



# IUCAA TELESCOPE & INSTRUMENTATION

IUCAA Girawali Observatory (IGO)

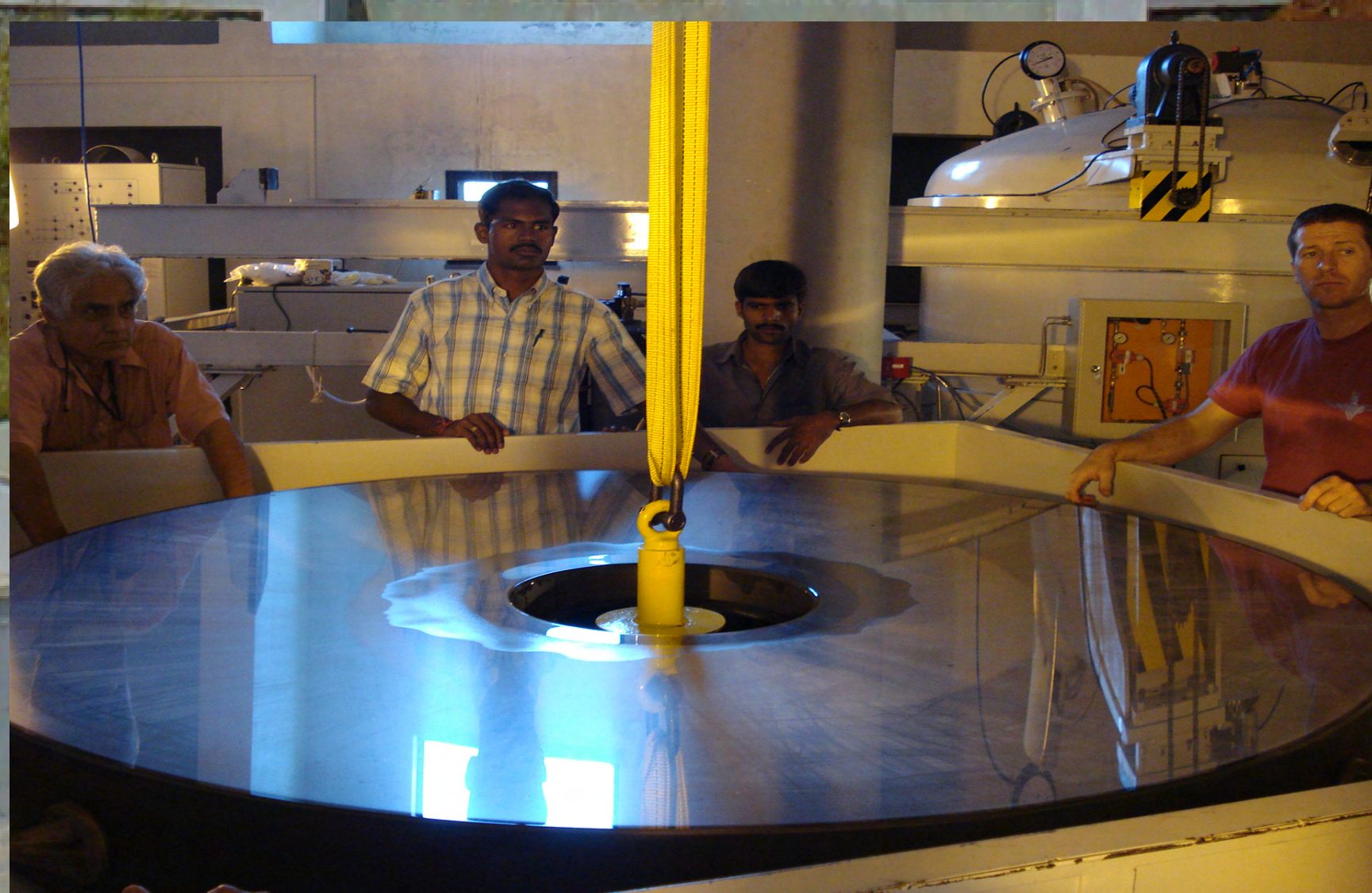
Observatory Control Room



Mirror Coating Plant



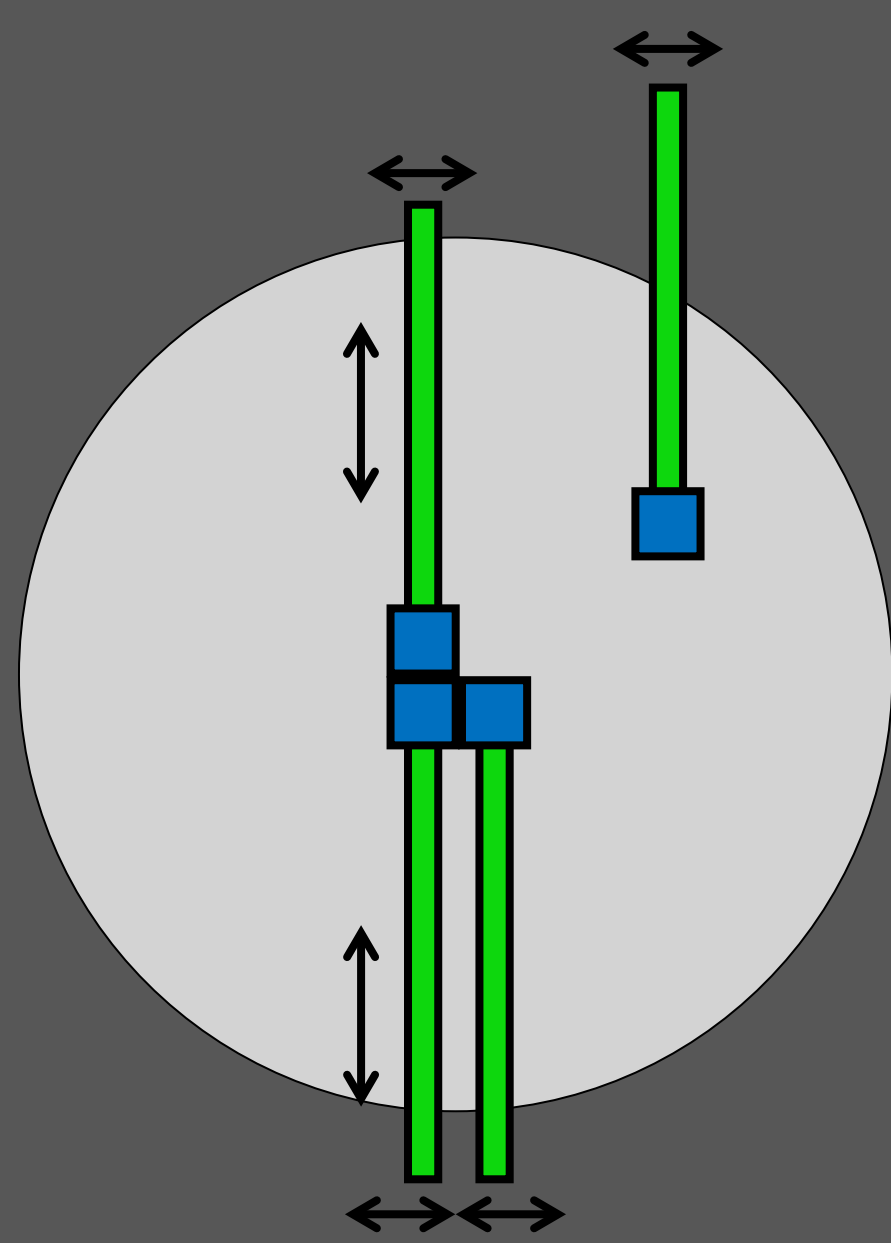
Primary Mirror of the Telescope



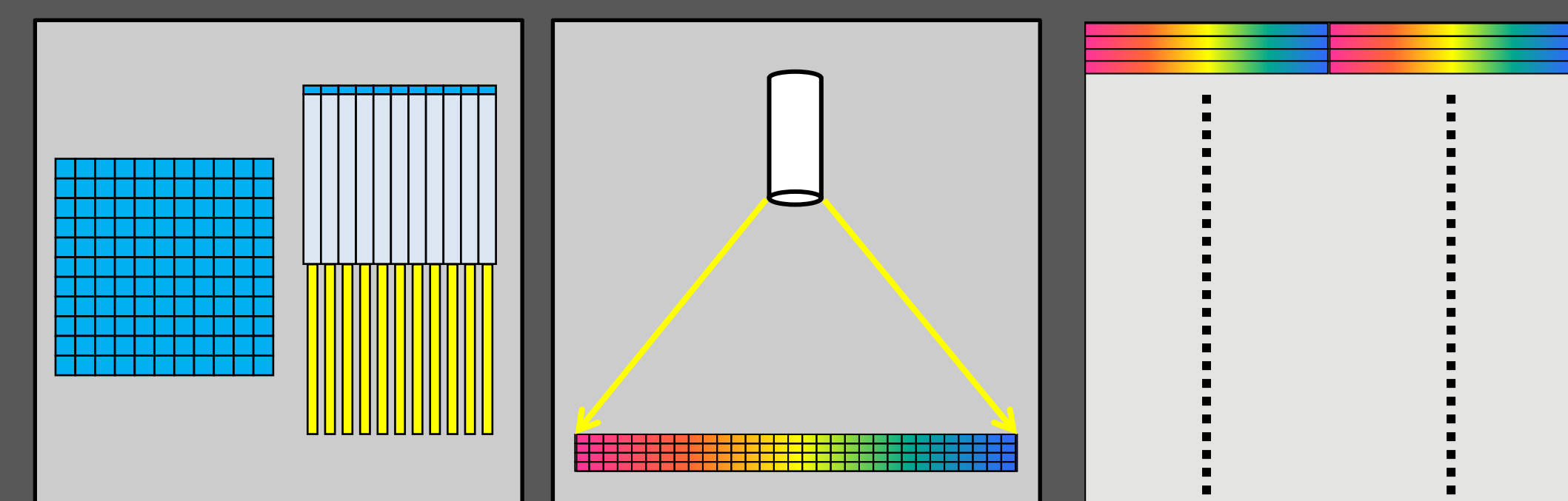
## Instrumentation R&D at IUCAA

### Integral Field Unit (IFU)

**DOTIFS (Devasthal Optical Telescope Integral Field Spectrograph)**, an optical fibre based instrument is being developed to provide 2-D spectroscopy facility at ARIES 3.6m Telescope, Devasthal, Nainital. A 2-D area of an astronomical object can be sampled by arrays of microlenses & optical fibers (IFU) and fed to spectrographs to record over 2300 spectra in one observation. There will be 16 IFUs at the focal plane and each of them has 144 microlens which would see 12 x 12 arc-seconds on the sky.



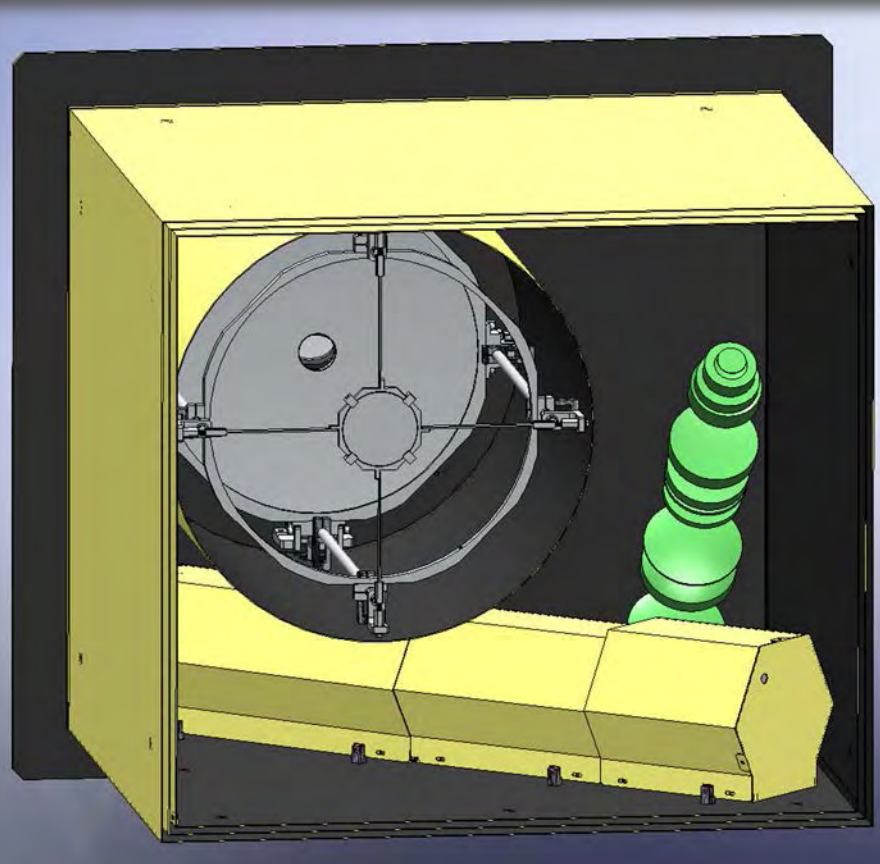
Schematic diagram of multi-IFU deployment configuration. Each 2-D movement actuator (green) holds one IFU (blue). IFUs can be deployed on any location on the telescope's 10 arcmin field of view focal plane. (white circle)



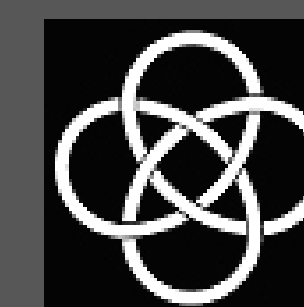
IFU Diagram Light from fiber to CCD Spectrum on CCD

Left: IFU Diagram. Each blue square represents microlens and there will be coupling fibers (yellow) for each lens. Middle: Light from one fiber is dispersed on CCD by spectrograph optics. Right: Spectrum on CCD. One CCD accommodates spectrums from 1200 fibers. 600 per each column.

Bottom Right: IRSIS (Infra-Red Spectroscopic Imaging Survey), a new small satellite telescope Integral Field Unit spectrograph has been designed. It is also fiber fed spectrograph and will see 5 X 5 arc-minutes on the sky with low resolution. (R~100)



### ROBO-AO



A collaboration between IUCAA & Caltech

Rapidly develop & deploy low cost Adaptive optics (AO) system for 1-3 m class telescopes:

- Use low risk technologies
- Ease of use, fully robotic
- Emphasis on high observing efficiency

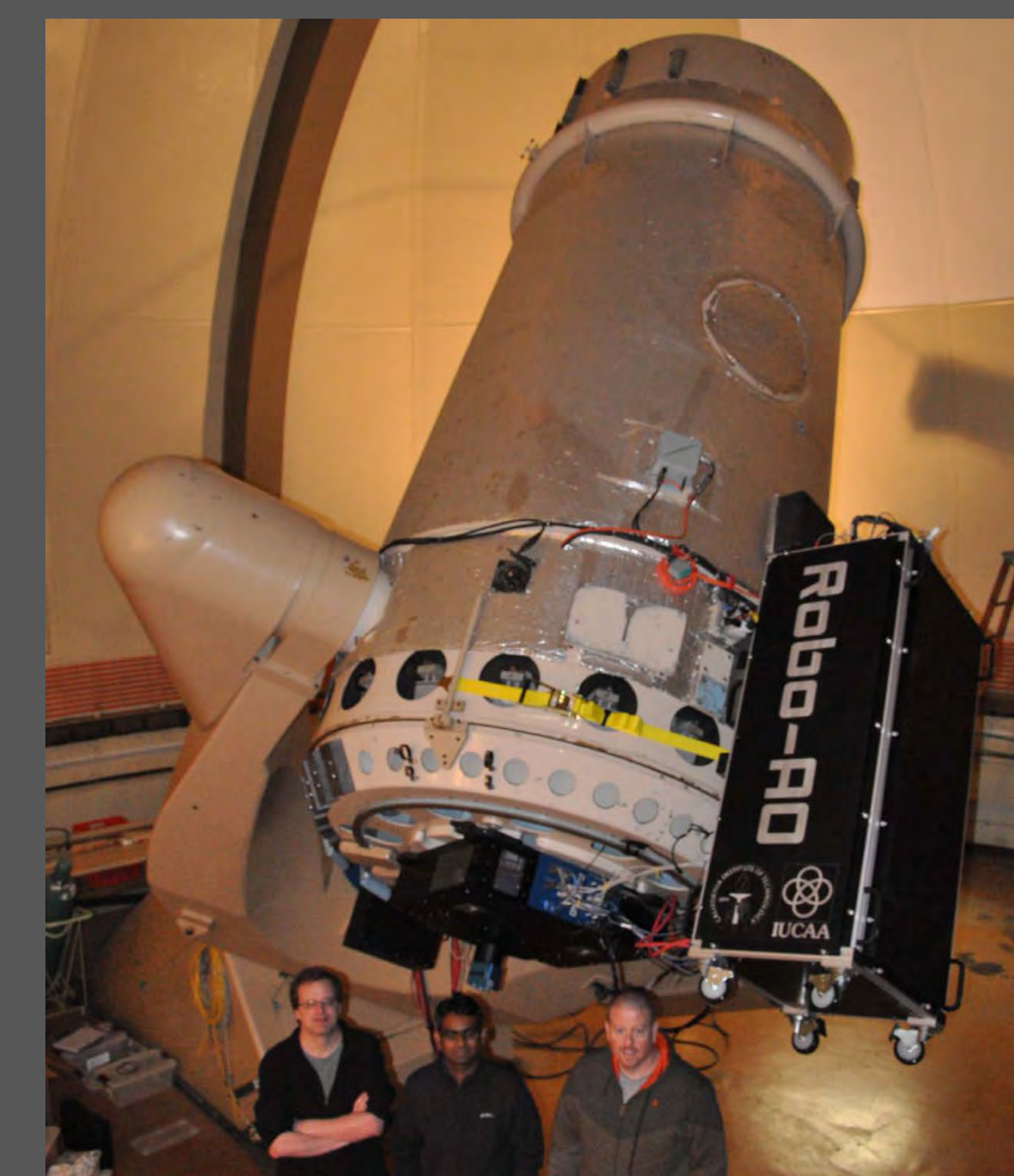
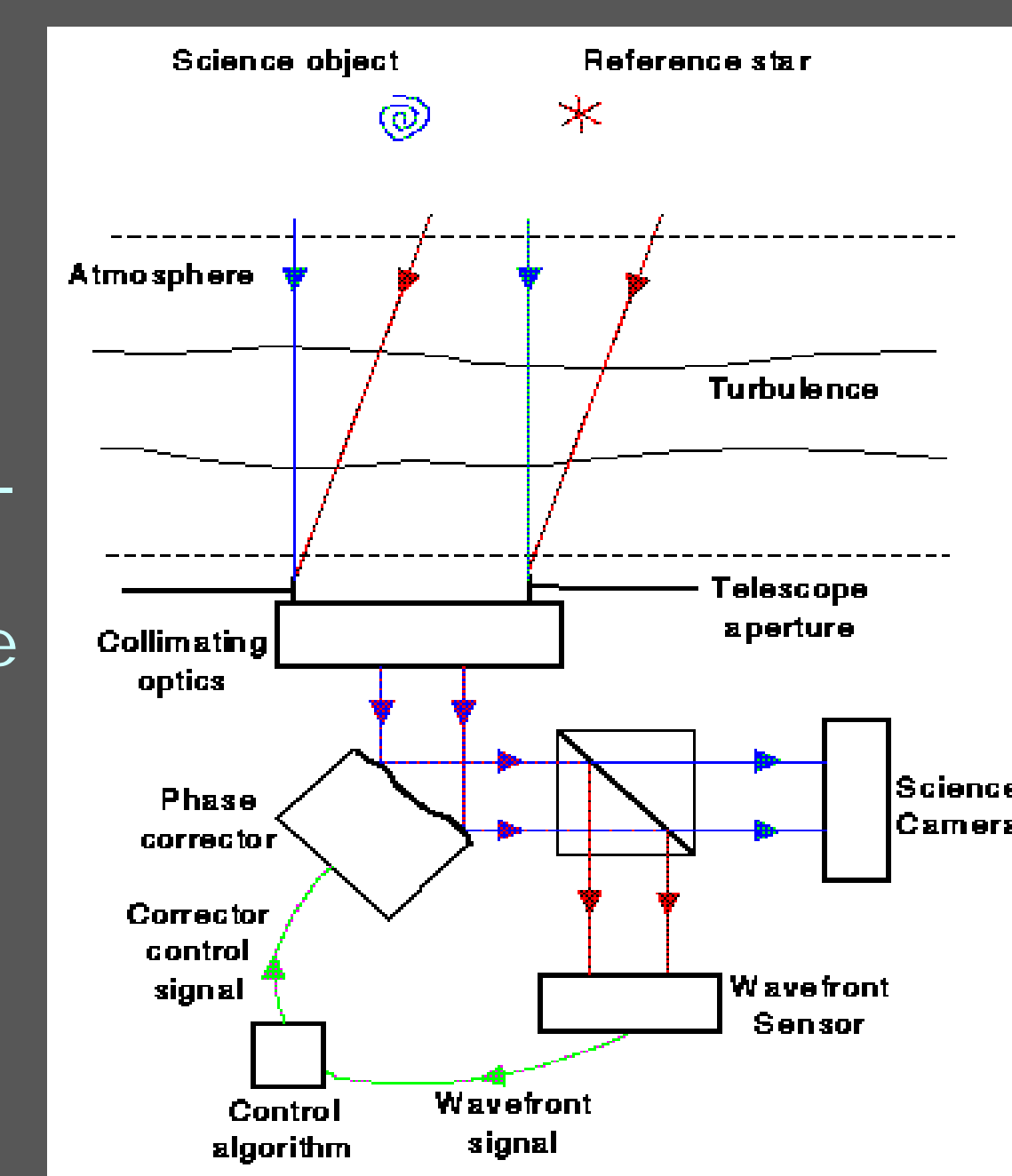
New astronomical science capability:

- Allocate large amount of time to diffraction-limited astronomy, previously not possible
- Integrated visible & near IR science instruments

AO basics:

- In ground-based optical telescopes, a blurring effect is introduced due to turbulence in the Earth's atmosphere.
- Adaptive optics (AO) techniques measure and compensate for the degrading effect of the atmosphere in real time and at least partially recover the image quality.
- For determining the atmospheric effects, a reference object (suitably bright star) sufficiently close to observational target is needed.
- Nowadays, conveniently, astronomers use artificial guide stars (firing laser beacons from the telescope into the atmosphere) as reference objects.

IUCAA is currently developing a similar AO instrument for IUCAA Girawali Observatory.

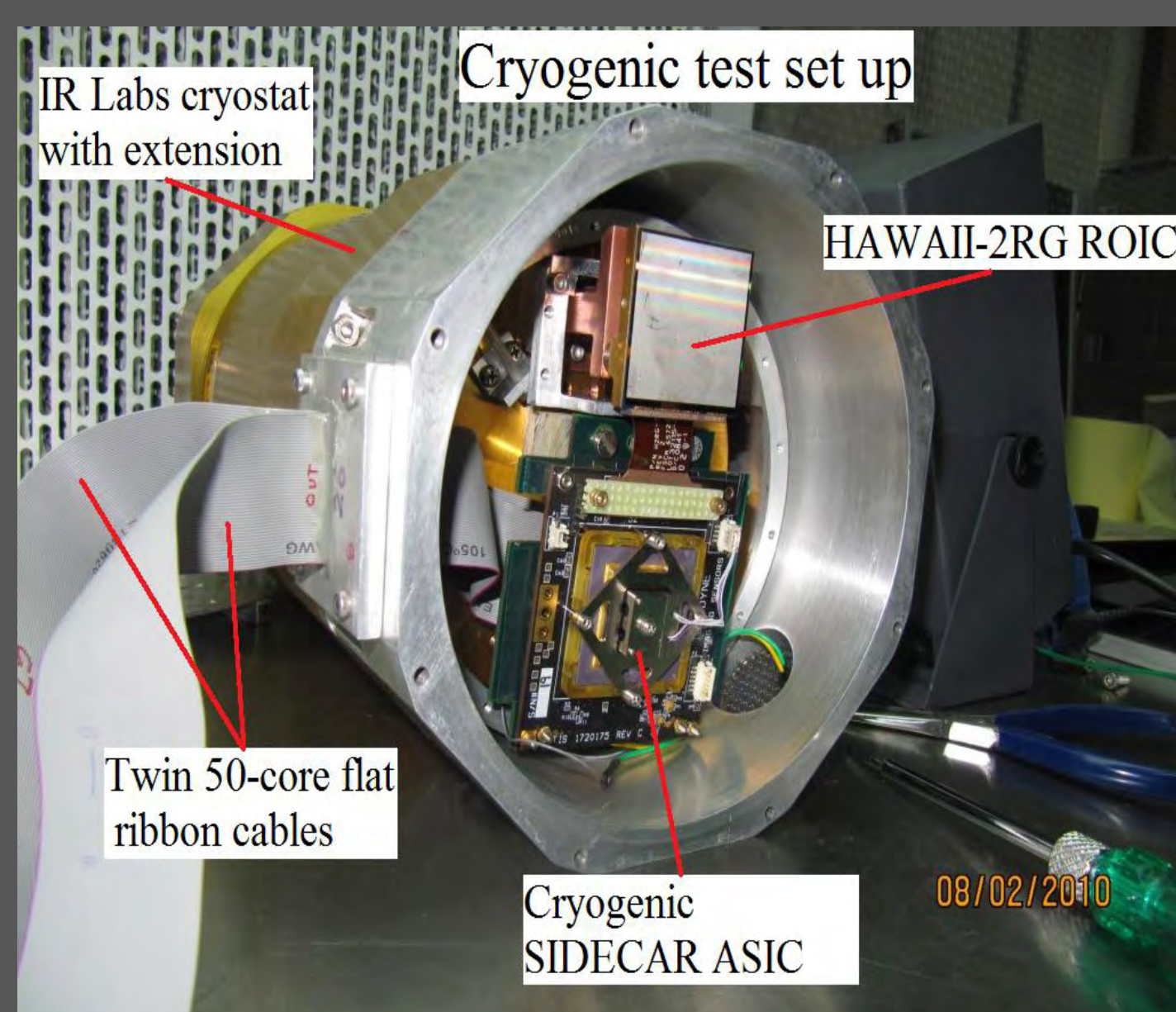


### HAWAII-2RG Near-Infrared Detector Control and Data Acquisition System

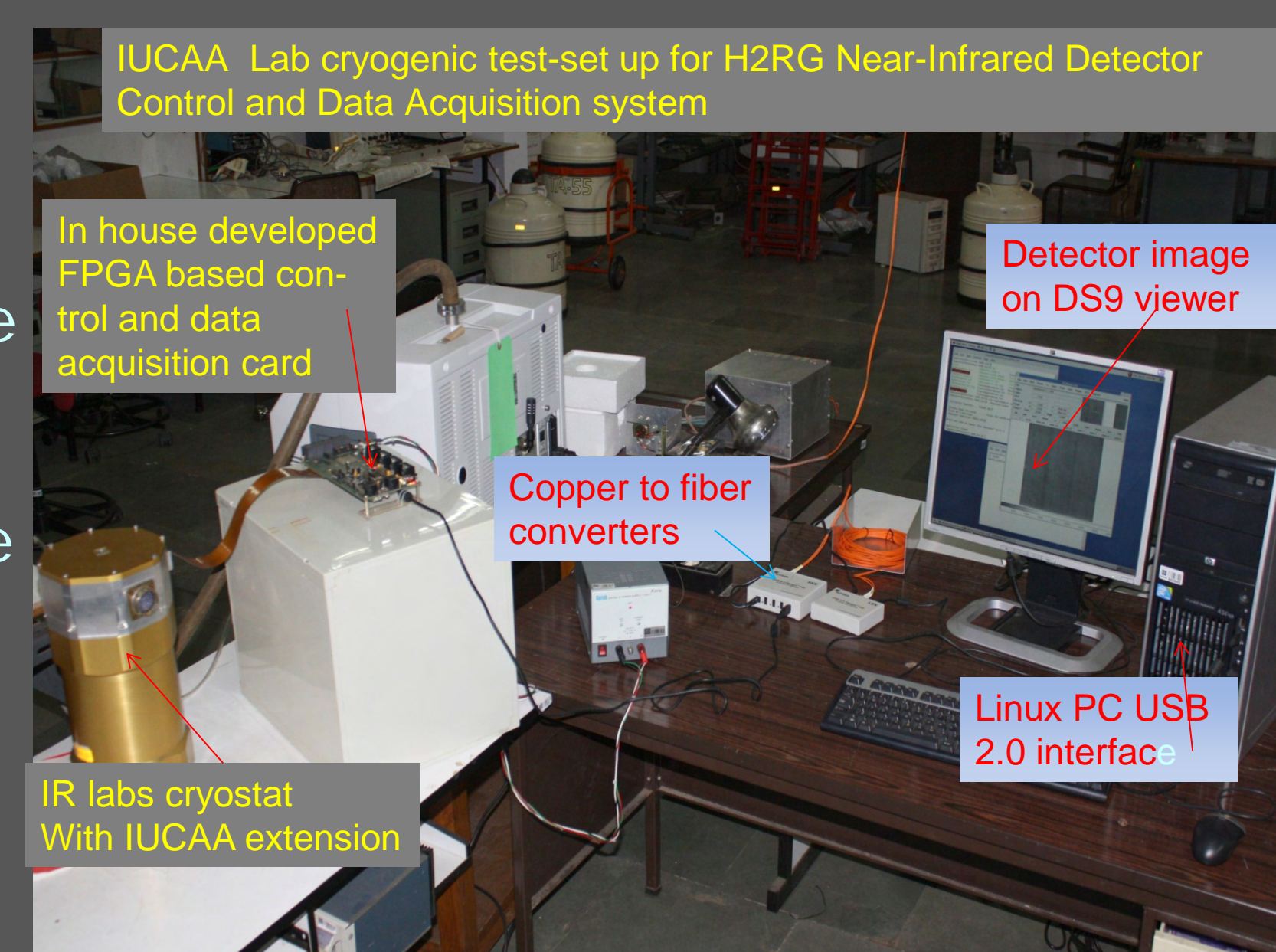
H2RG – Near-Infrared Detector with 2K x 2K pixels  
SIDE CAR ASIC - Complete Controller on a chip for H2RG

Main Features :

- SIDE CAR based (compact , low power/noise , cryogenic)
- Fast USB 2.0 interface (with fiber interface)
- Built around very powerful Vitex-5 FPGA –High Speed, On chip memory & DSP, supports all standard PC interfaces



- Platform independent software –tested on different flavors of Linux and Windows
- Fully compatible with Teledyne supplied H2RG firmware
- Can be quickly tuned to work with other similar detectors like H1RG, H4RG, etc.



This system is applied for 11 m diameter South African Large Telescope (SALT) and 10.4 m Gran Telescopio Canarias (GTC).