

Iranian National Observatory

Habib Khosroshahi

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4m telescope race



Source: wikipedia

The site















INO headquarter @IPM

Science with 4m telescopes

Galactic

Exoplanets

Microlensing

Stars

Magnetism is WDs Pre-MS stars ISM Metalicity

Solar system

Planetary studies to surveys

Extra-galactic

Galaxy

Dwarfs to giants morphology, star formation, metallicity, Kinematics, Environment, Dark matter, LSBs Gravitational lensing

AGNs & Quasars

Environments and hosts AGN varibility

INO operation modes

Regular observing time

Astronomers can apply to this in one of the following modes by submission of Phase I (and Phase II) proposals.

Visiting

The visiting mode will allow training of new observers.

Service

Mostly dedicated to programs requiring short exposures over many nights

Large/Survey programs

These will be set up by the INO in collaboration with the community of astronomers with international presence.

The surveys will be conducted by students assigned to these programs.

Guaranteed time

Target of opportunity

INO is likely to adopt a conditional "open sky" policy. A condition that engages the local community.



2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
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2001: Site selection studies begin 2003: 4 sites selected for long term monitoring	2004: Cabinet approves the project 2004: Parliament allocates budget code	2006: IPM hosts INO project 2007: Site selection concludes with Gargash and Dinava	2008: Site monitoring begins in Gargash and Dinava 2009: Vice-presidency for Science and Technology provides financial support 2009: Primary mirror ordered 2012: Conceptual design approved	 2012: Road construction begins 2013: Detail design begins 2014: Primary mirror is delivered to INO 2016: Detail design complete 	 2016: Secondary mirror ordered 2016: Road construction complete 2017: Science operation begins at the site 2017: Enclosure and site construction begins 2017: Enclosure and site construction begins 2018 Telescope construction begins 2020 Dome installed 2020 Telescope assembled 	2021 Telescone installed at the site

Site properties

Seeing	25%	50%	75%	Median
Dinava	0.60" (0.09)	0.74" (0.09)	0.91" (0.09)	0.73" (0.09)
Gargash	0.54" (0.04)	0.67" (0.04)	0.89" (0.04)	0.68" (0.04)







Online data



www.ino.org.ir

The telescope

Optics	Ritchey-Chrétien
Wavelength	325-2500 nm
M1 diameter	3400/700 mm
M1 f-ratio	f/1.5
Telescope f-ratio	f/11.36
Mount	Alt-Az
Guided tracking accuracy	0.2 arcsec
Field of view	8-20 arcmin
Structure weight	90 T



Telescope specifications

Mirror Cover

1000 N/m2 load 0-90 deg range

Motor/Gear

AC torque motor Spur gear 3 % altitude speed 3 % azimuth speed <10" RMS blind point <3" RMS model point <5" RMS tracking 10min <0.2" RMS auto-guiding

HSB

80T load 40μ oil film thickness 4 pads 5μ flatness (30cm) 100 μ flatness (total) Self-aligned >1e+9 N.m⁻² stiffness



Hexapod

1 μ relative accuracy <0.2 μ/0.2" resolution 110 kg payload 6 mm / 10' Stroke 5.2 kg.m2 Moment of Inertia

Adapter

100' sq. technical field Auto-guider unit WFS unit ADC unit

Instruments 1500 kg on-axis 20' FOV 3 x120 kg side 8' FOV Direct imager Iow R spectrograph Multi-obj spectrograph

Manufacturing









User interface

Observation Application

Telescope Operation Application



Site Monitoring Application

Alarm/Warning Application

User Info	Enclosure Control System			
Usemame:	◯ Close All ◯ Automatic ◯ Manual	Sun Alarm Daw Point Alarm Too Hot Warrison	Manifesting Country!	
System Role:	Enclosure System		wonitoring Control	Logs
Proposal Number:	i cody	Wind Alarm Rain Alarm Too Cold Warning		
11000 0 -	Shutter 0 % Open			Log ID DateTime Description Subsystem
INUCS Setup	Г			5214 23:18 [09-19-2017] Guid star is in range. Observing Engine
Automatic Setup		Outside Temp: 00.00		1685 23:20 [09-19-2017] Pointing started. Observing Engine
TCSS Subauton Ol B Status				5687 23:21 [09-19-2017] Alt repositioning Alt sys.
TC33 Subsystem On Status. 0.76 Heady				4475 23:21 [09-19-2017] Azimuth repositioning Az sys.
Alt/Az Subsystem ON II. Status: 0.% Ready	louver2		Alt Az 🚺 HSB 🛛 X Top unit	4457 [23:22 [09-19-2017] Tracking started. Observing Engine
				9674 [23:22 [09-19-2017] Autoguider is on. Observing Engine
Mirror Cover Subsystem ON II Status: 0 % Ready	Louver 3	Inside Top Temp: 00.00		2500 [23:23 [09-19-2017] Seeing updated BMS
	0 20 40 60 80 100			3675 23:23[09-19-2017] M1 checked. Alarm Manager
Balancing Subsystem ON Status: 0% Ready	Louver 4 label30			3698 23:24 [09-19-2017] Top Unit check. Alarm Manager
	0 20 40 60 80 100			5273 23:24 [09-19-2017] Top unit error detected. Top Unit sys.
HSB Subsystem ON II Status: 0 % Ready	Louver 5 Louver 5 label 39			5230 23:26 [09-19-2017] Oil pressure checked Alarm Manager
	0 20 40 60 80 100		Mirror Dutter Indramont	1744 23:27 [09-19-2017] Oil pressure warrning HSB
Primary Mirror Subsystem ON II Status: 0 % Ready	Louver 6 A Louver 6 Louver 6 Louver 6 Louver 6		Cover Shutter Instrument	
Secondary Mirror Subsystem	Louver 7 0 20 40 50 20 100	Inside Buttom Temp: 00.00	Alarm ID DateTime Description Subsystem Severity	
Adapter Colonators Details			1547 23:18 [09-19-2017] High temprature Top unit High	
Nuduci Subsystem			1784 00:05 [09-19-2017] Low oil pressure HSB Low	
Interlock Subsystem over Status: 0.% Ready				
	Apply			
Air Conditioning				
	Moon Rise 20 Moon Phase (%) 15			
Off O Automatic O Manual Temp Setpoint (°C) 15 € Set	Moon Set Angular Separation (')			

Software development





Factory Assembly Test



Primary mirror

Material:	ZERODUR®
Glass Weight:	~4000 kg
Diameter:	3401 mm
Thickness:	180 mm ± 10 mm
Central hole:	700 ± 1 mm
Surface roughness:	< 2 nm RMS









Spot diagram

Centroid displacement







INO100

INO LA

INO340

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Site monitoring station

حلق ومدخاته ملح الدان

Developing the site









Civil construction





May 2020

May 2021

including telescope site assembly

Winter closer Nov 2020-April 2021







Instrumentation plan

Phase I: Commissioning Camera

Phase II: Imaging camera (FoV 4 arcmin) Medium/Low resolution Slit Spectrograph

Phase III: Wide field Imaging camera (FoV 20 arcmin) Multi-object / IFU spectrograph





Lens Array



Ultra-deep imaging of M33: exploring its stellar halo with broadband imaging for the first time (No 1310)

III 30.06.2021 [©] 12:04 - 12:17 ^U Contributed talk [%] S12b : The Renaissance of the Low Surface Brightness Universe.

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We present the first attempt of exploring the stellar halo of M33 using ultra-deep broad-band imaging. Deep images using the star counting technique by the PAndAS survey reveals that M33 is undergoing a tidal interaction with its massive neighbor M31. Due to this interaction, the stellar halo of M33 is currently experiencing a tidal disruption. These features are only visible at extremely low surface brightness levels (i.e. >30 mag/arcsec*2). For this reason, M33 is a perfect test-bed for comparing ultra-deep broacbend imaging with the star counting techniques to characterize the faintest surface brightness stellar emission. The outcome of this experiment is. Therefore, key for interpreting the low surface brightness information in galactic systems where the stellar population can not be resolved (i.e. >16 Mpc).

Our experiment is conducted using the tranian National Observatory Lens Array (INOLA). INOLA's fieldof-view is 1.9 by 2.5 degrees, with a pixel size of 2.8 arcsec/pixel, easily covering M33 and its halo in one single exposure.

We will present a detailed description of all the technical challenges we have dealt with, including the construction of a very extended non-parametric point spread function (PSF) out to a radius of 45 arominutes, and a massive scattered light removal of 4400 stars within each exposure for improved sky background estimation before creating the final stack.





European Week of Astronomy and Space Science The annual meeting of the European Astronomical Society

First light 2018