

GOVERNMENT OF INDIA
MINISTRY OF EDUCATION
DEPARTMENT OF HIGHER EDUCATION
LOK SABHA
UNSTARRED QUESTION NO.3355
TO BE ANSWERED ON 09.08.2021

Inter-University Centre for Astronomy and Astrophysics

3355. SHRI VINCENT H. PALA:

Will the Minister of EDUCATION be pleased to state:

- (a) whether the Inter-University Center for Astronomy and Astrophysics (IUCAA) has created a light frame rate movie of growing black hole system;
- (b) if so, the details thereof;
- (c) the details of the study of black hole undertaken by the Institute for the last ten years and the outcome so far; and
- (d) the funds sanctioned and released for the Large Telescope Project?

ANSWER

MINISTER OF EDUCATION
(SHRI DHARMENDRA PRADHAN)

(a) & (b): The University Grants Commission (UGC) has informed that Mr. John Paice, a PhD student at the Inter-University Centre for Astronomy & Astrophysics (IUCAA), Pune, India, jointly with University of Southampton, UK created the movie in 2019 which was widely covered by the media in India and all over the world. The movie can be found at <https://www.youtube.com/watch?v=9V-sjuOzVVA>

(c): The UGC has further informed that many aspects of black hole research are carried out at IUCAA by faculty, students and other researchers. This includes theoretical studies of the formation and growth of black holes, of both the stellar mass and supermassive varieties, and their effect on Space and Time and the nature of gravitational waves and the implications of the General theory of relativity.

For the last six years, IUCAA scientists have been studying the flow of matter onto black holes using data from the Indian Space Observatory AstroSat and other facilities. In their recent study, IUCAA has identified some of these black holes to possess masses ranging between 2 to a few tens of times the mass of our sun.

IUCAA scientists are probing environments of super-massive black holes in active galactic nuclei using multi-wavelength observations with Indian space observatory AstroSat and other international missions. Main findings include (i) a truncated accretion disk around a 100 million solar mass black hole in an active galaxy using AstroSat observations, (ii) larger sizes of

accretion disks around supermassive black holes than predicted from theory using NASA's Swift observatory, (iii) high density accretion disk around supermassive black holes using ESA's XMM-Newton observatory, (iv) accretion disks providing seed photons for generating X-ray emission in active galaxies using AstroSat observations (v) frequency of occurrence of winds/outflows in active galaxies using XMM-Newton observations, etc.

Machine Learning and Big Data methods are used to distinguish astrophysical signal from detector noise in gravitational wave detectors for detecting binary black hole mergers, and IUCAA scientists have significantly increased the sensitivity of these discoveries.

(d): The Department of Science & Technology (DST) has informed that Thirty Meter Telescope (TMT) project is a large telescope project sanctioned under the Mega Facilities for Basic Research scheme of DST as an extramural grant. India is participating in the construction of TMT through Cash and in-kind contributions. The project is funded and implemented jointly by DST and Department of Atomic Energy (DAE). DST is the Lead Agency for the project. Indian Institute of Astrophysics (IIA), Bengaluru, IUCAA, Pune and Aryabhata Research Institute of Observational Sciences, Nainital are the three lead institutions from the country for implementation of TMT project. So far, DST has released Rs. 137.486 crore and Rs.108.85 crore have been released by DAE to IIA, Bengaluru for implementation of TMT project.
