

India develops spectrograph that can locate faint light from distant celestial objects

New Delhi, March 04: Indian Scientists have indigenously designed and developed a low-cost optical spectrograph that can locate sources of faint light from distant quasars and galaxies, regions around supermassive black-holes around the galaxies, and cosmic explosions.

Named Aries-Devasthal Faint Object Spectrograph & Camera (ADFOSC), the instrument was designed and developed by Aryabhata Research Institute of observational sciences (ARIES), Nainital, an autonomous institute of the Department of Science and Technology (DST), Government of India. It is about 2.5 times less costly compared to imported ones and can locate sources of light with a photon-rate as low as about 1 photon per second.

The spectroscope, the largest of its kind among the existing astronomical spectrographs in the country, has been successfully commissioned on the 3.6-m Devasthal Optical Telescope (DOT), the largest in the country and Asia, near Nainital, Uttarakhand.

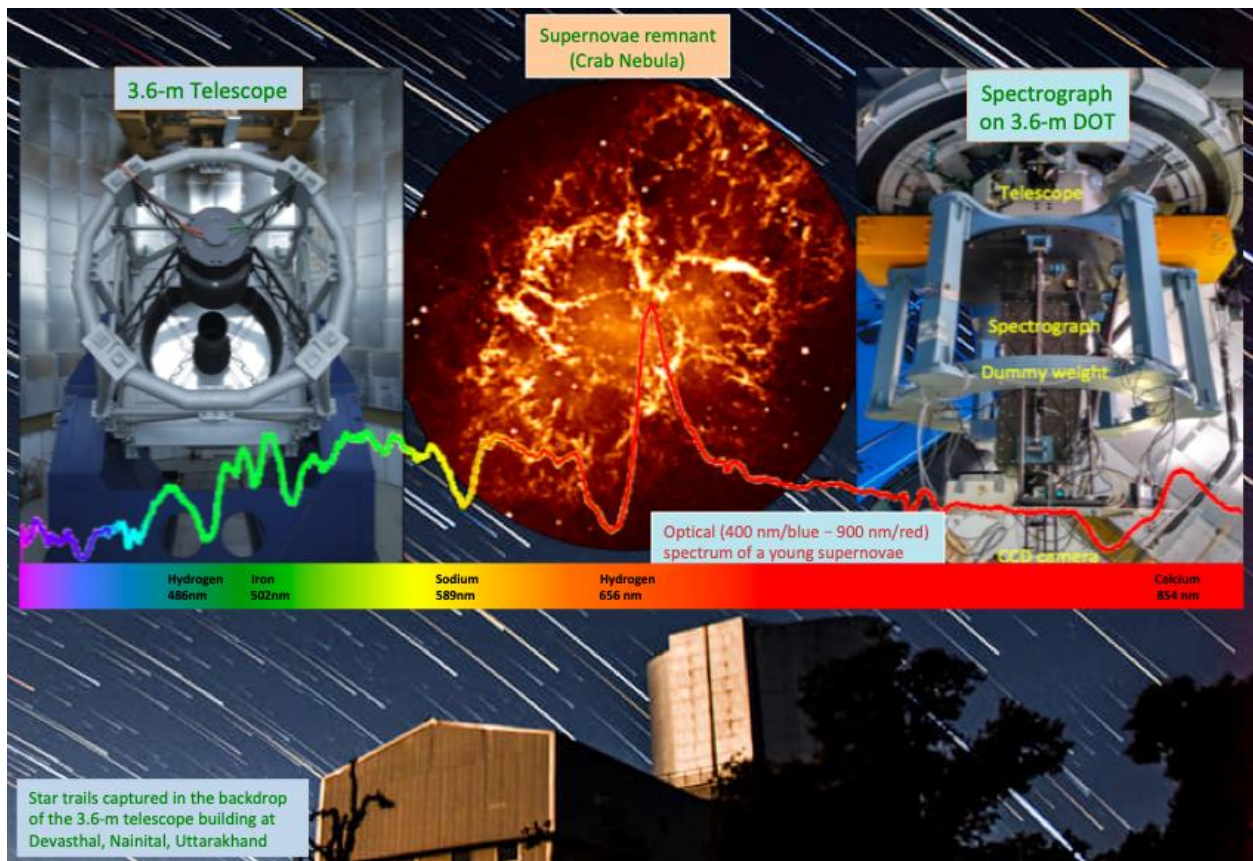
The instrument uses a complex arrangement of several lenses made of special glasses, polished to better than 5-nanometer smoothness to produce sharp images of the celestial sky. Photons coming from distant celestial sources, collected by the telescope, are sorted into different colors by the spectrograph and are finally converted into electronic recordable signals using an in-house developed Charge-Coupled Device (CCD) camera cooled to an extremely low temperature of -120°C . The total cost of this instrument is about Rs. 4 Crore.

Dr. Amitesh Omar, a scientist at ARIES led the project with a technical and scientific team that researched and developed various optical, mechanical, and electronics subsystems of the spectrograph and camera. The spectrograph is presently being used by astronomers from India and abroad to study distant quasars and galaxies in a very young universe, regions around supermassive black-holes around the galaxies, cosmic explosions like supernovae and highly energetic Gamma-ray bursts, young and massive stars, and faint dwarf galaxies.

“The indigenous efforts to build complex instruments like ADFOSC in India is an important step to become ‘Atma Nirbhar’ in the field of astronomy & astrophysics,” said Prof. Dipankar Banerjee, Director, ARIES.

Expertise from various national institutes, organizations, including the Indian Space Research Organization (ISRO) and some micro-small-medium-enterprises, were involved to review and build parts of the instrument serving as an example of effective collaboration. With this expertise, ARIES now plans to commission more complex instruments such as spectro-polarimeter and high spectral resolution spectrograph on the 3.6-m Devasthal telescope shortly.

keywords: indigenous, quasar, galaxies, black-holes, ARIES, Nainital, DST, photon, Devasthal Optical Telescope, DOT, Uttarakhand, lens, celestial, sky, camera, universe, supernovae, Gamma-ray, stars, Atma Nirbhar, astronomy, astrophysics, ISRO



This collage shows pictures of the 3.6-m Devasthal Optical Telescope (DOT), the 'Made-in-India' ARIES-Devasthal Faint Object Spectrograph & Camera (ADFOSC), and an image of celestial source obtained from the telescope.