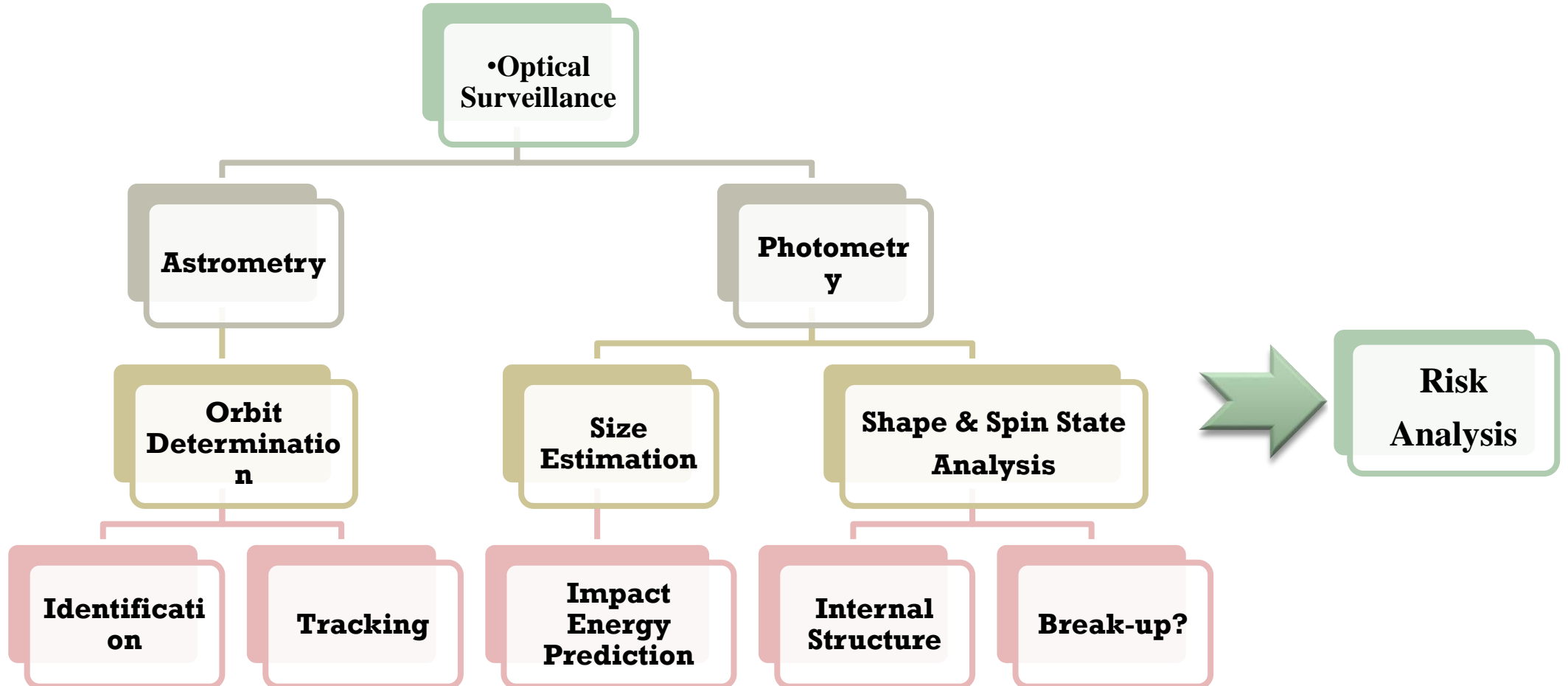
Continuous Tracking: Images taken in this mode show the object as small point and the stars as arcs





Asteroid Impact Risk Assessment

- **Optical Surveillance on Asteroids**



statistics for Kottamia Observatory on 2024

Number of discovery MPECs: 23

[MPEC 2025-B136 : 2025 BY4 \(*\)](#)

[MPEC 2025-B95 : 2025 BA3 \(*\)](#)

[MPEC 2025-A178 : COMET C/2025 A3 \(Tsuchinshan\) \(*\)](#)

[MPEC 2025-A151 : 2025 AG3 \(*\)](#)

[MPEC 2024-Y145 : COMET P/2024 X3 \(PANSTARRS\) \(*\)](#)

[MPEC 2024-Y50 : 2024 YG1 \(*\)](#)

[MPEC 2024-Y22 : 2024 YH \(*\)](#)

[MPEC 2024-Y16 : 2024 YC \(*\)](#)

[MPEC 2024-X301 : 2024 XQ16 \(*\)](#)

[MPEC 2024-X298 : 2024 XN16 \(*\)](#)

[MPEC 2024-X285 : 2024 XA16 \(*\)](#)

[MPEC 2024-X261 : 2024 XX11 \(*\)](#)

[MPEC 2024-X260 : 2024 XW11 \(*\)](#)

[MPEC 2024-Q40 : 2024 QJ \(*\)](#)

[MPEC 2024-Q37 : 2024 QG \(*\)](#)

[MPEC 2024-P133 : 2024 PN3 \(*\)](#)

[MPEC 2024-P127 : 2024 PW2 \(*\)](#)

[MPEC 2024-P110 : 2024 PK2 \(*\)](#)

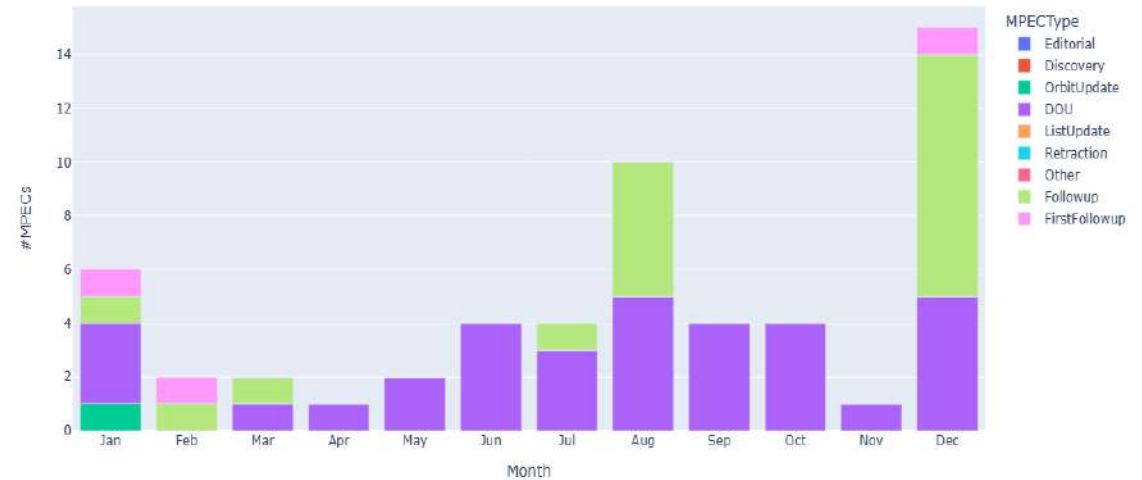
[MPEC 2024-N61 : 2024 NA1 \(*\)](#)

[MPEC 2024-F91 : COMET C/2024 E2 \(Bok\) \(*\)](#)

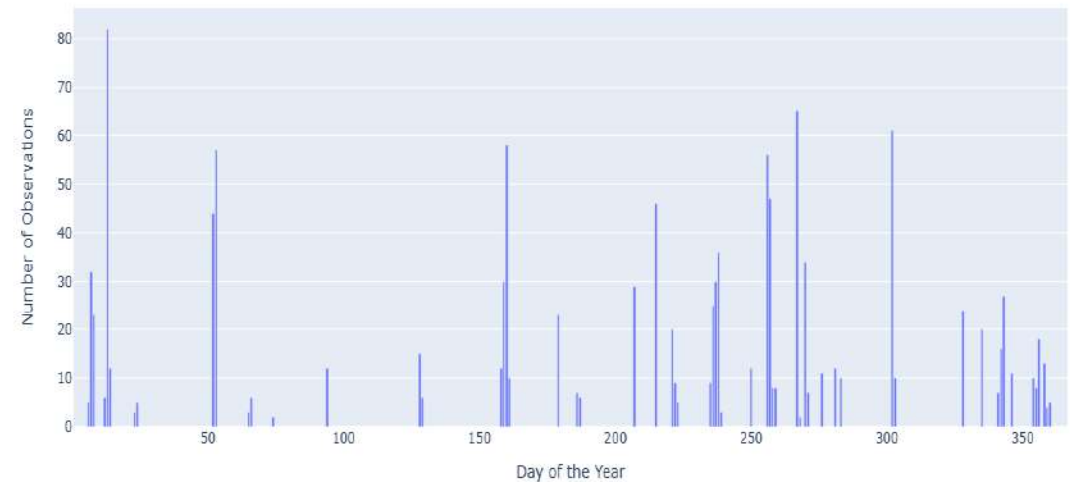
[MPEC 2024-D56 : 2024 AW15 \(*\)](#)

[MPEC 2024-B143 : COMET P/2011 NO1 = P/2023 WM26 \(Elenin\) \(*\)](#)

[MPEC 2024-B05 : 2024 AR4 \(*\)](#)

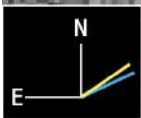


088 Kottomia | Yearly Frequency



ProvID: C/2025 A3
Speed: 0.105"/min
PA: 265.6 deg

Date: 2025 01 07.97837
RA: 10 30 49.67
Dec: +07 49 50.6
Mag: 20.4 G
Exp: 40.000m (20x120s)



Sol: 293 deg

Elong: 131.1 deg
Phase: 7.0 deg
Alt: 56.7 deg
Az: 126.5 deg
Earth: 5.434 AU
Sun: 6.125 AU
PABL: 153.0 deg
PABB: -1.3 deg
Speed: 0.11"/min
PA: 265.6 deg
PsAng: 292.8 deg
PsAMV: 301.2 deg

Obs: A. Abdelaziz, R. Hassan, A. Eid
Stn: 088
Tel: 1.88-m f/8 reflector
PSc: 0.48"/px
FOV: 1.5 x 1.5 arcmin

PermID: P123sX9
ProvID:
TrkSub: C2024
Speed: 0.673"/min
PA: 270.1 deg

Date: 2024 12 08.86244
RA: 05 58 29.14
Dec: +64 18 05.4
Mag: 20.4 G
Exp: 6.000m (3x120s)

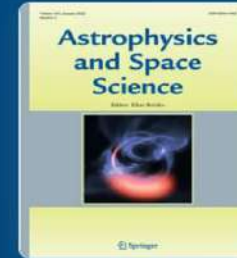
Obs: A. Takey, M. Abdelkareem
Msr: A.M.Abdelaziz
Stn: 088
Tel: 1.88-m f/4.9 reflector
PSc: 0.48"/px
FOV: 4.1 x 4.1 arcmin
Cam: 8.0 x 8.0 arcmin



International ISON project & databases on space debris and asteroids

Research | Published: 01 August 2024

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Photometric survey of 80 near-Earth asteroids

Fan Mo^{1,2}, Bin Li^{1,2}, Haibin Zhao¹, Jian Chen^{1,2}, Yan Jin³, Menghui Tang³, Igor Molotov⁴, A.M. Abdelaziz⁵, A. Takey⁵, S.K. Tealib⁵, and Ahmed. Shokry⁵

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Follow-up of GRBs at Kottamia Astronomical Observatory (KAO)

Ahmed Moursi

Associate Professor, Space Lab.
Astronomy Department, NRIAG
E-mail: ahmed_astro84@nriag.sci.eg

International Events: Astronomical Schools

We are pleased to announce the Fifth Advanced Arab Astrophysics School in the Kottamia Astronomical Observatory, Egypt, on October 17-23, 2025.

Organized By



The National Research Institute of Astronomy and Geophysics (NRIAG)

Co-organized by



International Events: Astronomical Schools

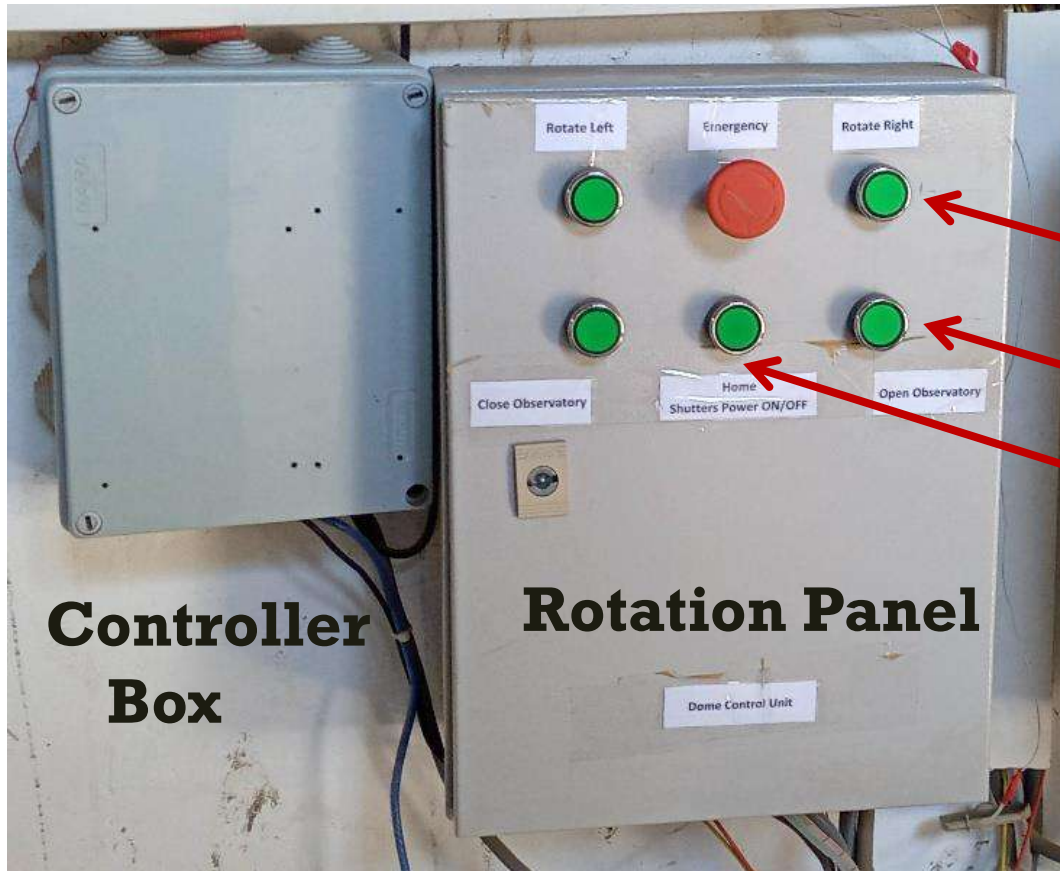


Geophysics, October, 11 -14, 2021

Development Example.

Dome Rotation Automation

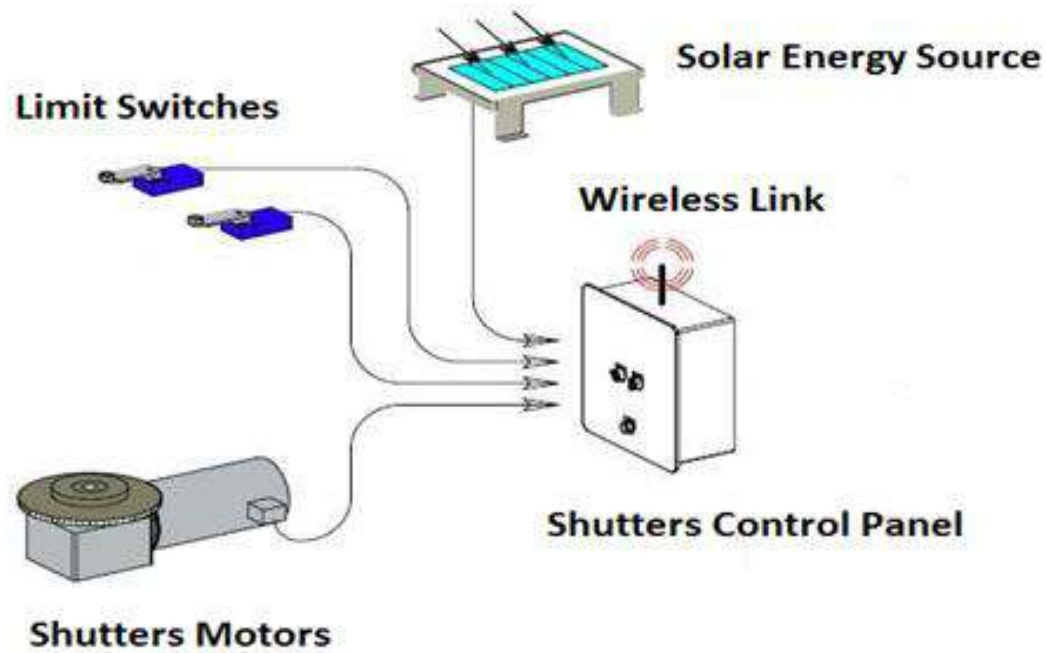
Dome Position " φ " Calculating



$$\varphi = \frac{360 * (\text{number of applied pulses})}{(\text{total pulses per one revolution of the dome})}$$

Shutters Power System Solution

Solar Energy Solution



Indoor control unit

Outdoor solar unit

Shutters Power System Solution

Slip Rings Solution



Slip Rings and Brushes



Control Panel

Shutters Power System Solution

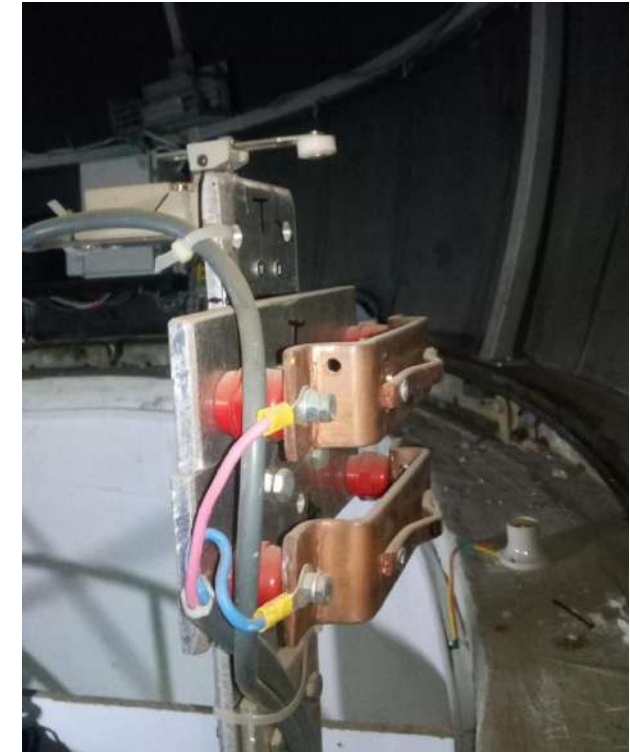
Modified Platform



Any position



Home Position



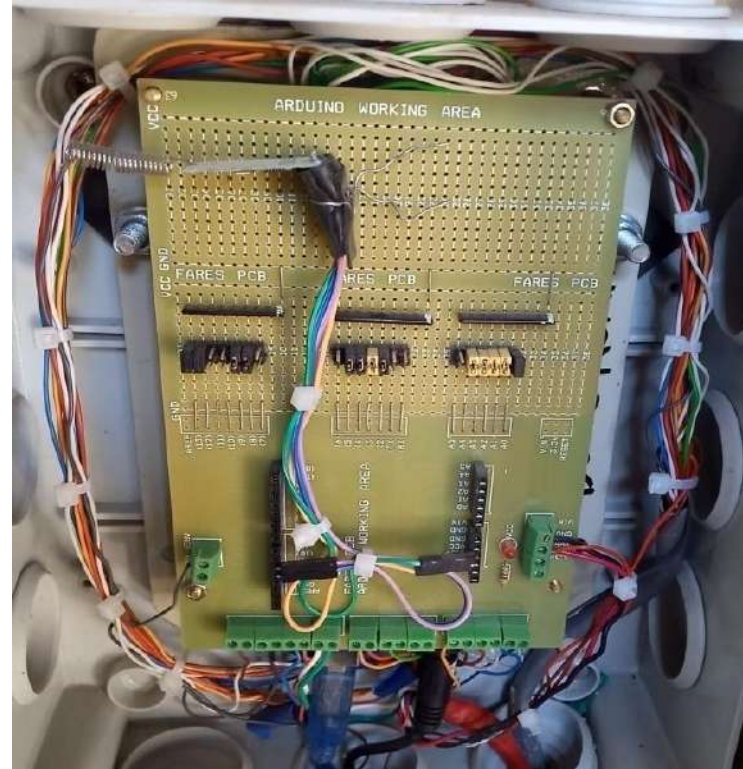
Source Copper

Dome Automation Embedded Circuits

Shutters Unit



Classical Unit

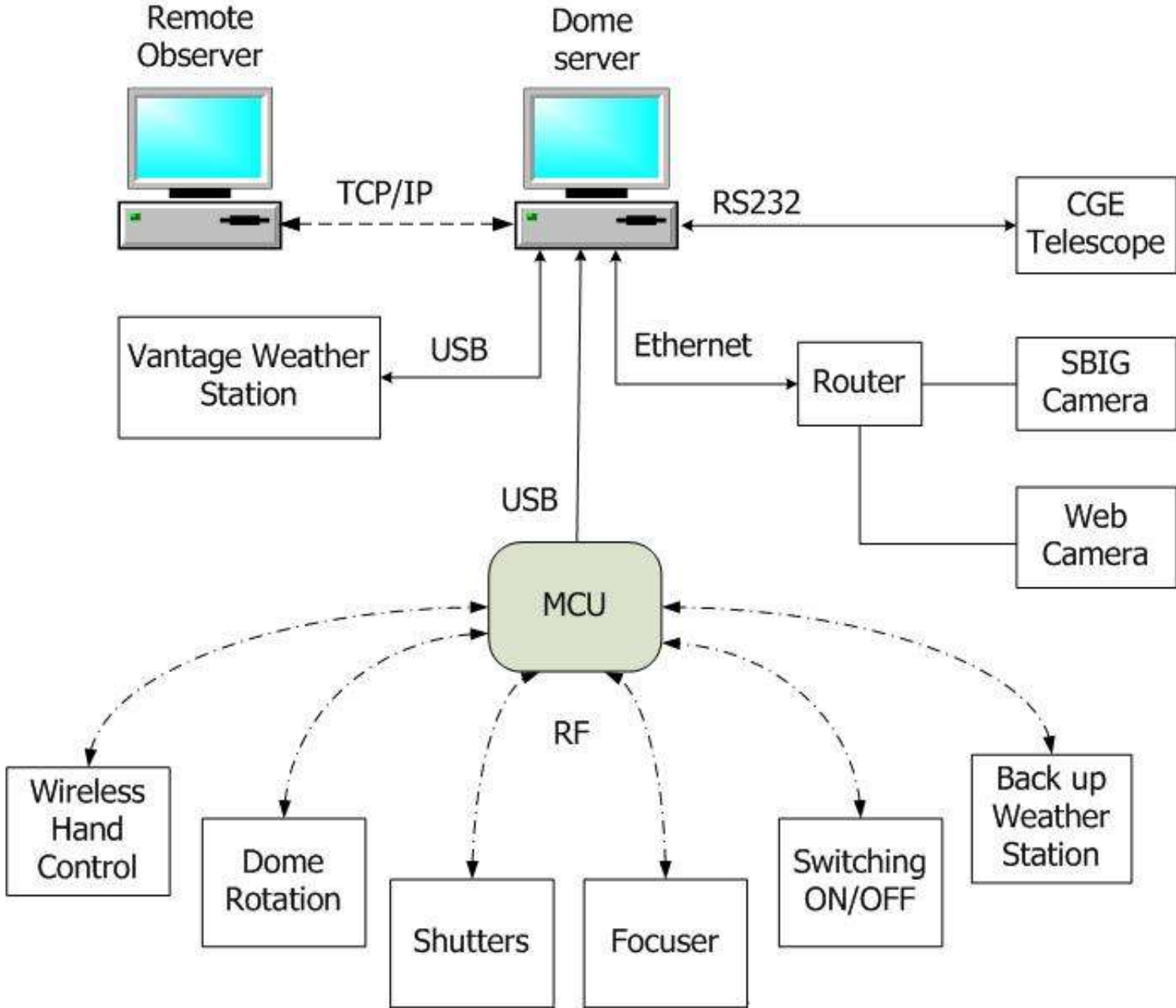


Controller Unit



External View

Control System Architecture

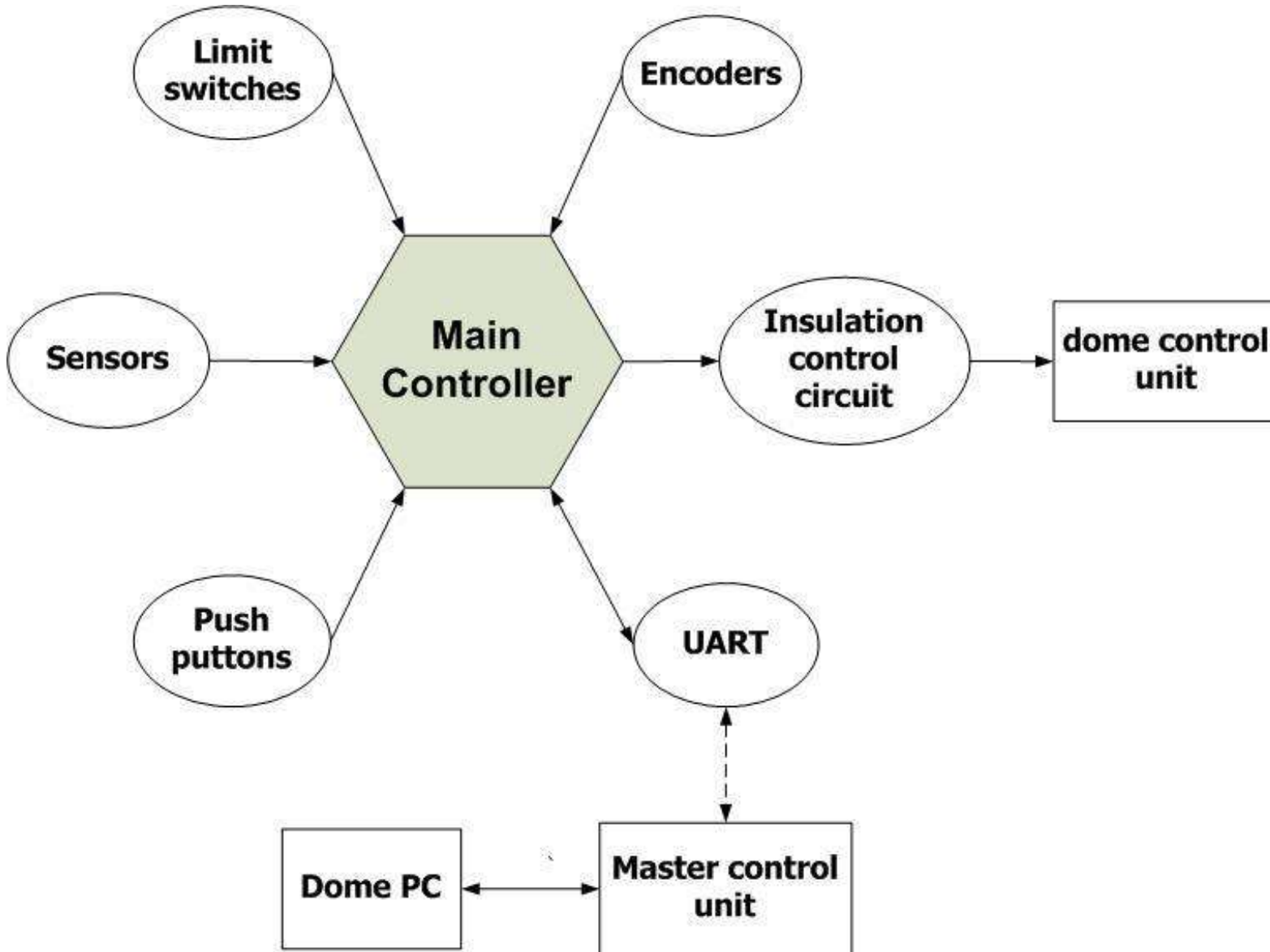


MCU refers to the Master Control Unit

RF refers to Radio Frequency Wireless Module

TCP refers to Transmission Control Protocol

Dome Rotation Controller Block diagram



• It Communicates.

• Input devices.

• Output circuits.

• Wireless module.

Graphical User Interface - GUI

Default Window under Visual Basic programming

CGE Main | HW Info | Cat 1 | TP3 | TP5 | SBig | TP7

Row 1 33

LT 3:26:52 2-10-2020 MRaDec 8:10:54.31 67:44:10.19

Sirius[Alp CMa] JD 2459124.5603 7579.56 MAzAlt 122:14:17.2 68:20:27.87

RaDec 06:45:09 -16:42:58 LST 04:19:07 DomeGo HAzAlt 24.59 39.49

HAzAlt 138.02 31.57 HA 20:08:08 SecZ 1.57

HA 21:33:58 M AzHMS 08:08:57

SecZ 1.91

Update Data AutoUpdate Data CGE Ready

Dome Go

Object	RA	DEC	VMag	ALT_H	AZ_H	HA	SecZ
Sirius[Alp CMa]	06:45:09	-16:42:58	-1.44	31.57	138.02	21:33:58	1.91
Canopus[Alp Car]	06:23:57	-52:41:45	-0.62	3	161.67	21:55:10	19.13
Arcturus[Alp Boo]	14:15:40	+19:10:57	-0.05	-32.59	35.1	14:03:27	-1.86
VGEA[Alp Lyr]	18:36:56	+38:47:01	+0.03	-14.15	332.95	09:42:11	-4.09
Capella[Alp Aur]	05:16:44	+45:59:53	+0.08	70.39	31	23:02:23	1.06
Rigel[Bet Ori]	05:14:35	-08:12:06	+0.18	49.6	158.53	23:04:32	1.31
Procyon[Alp CMi]	07:39:18	+05:13:30	+0.40	36.84	107.47	20:39:49	1.67
Betelgeuse[Alp Ori]	05:55:15	+07:24:25	+0.45	58.12	130.11	22:23:52	1.18
Altair[Alp Aql]	19:50:47	+08:52:06	+0.76	-26.06	298.66	08:28:20	-2.28
Aldebaran[Alp Tau]	04:35:55	+16:30:33	+0.87	76.04	163.08	23:43:12	1.03
Spica[Alp Vir]	13:25:12	-11:09:41	+0.98	-45.52	74.48	14:53:55	-1.4
Antares[Alp Sco]	16:29:24	-26:25:55	+1.06	-85.83	326.47	11:49:43	-1
Pollux[Bet Gem]	07:45:19	+28:01:34	+1.16	45.25	79.09	20:33:48	1.41

Cancel GOTO

Stop Moving

Dome Az 336.49

Clear List

RF Main | Master | Dome | Shutters | Power | Weather | Focuser | Davis | SoftPad

ddd Home Power Shutters ON/OFF KK KK Master

Rotation Dir Stop Top Shutter Ajar Davis Ready

BarLimit State 1 Bottom Shutter Ajar Out Temperature 21.3 °c

BarsPower OFF Dome Lights In Temperature 23.5 °c

Dome Azimuth 336.49 Telescope Lights Out Humidity 68 %

Encoder Counts 0 EmergA In Humidity 75 %

EmergB Barometer 1012.5 hPa

3.6 m/s

0 mm/hr

Open Top Close Top Open Bottom Close Bottom Shutters Violate Open Shutters

Move Left Move Right Stop Rotation Home Shutter Power ON/OFF Stop Shutters Close Shutters

Power ALL ON Power ALL OFF Telescope Lights OFF Dome Lights ON

Enable HW Emergency Dome Status Shutters Status Weather Status Power Status Disable HW Emergency

GUI - SBIG Camera & Weather Station

CGE Main HW Info Cat 1 TP3 TP5 **SBig** TP7

Camera Model	SBIG STX-16803	Camera Size XY	4069	4069
Firmware	2.51.0	Pixel Size XY	9	9
Gate Array	1.15	Max Bin XY	9	9
Imaging ROP	1.00.05	ElectronsPerADU	1.53	
Tracker ROP	1.00.04	FullWellCapacity	100000	
HTTP API	1.03	MaxADU	65535	
CCD Temperature	33.16	Ambient Temperature	32.31	
Cooler Power	0			

Get Parameters

Bin X,Y	1	1	Cooler State	0
Start X,Y	0	0	Temperature Setpoint	25
Num X,Y	4069	4069		

CCD Set Parameters

ObjectName: Jupiter
Telescope: CGE
Focal Length: 2000.00
Aperture Diameter: 200.00
Aperture Area: 25000.00
Observer: Ismail M.

Fits Set Parameters

Test

Light Exposure Time (s) 1
Flat
Bias **CCD State**
Dark

Start Exposure
Download Fits Image

Observation Path: D:\Observation\2-10-2020
File Name: Image001.fits

Filter1 Filter State
Filter2
Filter3 Determine Filter
Filter4
Filter5
Filter6
Filter7

SBIG Camera

RF Main Master Dome Shutters Power Weather Focuser Davis **SoftPad**

Out Temp	21.3 °c	Time	2:36:19 2-10-2020	Firmware Date Code	Sep 11 2017
In Temp	23.6 °c	10M Avg Wind Sp.	2.7 m/s	Transmitter Battery	0
Out Humidity	68 %	2M Avg Wind Sp.	21.5 m/s	Console Battery	2.7V
In Humidity	75 %	10M Wind Gust	4.5 m/s	Firmware Version	3.8
Barometer	1012.3 hF	Wind Dir 10M Gust	360 > Noi		
Wind Speed	1.3 m/s	Wind Direction	355 > NW	<input type="checkbox"/> Weather Close Observatory	

Rain Rate	0 mm/hr	Dew Point	15 °c
Day Rain	0 mm/hr	Day ET	0.2 mm
Month Rain	0 mm/hr	Month ET	29.7 mm
Year Rain	8.8 mm/h	Year ET	32.8 mm
Heat Index	21 °c	Wind Chill	21 °c
Sunrise	8.01	Sunset	19.51

Forecast Icons: Partly Cloudy
Rule number: 45

Alarms

Out Temp	40
In Temp	35
Out Humidity	80
In Humidity	70
Wind Speed	20
Rain Rate	0

```

==== Davis not detected
Testing port :-----
Davis_TEST_Detect
Davis Len=..... 8
..... Davis detected
Davis Loop2 Len= 59
Davis Loop2 Len= 59
Davis Loop 1 Len= error < 99 it :
Davis Loop2 Len= 59
Davis Loop2 Len= 59
    
```

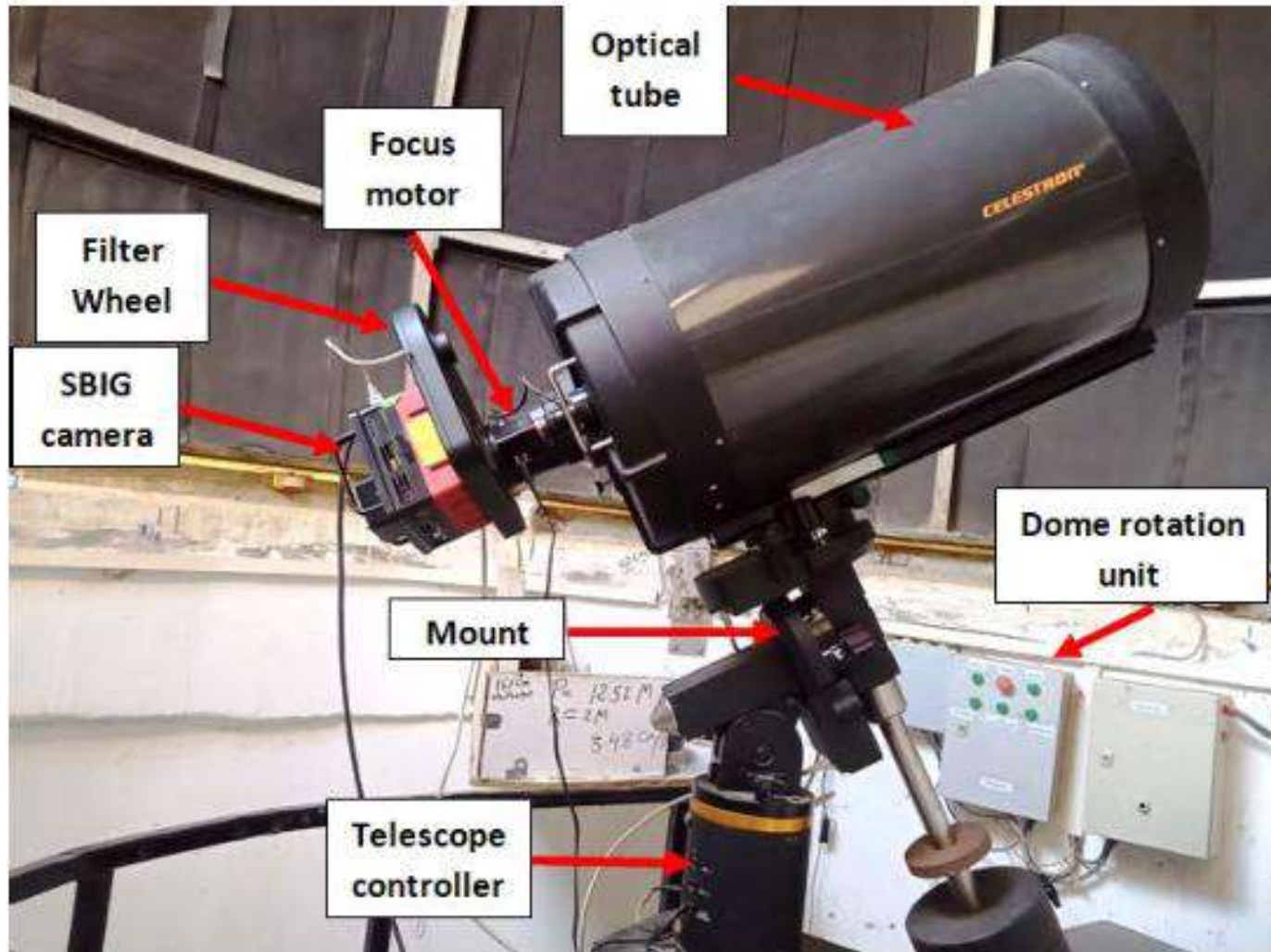
Warning Inside Humidity is 75
Warning Inside Humidity is 75
Warning Inside Humidity is 75

Clear Davis List
Clear Warning List

Load Save Upload Download Console Lamp ON Set Time
Console Lamp OFF TEST
 Enable Sound Alarms

Weather Station

Experimental Results – Overview



Focused Observed Images



UN Focused Observed Images



Future Aspects

A decision to build a new larger telescope in a new site in Egypt have been agreed upon which is expected to have a 6.5-m aperture. A lot of work must be done to match between ELOT optical design, its attached astronomical instruments and site optical characteristics. As a first step, two sites have been selected which are very good candidates for astronomical sites based on some specific physical and meteorological parameters using satellite and/or ground based data. The second step is to characterize these two candidate sites using some specific instruments that will be installed on those sites. However, there are some logistic challenges and difficulties facing the instalment of these instruments which will permit going on to the next step

Sinai site test Abo El-Rojom mountain 1200 m high from sea level



Sinai site test Abo El-Rojom mountain 1200 m high from sea level: DIMM unit

Differential Image Motion Monitor - DIMM - seeing monitor





THANK YOU